



Torquing Group Ltd Creator!

Backed 1 project · Wales, UK · Joined Oct 2014

Providing UAS solutions in the Defence, Law Enforcement, Commercial and Consumer markets.

History ... [See full bio & links](#)



ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

by Torquing Group Ltd · First created
Successfully funded on Jan 9 2015

“ Press release for Ivan Reedman's resignation: “Everyone at Torquing was saddened to receive Ivan Reedman's resignation on Tuesday 10th November 2015. We are now considering the company's position on how best to move forward.”

[Nov 14 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ @arryG, we're working on it. You guys will be the third to know after myself and Ivan! Kevin and Robin are making great progress on the iOS App and we don't think we're far away. Cheers, Reece

[Aug 21 2015](#) on #39: from the project ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Will provide a test rig update end of play today everyone. - Reece

[Aug 20 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi Josh, BETA Testers will be shipped at the same time as the rest of the backers. However, exciting news for BETA Testers coming in the next few weeks.

[Jul 22 2015](#) on #33: from the project ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi All, Just to clarify an issue. Our shipping agent (who various directors of the company have used for 25 years in various businesses) will be vetting ALL shipping addresses prior to shipment, to ensure the address we have for you in our database are valid. If there is a mistake, or our shipping agent requires more information, we will contact you ASAP. We will not simply ship the ZANO to your listed address and hope for the best. We will cross every t and dot every i to ensure ZANO is shipped to your desired location. For example, Please do not worry about issues like, house number being on a separate line to street name, etc. Or other variations of the format in which your address is listed back to you. This will all be vetted by our shipping agent, through a sophisticated system. We will be sending the database to our shipping agent next week for the verification process, allowing enough time for us to contact any backers who we require more shipping details from. I hope this makes sense. Thanks, Reece

[Jun 3 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi Dooley, We expect to be contacting the "overpledgers" in the next 2 weeks. Thanks for your patience. Cheers, Reece

[Jun 2 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi All, There seems to have been some confusion in regards to the "over-pledged" backers and the £10 discount for FlyZANO.com. Let me clarify. Those who "over-pledged" will be contacted shortly with more details regarding their "over-pledged" credit and what items they wish to allocate their credit towards. Those who "over-pledged" will have their pledge reward and their additional items they "over-pledged" for shipped together as one consolidated package. Those who "over-pledged" ARE NOT obligated to spend anymore money to receive the additional items they "over-pledged" for. The £10 discount on purchases over £50 for FlyZANO.com is for those backers wishing to purchase additional accessories/ZANOs above and beyond their Kickstarter pledge. These orders can not be consolidated and will shipped separately. I hope this makes sense. Thanks, Reece

[May 27 2015](#) on #24: from the project ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi All, There seems to have been some confusion in regards to the "over-pledged" backers and the £10 discount for FlyZANO.com. Let me clarify. Those who "over-pledged" will be contacted shortly with more details regarding their "over-pledged"

credit and what items they wish to allocate their credit towards. Those who "over-pledged" will have their pledge reward and their additional items they "over-pledged" for shipped together as one consolidated package. Those who "over-pledged" ARE NOT obligated to spend anymore money to receive the additional items they "over-pledged" for. The £10 discount on purchases over £50 for FlyZANO.com is for those backers wishing to purchase additional accessories/ZANOs above and beyond their Kickstarter pledge. These orders can not be consolidated and will shipped separately. I hope this makes sense. Thanks, Reece

[May 27 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi Pollock, We are launching a new website shortly, in which your ZANO smart device "App" will automatically create an account for you on. ie. When you first get your ZANO and you download the ZANO "App", before you use your ZANO, you will be asked to create an account, which will also create your new account on FlyZANO.com. This will be a new account database (different from your current FlyZANO.com account). We will migrate or sync the current FlyZANO.com accounts and the new ones over time. We will automatically upgrade your new FlyZANO account to your BETA tester status. Does this make sense? Thanks, Reece

[May 26 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi All, We sent out close to 6,000 survey's yesterday, with a view of sending out the remaining surveys over the next 2 days. Please keep an eye out in the e-mail folder you used to pledge for ZANO. It's also great to see those who have already received their surveys helping out those who haven't! Thanks guys, awesome effort! Thanks, Reece

[May 19 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi All, The surveys are being rolled out as we speak, we are sending them out one reward tier at a time. So far, we have done 3 reward tiers. Another two will be done today, looking at getting the rest of the reward tier surveys sent out next week. Please keep an eye out in your e-mail inbox you used to pledge for ZANO. Development and production schedules are right on track for June delivery. Things are are certainly getting very exciting around ZANO HQ right now. A BETA Tester information pdf will be sent out shortly. (1 - 2 weeks). So bear with us on this one. Please appreciate that our focus is 100% on final development and production for ZANO to ensure we hit our June shipping date. With that said, we are very much looking forward to working with

those involved in our BETA Tester program, your input will be vital in ensuring that ZANO is the most intuitive, sophisticated and most of all, enjoyable drone experience on the market. I will provide a more comprehensive update next week. Thanks, Reece

May 15 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi All, We sent out the survey to 94 (one reward tier) of our 12,000+ backers on Thursday. The reason for sending the survey to only 94 of our backers, was to ensure the process was 100% functional. Good news, the process is effective and we're happy with the results of the test. We will begin rolling out the rest of the surveys tomorrow. Thanks, Reece

May 11 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone. Well I promised I would let you know as soon as I heard about the pre-EMC tests for Zano. It passed both the RF specific and the general emissions without issue. We still have work to do, but the result is superb. The full certification process can now be started. Anyway, that's all for now. Have a good weekend. Kind Regards, Ivan @FlyZano

May 9 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning all, Hey Ashleigh. Regarding the email with the link. We have actually already started testing this. I can check but I believe the team handling this are planning to email small batches of backers with the email first to test the entire system in a production environment. This may have already happened, if not it is very soon too. I have seen the test emails myself and the system works very nicely. Regarding other questions about the survey. The aforementioned email and link will sort most of your queries. We are still working with our shipping agent regarding batteries. The legalities around these are time consuming but we are making excellent progress. I can not confirm yet but we may have to ship additional batteries (beyond the two that come with Zano) separately due to shipping agent requirements. Once we know more, I will update you all. Onto some cool news. Our pre-EMC tests are scheduled for tomorrow with UL. UL is underwriters laboratories and is the organisation doing the full compliance process for Zano. Those in the USA will probably recognise the UL symbol on most products you buy. The UL symbol is a mark that a product meets the UL requirements. I have a basic understanding of all this but our compliance specialist is sorting all this out with UL themselves. So the crux is, hopefully soon we will know if any EMC issues are present in Zano. If not, then our schedule should hold, if there are

any EMC issues then we will need to address those before the full certification can be completed. This is a standard process for virtually all consumer products and though we aren't expecting any issues, if there are any issues, we will resolve them. Have a good morning everyone. Kind Regards, Ivan @FlyZano

May 7 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, We have just had a three day weekend here in the UK. I am sat here in my office watching the rest of the team here arrive one by one. Thank you to you all for answering questions and generally helping each other, that is one of the best things about Kickstarter, the community that it helps build. Regarding the drop in altitude if flying from a balcony, Zano also detects the rate of change of altitude so above a configurable height in mm between x number samples, Zano will then use the new altitude as the relative altitude to the operator. This allows Zano to follow the ground but if you fly off a cliff or balcony for example, Zano will maintain its relative altitude to the operator. If the ground is beyond sonar range then as Hans has mentioned, Zano will use the air pressure sensor instead. Regarding the emulator, this is being worked on. I don't have a release date for this yet. However, we are planning at the moment in mid may to release the alpha version of the SDK and documentation. Zano is off this week for pre-EMC compliance tests. This will largely determine if the main compliance tests are likely to show any issues. The pre-EMC tests allow us at this stage to make small design tweaks to help resolve compliance issues before we get to full production. Paul F. Regarding that video, wow that is quick. That sort of speed is along the lines of what we expect from our Sparrow which has a ridiculous power to weight ratio. Quite a good pilot was doing the flying too, really cool. Regarding the xbox controller, we are planning a formal release of a desktop version of the Zano app. It has been something we have discussed. It may not be for sometime as there are lots of high priority tasks but it will happen. Have a great morning. Kind Regards, Ivan @FlyZano

May 5 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning all, I have just posted a small update in the comments section answering loads of questions. If you don't see the answer to your question below, please check out the main comments section as I may have already answered your question. I am really pleased to see how great the reception of our fun video was. We were finished with our filming and thought we would have some fun. It worked out brilliantly as a video and shows you all just how cool Zano is and it is only going to get much better as time proceeds. Any questions about noise, if you could see the main comments section, I have answered this query there. Thank you. Hey David. Good

question. Regarding propellers, the motors and propellers were chosen to have the best match for performance and efficiency. Larger propellers would mean Zano would have to be larger, longer arms, would weigh more, would need a bigger battery to maintain flight time and the process continues. All of Zano has been carefully chosen and designed to be the way it is through many challenges we are not getting very close to the production version which is the same size as the initial prototype. Larger propellers can be more efficient but there are other alternatives, one that we are following is designing a special high efficiency propeller for Zano. This special propeller is going to maximise the lift of Zano for the absolute minimum power consumption to maximise flight time whilst keep all losses including sound to a minimum. Does that answer your question? Hey Dmytro. The landing was a bit rough at the end but Zano was completely unaffected. I have flown it into the wall many times (not deliberately) during testing, it has fallen to the concrete floor from 2-3m without issue. I had not configured the land command on the controller we were using so that landing was my doing. :-)

Hey John. Regarding inertia, if you see the main comments, I answered your question there with quite a bit of detail. Let me know if you would like more information.

Hey Yannick. Regarding seeing windows. It should as the surface is shiny and refraction will see some of the IR light bouncing back to Zano. If you are perpendicular to the window you will have a stronger signal I would suspect due to the almost perfect off angle reflection that glass will provide. If you are at 45 degrees to a window, that I would suspect Zano will be completely unable to see the glass unless very very close to it. Time will tell though as this will be tested by us over the coming weeks.

Hey Manish. Regarding the xBox controller, I will explain this in the next chapter of creating Zano to be released this week. Whilst the team here is building the new app, I needed a means to task and test all of Zano's functions. So we have a small C++ program that uses the alpha version of the SDK and links certain tasks to certain input from the xBox controller. So we have a button for 1m altitude, 1.5m altitude, launch and free flight modes etc. Anyway, stay tuned for the next chapter and it will make a lot more sense. Right, off to the forums. Have a great morning and thank you all for your support. Kind Regards, Ivan

Apr 22 2015 on #21: from the project ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning all, Been a little while since I popped on here to answer questions. I am pleased to see how well our Zano Obstacle Avoidance Tennis video was received. We have been doing quite a bit of filming over the past week and were having a bit of fun yesterday from which a new game was born. We are doing more filming today to get the rest of the content for the next creating Zano chapter and this is one I am really quite excited about. Explaining in broad terms about the SDK, what you can do with it, how easy it will be to develop for etc. I promise to keep it in broad terms and not get too technical To discuss the video, let me first explain the parameters that were set to

task Zano for Obstacle Avoidance Tennis. We firstly set the avoidance range to 300mm and the maximum angle to 15 degrees. Reece mentioned both of these in the update. To explain exactly what that means is anything beyond 300mm Zano will ignore, the closer an object gets within 300mm the more Zano will lean away from it up to a maximum of 15 degrees. All these values will be pre-configured by the Zano app for the environment you are flying in so no need to worry about how to configure Zano. Zano fly with what looks like inertia, it slowed down then accelerated away from the player. The obstacle avoidance has two key parameters, one is distance error and the other is speed. By distance error I mean if you set 300mm as your avoidance target and an object is at 295mm there is an error of 5mm. If an object reaches 200mm then the error is 100mm. The larger the error, the more Zano will lean away and try and avoid the object. The second part is speed of approach control. This was disabled for the video. If it was enabled, Zano would have just halted mid flight on approach as soon as it detected Thomas or Reece, this would make it look unrealistic from a tennis ball perspective. The next major question or query to answer is about noise. Zano is only about as loud as normal human conversation. We have used a sound pressure meter to verify this. The environment that we recorded the video is yesterday is absolutely horrendous from an acoustic perspective. Honestly you can hardly have a conversation in that space for the echo. Over the coming weeks we will be showing more video flying inside our office, flying outside around obstacles, you will very comfortably see that Zano is really quite quiet. A question about frequency range of control. Firstly you task Zano not control it :-). It is tasked over WIFI running at 2.4G using 802.11b/g/n. Zano does have a second radio transceiver that runs at 915MHz or 868MHz. The frequency is region specific. North America is one frequency, Europe is another. This local RF as we call it, is not used to task Zano, it is used for Zano to share its position and speed information with other Zano's in the local vicinity. I just spotted a question about rubber bands and kids trying to shoot Zano down. In answer to your question, Zano will always try and avoid obstacles or objects, no manual intervention is required. The real question is could the production Zano avoid a rubber band. I don't know would have to be my answer but this is going onto my list of things to try. Regarding the app we are developing. Android is the first phone to be supported, followed shortly thereafter by iOS (only delay might be the Apple certification process) followed shortly thereafter by a Windows mobile version. Another interesting question, can you task multiple Zano's from one controller. Absolutely but stay tuned for the next creating Zano chapter. What we have in store for developers with the SDK is really cool and I think will lead to hundreds of brilliant apps for Zano. Reading through I can see a question about supporting/bracing the PCB which forms the flight frame. Really no need. That single Zano that was used for the tennis video has been flown into the wall many many times, has fallen from 2-3m to the concrete floor and has had me working, modifying it and testing it since it arrive weeks ago. There is no fatigue or stress marks on the flight frame PCB whatsoever. Remember, Zano only weighs 60grams and the PCB is made from fibre glass, which is very

flexible. The sensitive components not he PCB are well protected and this was all part of the design process. Zano is very tough and robust, really no need to worry about that. Right, I'm heading to the forums for a small update there then later today we are finishing filming for the next chapter of creating Zano. Thank you as always for your support and enthusiasm. Kind Regards, Ivan @FlyZano

Apr 22 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi Manish, we will explain the xBox controller in Creating ZANO Part 6! Our App developers are hard at work with our Windows, iOS and Android Apps. So we have written a very simple C program, as a test harness, that uses the buttons on the xBox controller to task ZANO. More info in Creating ZANO part 6. - Reece

Apr 22 2015 on #21: from the project ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ @Martin W: Thank you for the kind words, we're doing our very best! No, ordering accessories, extra batteries, props etc. will not delay shipment of your ZANO at all. We are offering the £10 free shipping via FlyZANO.com in order for you to consolidate any accessories/extras you wish to add to your Kickstarter reward! @PeterR: Yes, you're absolutely correct. You will be able to add additional accessories/ZANOs/extras at discounted "Kickstarter Backer" prices, with no additional shipping cost. This will all arrive in the one consolidated order with your Kickstarter pledge reward. @Mark Kadleckek: Yes, we've thought of this and the system will be able to handle it! @Abulkhair Hejazy: ZANO comes complete with a detachable module, please e-mail hello@flyzano.com and we will do our very best to assist with your request to ship a ZANO without a camera. We compiled and consolidated all backer data, including multiple pledges into one database. However, please include a question about this in your e-mail to hello@flyzano.com and either Emma or Anna will be able to assist with this request. Thanks everyone. We're excited with the progress and we can't wait to start shipping you your ZANOs! Reece

Apr 21 2015 on #20: from the project ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi all, As requested by some of you and as promised by me, I will be making more updates available. Not official long winded ones (I know I can rattle on sometimes) but quick thoughts and progress directly from my office. If you are interested in this, please pop to the forums <http://www.torquinggroup.com/forum/viewtopic.php?f=3&t=456> I will post to this every couple of days with just news and progress. Some of it will be very minor and probably of no interest to you but this is the nature of software

development. Sometimes we will have really cool stuff to share and other times to us its important like the development or completion of a new algorithm but to you it may not be so exciting. Either way, lots of little updates will be posted to this topic. Right, I need to go test the new RGB leds so we can finalise that last Zano board. Have a good morning. Kind Regards, Ivan

[Apr 9 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon all, Just to let you know we are still here and working away. If you celebrate Easter than I hope you had a good Easter. We had a long weekend here in the UK and it was very much needed. A short break helps energise everyone here and we all got right back to work Tuesday morning. My office is slowing filling with boxes of components. I believe as of Friday the last of the component deliveries for the 500 build are expected. It is great to see all the parts arriving. We have had one of the Kickstarter backers here with us for the past two days, if he wishes to comment about his visit with us then I will leave that entirely to his discretion. A quick update regarding the surveys. We have most of the tool built and the process sorted for the surveys. The beta testers list is basically completed but we have a few applicants who we have not yet been able to contact. Once this is completed we will do the three give away glow in the dark Zano's lottery. We also had a management meeting this morning and a comment was made that we received some feedback that a few backers have had inconsistent information from the various teams here. Firstly, I would like to apologise for this and also mention that we have taken steps to rectify this. The various email addresses have been handled by different teams here, our solution has been to ratify the handling of these requests based on the content of the emails so that the same team always handles the same type of query. An obvious correction but handling as much email traffic as we handling is not something we have had to do before so we are learning and refining our processes. Thank you for your patience and if you have had inconsistent information from any of our teams, I hope you will see an marked improvement in this. Regarding the PCB's, one of our suppliers delivered a few panels of v1.3 of the flight frame. We will validate this design and if all is as expected, get a few of these units built and off to our testing and compliance partner for our pre-EMC tests. I have also take steps to be more active on both here and the forums, more like I was a few months back. Simply due to the project workload, I have not had the time to update you all as often as I would like. So stay tuned and you will see an increase in the frequency of updates from me. Have a great afternoon. Kind Regards, Ivan
@FlyZano

[Apr 9 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning all, A quick update for you. Production for the next chapter of creating Zano is underway. We want to cover quite a bit in this one so it should be fairly comprehensive. I won't give away any spoilers but you will get to meet more of the team. On the production and project side of things. We have completed our motor tests and had two stand out winners with efficiency well above all the others. The most efficient would have been my preference but it did lack the extra lift required to comfortably support the extended battery so the next choice was the next most efficient motor (95% as efficient as the best motor) but has substantially more lift. I am currently working on the tuning of Zano for this motor. Every change results in a butterfly effect. So changing the motors, changes magnetic fields on Zano which need to be adjusted for. Different motors have different output per watt of input. This requires retuning of the PID control systems. All routine but need to be done and done carefully. We have a few tweaks to the obstacle avoidance systems, these are working nicely but I want to maximise the range so we will try a few small changes to see if we can improve the sensing range. The only effects of this change is one change on the bill of materials with short lead time parts. To find the best mix of power efficiency for the digital electronics and performance, the digital supply rail voltage has been adjusted. This change requires a voltage sensing array update to better accommodate the battery voltage sensing. Once again, only a single change to short lead time parts on the bill of materials. This is all typical and usual fine tuning of electronics values as we approach the first production run. Our production schedule still has manufacturing and shipping Zano's in June with pre-orders being manufactured in July/August for shipping as they are produced. One thing has arisen that may slow us down. All consumer products require compliance certification for the regions they will be sold in. This includes a raft of electrical, RF and safety tests. You often see a CE mark or UL mark on the boxes for products you buy. These are marks to say the product has undergone and passed various compliance tests. You may also notice FCC and other notices. These are related to RF (radio frequency) testing in layman terms. We have scheduled for this, allowed time for this and have external specialists in this area handling the process for us. However, this process can take time, we are on schedule and don't expect any delays but I am mentioning it now just in case. A question from Shaun, the battery that Zano is currently squeaking under 60g with is a 450mAh. It is currently weighing more but it has lots of my wires hanging off it and 3D printed parts. We should sneak in on the 60g. A question from Tom about videos. There are parts of many videos of Zano flying in various forms. I know not as much footage as people would like to see but it is there including some footage of Zano flying without any plastic parts. The next video footage of Zano flying that we will publish will be of the latest version as we enable each part of the autonomy and document it. It is coming but as I have mentioned, our priorities had to shift and focus on the project deliverables (ordering, bill of materials, part selection etc). These milestones are now largely out of the way and my team is focusing on the app which is looking fantastic

(you will see a sneak in the next creating Zano chapter) and my focus is on the operating system, boot loader, recovery processes etc. For me, I am working right now with the new motors and tuning Zano. Got a few funny vibration issues that I need to resolve but all part of the process. As always, any questions, hello@flyzano.com and betatesters@torquinggroup.com are available and are handled by different teams so if your questions relate to a specific area, please contact the relevant team and they will assist in any way they can. I almost forgot to mention. I have one of the RGB boards (the little display) loaded with the new replacement RGB leds that replace the previous led we were using ready for me to test. If these new leds work as well as we hope, then that is one more part signed off and the RGB board can go into production. Remember, this board is a module and can be removed. We have some great ideas for other modules we plan to build for Zano and make available via the www.flyzano.com site. Obviously the bottom shell of Zano will need to change but we plan to make shells compatible with the various modules available. These will be easy for anyone to fit without using any tools. Anyway, have a great morning. Kind Regards, Ivan @FlyZano

Mar 31 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning, Hey Martin. It is a challenge. It is currently weighing it just over 60grams but with small reductions in the wire length for the battery, removing all my prototype testing wires, the final production plastics weighing less than our 3D printed test parts, the weight should sneak in under 60grams. Hey T Kap. I just tested the address, it is working and I know the team is getting emails from that address. Can you double check the spelling please and try again. betatesters@torquinggroup.com Hey Hans. Good one. :-) Have a good morning all. Kind Regards, Ivan @FlyZano

Mar 25 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon all. Just another update to keep you all in the loop. 1. All the plastic parts have been ordered and the specifications confirmed. 2. 90% of the BOM (Bill of materials) has been ordered and delivery times have been confirmed. Things left to order are low risk passive components. 3. Motors, Zano Fuel, Cables etc have been ordered. 4. We are waiting on delivery of the final PCB panels in full production sizes (Flight frame, Top board) 5. We are waiting on testing of a replacement RGB led for the RGB display. This was due to the original part being discontinued. Once we have verified the performance of the new part, we can order the PCB panels of these. 6. Motor testing is coming along very nicely. We are narrowing in on the most efficient motor. We had over 20 of the same physical size from various manufacturers to test. We should have this completed within the next week to ten days. 7. My job at the

moment is focused on the boot loader and fail safe recovery of Zano. As part of the user experience, we want a 100% fail safe way of restoring Zano to factory settings or uploading a new version of the operating system. We have a really nice process for users doing this now and I am 80% through implementing the updates. For beta testers, this means in the extremely unlikely event that an update crashes the Zano OS, you have a quick and reliable means for restoring factory settings. The entire process should only take 60 seconds. 8. We have some new branding for Zano. Updates to the logo and artwork. All looks really good and you will be seeing it as we publish photos of items as they arrive with the new graphics. 9. The SDK is coming along, we are aiming to publish the alpha version during April 2015 (Yes within a few weeks). The publication of this has taken a back seat to the high priority tasks of late but our focus is now shifting to the SDK, testing of Zano, refinement of functionality etc. 10. Certification progress is being made. We have Zano scheduled for pre-EMC compliance tests soon. All the processes are under way for worldwide compliances for Zano. Being a complicated unit, Zano requires compliance and certification across many areas. This is all in hand and once I have a more detailed update on this, I will let you know. That may not sound like much activity but things are really buzzing here. Everyone is focused and working hard and we are still meeting milestones. Have a great afternoon. Kind Regards, Ivan @FlyZano

Onto the questions. Regarding beta-testing, sorry if you have written to hello@flyzano.com and not had a response. We have created a new email address specifically for beta testers and enquiries. Please email betatesters@torquinggroup.com. This email goes to a different team who are focused on beta testers and sorting out the applications. I have had a chat with the guys on hello@flyzano.com and to the best of their knowledge all emails had been forwarded internally but they will keep a close eye out. So if you haven't heard about your beta-testing application, firstly please check your SPAM folders. If still no luck, please email betatesters@torquinggroup.com. We had more than the 4,000 applications we had allocated in the end once the list had been completely cleaned. However, we made a call to accommodate all the Kickstarter backers who applied as beta-testers, thank you to you all. Now, onto the survey. We discussed this on monday. We have largely worked out how we are going to do this. We have some new staff starting soon and whose job it is to first off build the tool we need to collect the information from you all, integrate this into our store, manage over pledges and ensure you (our backers) only enter your information once, in one place and have a really good tool to manage your interactions with us. The user experience is critically important to us and if things take us a little longer than expected, all I can do is apologise but promise we are doing things once and doing them right. A good question from Michael about Zano landing on a boat and recognising water. Firstly about water, I believe (we can't do it in version 1 released in June) we can in future updates to the OS detect water using the sonar. Quite how, honestly I have a few ideas but that is all it is. I suspect water will have a different signature but until I get some time and have a play (might get one of my team onto the task of processing the

signal and looking for a pattern), I can't be sure. Regarding landing on a boat. How big is the boat? ;-) GPS has a limited resolution so if your boat is a few meters long and a couple wide, or larger, you should be able to safely land on a stationary boat. If your boat is bigger then a moving boat might be possible. There are many factors at play. Can you provide more information about the boat, speed and size? Right, back to the boot loader for me. Have a great afternoon. Kind Regards, Ivan @FlyZano

Mar 24 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, Glad to see you are starting to receive emails about Beta testers. From memory we had 4,900 or so applications for beta-testing. Once we removed duplicate entries this dropped to 4,000 or so. Of the 4,000 there was initially 800 that we couldn't match to Kickstarter backers due to email mismatch or other data that wouldn't align. All of these applicants were contacted via the provided email and asked for more information. I believe that process is still ongoing. Last I heard there was a few hundred applicants that we still had not confirmed were backers and the team were still trying to contact them. So, if you have not received an email asking for more information and not received an email saying congratulations about becoming a beta-tester, can I ask you email hello@flyzano.com and explain that you did apply and had not been contacted yet and provide your kickstarter user id and email. Anything really the team can use to confirm your application. Once this is done, they will approve your application and add you to the list. We do have a cut off date for this process so act quickly please. The cut off has been set to allow us to complete the beta-tester list and announce the three lucky backers to receive a free Glow in the Dark Zano. It is all happening. Have a great morning. Kind Regards, Ivan @FlyZano

Mar 19 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey all. I was just on the forums and one of the backers pointed out that I said we would have published an update on here back on the 27th of February. He is quite right and I am glad this was brought to my attention. Thank you Randy. As I have always stated, if I make a mistake, I will be the first to admit to it and to rectify it. I completely forgot about the update, yes we have been so busy on the project and ensuring we hit milestones which I am so pleased we are on track to the day but when I said we would publish an update and gave a date, I should have stuck to it. So firstly, sorry. I have had a chat with the team and we will have an update on here in the next few days showing the new Zano shape, the tiltable camera, the new battery, where it fits and other minor changes. We will also show you the assembled Zano boards. This update is purely about production Zano and the schedule and is to keep you all in the loop as to what to expect from Zano when shipped in June (Again, we are still on

schedule ;-)) Have a great afternoon. Kind Regards, Ivan @FlyZano

Mar 12 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon all, It has been 5 days since my last update here and we hit another milestone that I wanted to share with you. Before I do, let me answer a few questions if you don't mind. Hey Randy. Regarding when will part 6 of the creating Zano be released. We had intended to release this a little while back but we had to shift our focus to project milestones in order to stay on track and in order to get the cool content, we needed to hold off until the really boring stuff we are all focused on right now is out the way. So as to when, the plan currently stands that we will begin filming for part 6 next week. I will update you all if this changes. We generally release the videos a few days after we finish filming. Hey Derek. Regarding schedule. Yes, still very much on track. Not to say it was easy but by putting in the hours, we have stayed on schedule despite the set backs. The noise was introduced by a new component that was not on the prototype and the noise was not expected. Once I identified where the noise was coming from, we have made a simple modification to the pre-production Zano's we have here and tested the solution. This solution has also been implemented for the production version. Some more news on that in a moment. Hey Michael. Congratulations on getting married and have a great time. Be wonderful if you wouldn't mind sharing a photo or two taken with Zano from your wedding. Regarding the colour, if you email hello@flyzano.com and request a change, I am sure the team will be happy to help. Hey Jack. Regarding a home button, it is a really good idea and one the team are building into the app. Hey Abdul. Regarding the production update being an update instead of in comments. Fair point and thank you. I will do a proper update there shortly with photos etc. We are waiting on some samples for the plastic shell to arrive today. This will allow us to assemble a new Zano and show you all the details. Hi Alan. Thank you. It was important to us when we started Zano to future proof it as much as is feasible and something we have stuck too ethically as well. We want all Zano users to enjoy their Zano for many years without planned obsolescence that seems to be built into some products. Hi Oliver. Regarding the beta-testing I believe your asking about and if a software error causes damage to your Zano. In the event of this happening, we will repair your Zano at no cost up until the time we release a fix for the problem or notification to users to stop using that beta-tester only function. Our goal is obviously to only allow beta-tester access to functions we are confident are rock solid but need some additional broader testing. We won't use the beta-testers as guinea pigs. Does that make sense? Hey JD. Regarding waypoints and a point of interest. Very much this is the case. Every waypoint of Zano includes co-ordinates for a point of interest. The team are building in a waypoint mode into the app. Initially we planned to leave this for third party developers to build but so many backers wanted it, it is now in the development schedule. Ok, onto the update. At 9.45am this morning

we ordered the full production panels for the top board and for the flight frame. These are full production versions with all the latest parts, amendments, power supply updates, beefed up motor controllers (200% the capacity of the prototype). We ordered enough panels to build hundreds of Zano's and right now we are on track to the day to our schedule. As mentioned earlier, we are expecting some sample plastic parts today for Zano. These are 3D printed but high resolution and identical to our injection moulded parts that the tooling is currently being built for. Once these 3D printed parts arrive (We have our own ABS production printer but the resolution is not quite high enough for the production injection moulded designed parts to be 100% accurate to the final result) we will test fit them and take some photos to include in the proper update which Abdul mentioned I should do about production. He is quite right and I will work on this with all the content. Right now, we are very much on schedule. It is all very boring stuff, ordering parts, checking suppliers, looking for second sources, verifying fitment etc. I have and am testing the pre-production Zano's we have received back and as mentioned previously, they are working really well. With the modifications that remove the new digital noise, we should be onto some cool stuff next week. I think it is all for now, in summary, all on plan and on schedule just nothing exciting to show just yet. Once the parts arrive today, we will be able to show you the new Zano so stay tuned for a proper update on here. Have a great afternoon. Kind Regards, Ivan @FlyZano

Mar 11 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon all, Just completed some more testing and wanted to take a break so thought I would pop on here and say hi. Before I give you an update. Hey Jianwei Chen Michael, Regarding a refund, certainly. Sorry to hear you are leaving us. If you could email hello@flyzano.com with your request, one of the team will pick it up and action it for you. Ok, onto a quick update. 1. The plastic parts are all designed and have been sent away for review and tooling. If you would like a CAD file of these in IGES or STEP, you will need to ask Thomas nicely on the forums but it would be great if you do designs based on these that you share them with us so we can help promote your designs. Either as STEP files for people to download and 3D print themselves or if you want to offer completed shells for Zano for sale on www.flyzano.com. 2. Regarding Bart's question about a portal to upload your videos. This is definitely happening. We have some cool ideas and there is quite a bit of discussion on the forums about this. Bart, may I ask you pop over to the forums and put any ideas you have forward. When we reach the point of building this portal, any ideas that have been suggested will help form how the portal looks and feels. 3. Onto Zano hardware, every single piece is now tested. A few minor issues but nothing major. Just little things like some digital noise appearing on some analogue lines. Only milli-volts but noise I don't want there so a few minor filtering updates and power supply changes to

remove these. 4. We have also settled on a battery shape and series of capacities. We need to test our chosen battery capacities in detail but at the moment I can confirm the minimum battery will be 450mAh and we are planning on having sizes all the way up to 900mAh. The 900mAh battery especially needs testing due to the weight so I can't confirm this will be an option but it is going to be tested. 5. With updates, we have been able to further decrease Zano's power consumption. This means it can sit and perch for longer and will have a small impact on flight time. 6. Minor updates to the onboard battery charger have been done to accommodate the larger capacity standard battery. 7. There have been a few parts were part of Zano that we have just been notified are scheduled to no longer be produced. This is common in the electronics industry and this wouldn't affect us for 12 months but we are doing a few updates to design those parts out so that when we produce Zano in volume, they will all be the same hardware for the next two years. 7. By the end of next week, we should have all the critical parts ordered. 8. 14 days from now, everything including carry cases, batteries, PCB's and components will have been ordered. 9. The new Zano app is progressing nicely. The user interface is in our opinion much better than our previous idea's. Easier to control and task Zano. Also due to popular requests, the team are building in a map and waypoint mode. Have a great weekend everyone. Kind Regards, Ivan @FlyZano

Mar 6 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning all, Just reading the comments below and although Thanos has doubts, I appreciate his comments. The fact he has commented to me shows passion and the courage to ask questions, I respect that in people. I want to avoid going over old ground as I genuinely believe we have covered everything. As such, lets move onto some really cool stuff. 1. Chapter 6 of 'Creating Zano' is scheduled to be all about the SDK and the emulator. Both are coming along really well. The display for Lantronix at embedded world was using an early version of the SDK for controlling Zano. The emulator has grown, really grown. It is now a full simulator running in Unity. This means full 3D environments, changing weather, night and day and a fully animated and active virtual Zano. Why are we doing this? Quite simply for developers, students, schools etc. Learning to control a Zano through the SDK is a challenge especially if you only get 10-15 minutes of flight testing each time. So the simulator will allow developers to build and test their apps against a virtual Zano and get them to a point where they are then ready to test against a real Zano. I'll see if we can do an update either today or next week to show screen shots, small videos etc of this environment. This is being developed concurrently with the SDK. 2. Our schedule shows us sending all the plastic part files away for tooling as of Monday next week. As promised, when we send them away we will also publish the files in a number of formats to allow interested parties to start working on their own variants of the plastic parts for Zano. 3.

Testing of the first pre-production Zano has gone really well. So far, the list of results is as below; - GPS (Tested and working) - Speaker and Audio Amplifier (Tested and working) - PDM Microphone (Tested and working) - Local RF (Not tested yet, on the list) - Obstacle avoidance sensors IR (Tested and working, much better than on the prototype too) - WIFI (xPICO by Lantronix) (Tested and working, custom firmware initial testing completed and Lantronix are now moving to build the xPICO for your Zano with this custom firmware) - Main processor (All lines tested and meeting specifications) - Sonar (Tested and working, performance and SNR is much much better than prototype) - LIPO Charger (Tested and working, will run Zano without battery installed if used for testing) - Motor control (Tested and working, EMI field less than prototype) - Camera Interface (All signals are correct but not tested yet as on the list yet to do) - RGB Leds (Tested, working) - UV Leds (Tested, working) So all in all, brilliant progress. So far apart from one simple modification, everything is working perfectly. 4. Once the plastic parts are sent away, we can also finalise the carry case internals to ensure Zano fits perfectly then these will also be ordered. 5. The Zano fuel is scheduled to be ordered soon too. 6. 99% chosen the standard battery for Zano. I will wait until this is 100% before announcing it. We also have an extended battery 99% chosen. We are waiting for flight tests of this pre-production Zano before we can confirm we are happy with both batteries and we are within our 60g weight budget. I trust that all makes sense. As mentioned, I will see if we can do a Kickstarter update today or next week on the above and show photos etc about them. Have a great morning and as always, thank you to you all for your support. Anyone with questions, you are always more than welcome to ask and we will do our best to answer any concern or query. I do ask though that you ask us questions, don't speculate. Speculation doesn't achieve much. We are very focused on delivering Zano as promised and on time and a robust product. If we go quiet from time to time, that is simply because our focus is needed on the project itself. Anyway, have a great morning. Kind Regards, Ivan @FlyZano

Feb 27 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon all, Hey David. Regarding your comment about wind. I am not sure if you saw a post of mine many weeks back about the production Zano having larger motors. The prototype did struggle a little bit in stronger winds so we designed the pre-production unit with 30% more powerful motors to compensate. Ultimately the laws of physics have a great deal to say and anything as small as Zano is always going to struggle in really gusty conditions. Zano is about fun, please remember that. We don't expect Zano to compete against quads weighing 1.2kg and costing \$1,000 but Zano will produce good results for both photography and videos and capture those moments you couldn't otherwise capture. It is also small so you can carry it with you, hence the really cool carry cases we have designed too. Hey Thanos. I am sorry you

feel the way you do. We have always been upfront and honest with everyone and I have stated repeatedly our priority is to deliver the product. We have had some delays (PCB manufacturing errors, parts not arriving etc) but these are all normal and expected, it has meant that we have had to spend the extra time on project milestones to ensure the project stays on track. You talk about video, we have published a lot of video of Zano itself. Even video about how Zano is made, internal testing etc. I have to ask, would you prefer we publish more videos at the expense of hitting project milestones? I am sure most backers would not be happy if we spent 6 months showing all manner of videos only to miss our production schedule and deliver late. As I said, I am sorry you feel the way that you do. Would you like us to arrange a refund for you? Hey Ron. Thank you for your comment. We have published quite a bit of video of Zano. Yes, most of it is very professional but we are trying to promote a professional product. The 'Creating Zano' videos are about a journey from the early days of the project right up to when we ship Zano and everything in between. May I ask that you go through all material we have published, the original camera as used on the prototypes that were used in the filming is nothing like the final camera we will use in production. The prototype also had smaller motors, early firmware, different propellers, different battery etc. In many way's it really isn't the same Zano as the final finished production Zano. As such, rather than spend time publishing more and more video of the prototype, we have said, we will focus on the production version and release these videos when they are ready as that is the only true representation of what Zano can really do. I appreciate your comment but when we publish the next videos of Zano, they will be of the Zano I am testing now which is the pre-production units and much closer to the final Zano that will be built and shipped in June. I trust that makes sense. Hey David. Zano already has GPS so no need to add anything. It uses the Origins GPS ORG1411 Pico Hornet. A cool little device. If you look at some of the photos, you will see a small grey square on the top of Zano, that is the GPS antenna. Thank you for your support. Right, I need to head home. Have a great evening. Kind Regards, Ivan

Feb 27 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, This small post is to keep you all in the loop with progress. We received the very first of the pre-production Zano's late Friday afternoon just gone. I will post some pictures soon. Initially with any new board, the testing process is painfully slow and careful. Firstly I powered it up with a current limited supply and recorded the current and took a series of measurements all over the board to ensure all the power systems were functioning correctly. Next, I programmed the Zano OS into the main processor, then powered it up again and once again carefully checked all the systems had booted and were operating. This process is quite time consuming as I have to check all the digital communication lines, make sure all the parts are

communicating and then connect to the Zano OS and start the testing of each sensor to ensure it is operating as expected. This was all completed by Sunday. Monday I then started testing the peripherals that had to be modified on the prototype to work. This included the audio amplifier and local RF. Once again, checking all the signals and the response these devices have sent to the Zano OS to ensure they are working correctly. So far, so good. Everything is working really nicely. Friday was also the day that Lantronix issued us the custom firmware for the xPICO wifi module. This was flashed onto the xPICO on the first pre-production board on Monday and we began testing that too. There is so much that goes into getting something like Zano ready for mass production, it is really quite an enormous task. Lantronix need to know from us if the new firmware meets our requirements by close of business today so they can build the xPICO for Zano with the custom firmware in it. So we have been testing the new firmware and have it all working, we are now working on a test harness piece of code for bandwidth testing. This will put the Zano OS and the xPICO wifi through their paces and identify the maximum bandwidth and network latency that we can expect. This process is ongoing as I write this. My next job is to fit camera, all the IR obstacle avoidance sensors and the motors to complete my testing of the electronics. Once I have tested the IR and motors are working perfectly on this iteration of the board, my next job is to check all the code for the camera modules I am testing works. This is a big task. Once completed, I will then have a number of camera modules streaming video through the new pre-production board and pushing the xPICO wifi bandwidth to the limits. There are so many time critical actions we are working on at the moment. Any delays at this point, mean we can not move onto building the next 500 which is where the EMS (Camtronics) will really start to optimise the build process. Once we in a position to fly the Zano I am testing, all these videos will be published. I also have allocated a member of staff to fly and fly this testing Zano to identify any issues. The sooner we can identify any issues, the sooner we can fix them and ensure the Zano's being shipping in June are absolutely rock solid reliable. Hey Tom, I trust the above answers your question. We PCB's were delayed as I mentioned in a previous update due to manufacturing faults. This pushed us back a bit. We have also had a few assembly issues, some of the holes in the PCB are a tiny bit too tight for some components so this needs to be amended on the next revision. Mass producing an item as complex as Zano is a very big task and our priority is to get a rock solid reliable Zano ready in time and on schedule. Hey everyone. Regarding emails. We have heard back from most of the unsuccessfully billed pledges. The cut off for these is the 28th of February. We have a new member of staff who will also be contacting every backer with an over pledge amount to ascertain what extra items you wanted so we can finalise the allocation of all the limited edition items. If you were a backer who over pledged, please expect an email over the coming week to ten days, there are quite a few and it will take a little while to email everyone. Keep an eye on your spam folders too please. Regarding the Lantronix stand. We specifically made the Zano display about Lantronix xPICO wifi and not about Zano. Lantronix have done a lot to

assist us and it is our way of saying thank you. So the stand shows a Zano that you can control via the touch screen but it is about connectivity and not so much about Zano. I trust that makes sense. Thomas is working on finalising the plastic parts ready to send away for tooling. So all in all, very much on track and on schedule. We have not yet published the videos of the new Zano flying simply because I have not yet finished testing it so I can make any amendments and sign off for the 500 build to happen. I also want to say, I know you are all keen to see more information, more videos and more updates and I thank you all for your patience. We are at a critical part of the project where all the ordering and sign off for everything is happening. Any delays now will have a flow on effect. Once the ordering is all done and my team and I are working purely on functionality, the frequency of videos and updates will increase dramatically. Right now we are all head down pushing hard to meet the critical milestones of this project and we are all on track. We can only stay on track and schedule by staying incredibly focused. We are also still recruiting staff, finding the resources we need. Things like skilled web developers are a resource we need. We have a brilliant engineering team, so Zano, the App, the SDK are all well on track. We need to get web developers to expand our team there to work on the developers portal for Zano, the B2B capability we need for resellers and distributors etc. So if your a good web developer and looking to work in an incredibly exciting company on really cool products, drop us an email hello@flyzano.com with your CV and port folio. We have two positions still to fill. Have a great morning. Kind Regards, Ivan @FlyZano

Feb 25 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning all, Just to give you all an update on where we are with regards to the give away of three glow in the dark Zano's, contacting backers and when you will be able to add items you want delivered with your Zano. Firstly, contacting backers. We had 300 dropped backers, that is ones whose payments were attempted by Kickstarter but were not successful. We have contacted all 300 backers and asked that if they wish to stay involved, to let us know by the 28th of February. If we don't hear back by then, then we will assume they do not wish to stay involved and we can move onto the next step. The next step is to then contact all backers who over pledged. These backers wanted two limited edition Zano's or more batteries, propellers etc. We need to contact these backers and ascertain what they wanted to do with their over pledged amount. It is during this process we will allocate unallocated items such as remaining LE Glow in the dark, our internal stock of LE Red, LE Camouflage Zano. From here we can also ascertain the total number of cases, Zano Fuel, Batteries, Propellers etc etc. Anyway, whilst this is going on, we will also sanitise the beta-tester application list to those who are actual Kickstarter backers. Once this list is finalised we will randomly pick 3 applicants to receive a free Limited Edition Glow in the Dark Zano when they all ship. Once the backers who over pledged are sorted, we will then create an account

on the flyzano.com store for all Kickstarter backers and assign you all to the Kickstarter group. This will give you lifetime discounts on all products in our accessory range both now and items we add in the future. Regarding Jessica's question about adding Zano's. Once we know what Glow in the Dark and Camo Zano's are remaining, this stock will be made available on the Flyzano.com store for purchase until the Limited Edition quantity has been used. These variants will never be produced again. Hey FE. My 'back to work' comment is because writing here is fun and doesn't feel like work. Technically you are 100% correct. I will from now on say back to Zano development :-)

Hey Rudy. Regarding ZanoFuel. Yes, Thomas has all the dimensions. If you ask the question on the forum, (it may even be in the WIKI but I'm not sure) you should get all the information your after. Right, back to Zano Development :-)

Have a great morning. Kind Regards, Ivan @FlyZano

Feb 19 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, Regarding a few questions I can see have been asked. The next Creating Zano should be finalised soon. We want to show you all footage of the first Zano's (production version) being built. We have a couple being built as a priority for us to allow us to continue on development, videos, testing etc but the rest of the first small batch will be made and recorded so you can see the process if your interested. Regarding the first 500 units. I get one :-)

Seriously, the first 500 are to be used for compliance testing, reliability testing (to destruction), all the development team staff get one or two for testing purposes. Depending on how many are left over, and subject to them being full production quality and 100% signed off, they may be used as part of the first shipments to backers. From my teams perspective, we are working well on the SDK, Updates to the Zano OS, App development, Server side applications, building the software environment for the HPC. The operations team are also on track with regards to the production schedule, ordering of parts, organising logistics etc. Finance team have started contacting backers. I believe all backers whose pledges were not successful due to various reasons have been contacted and many have responded. If you are one of the backers whose pledge was not successful but wish to stay involved, please check your email and SPAM folders as you should have an email from us. Right, I'm off, back to work, lots to do. Have a great morning. Kind Regards, Ivan @FlyZano

Feb 17 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning all, Some news to share with you. Many of the key components for the build of your Zano's scheduled to start in May and run through June have been ordered with their delivery drops scheduled to align with production. The important

thing about this news is one of our stated risks at the beginning of the Kickstarter campaign was potential supply delays. To mitigate the potential delays, the finance and procurement team here are working with the suppliers and have been since early January to secure the stocks we need and also secure the delivery dates we require for the production build of Zano. At the moment, the project is very much on track and the schedule is running very nicely. We expect two of the next ten production units back with us next week. We will then begin our testing process of these to ensure everything is working, and make any minor updates we need to as part of the production review (any changes required to make it easier and quicker to assemble) before moving into the next 500 build. Of the first 10 units coming back next week, two of these will also be sent away with one of our production engineers for a pre-compliance test. This test will check if the production Zano is likely to pass EMC testing or if we need to make any minor changes to the motor switching and RF systems to ensure the production Zano does pass EMC testing. These are all very important steps that we get right now so we don't have to revisit these items later. This 500 build is an early production build and is largely intended to help our EMS (Camtronics) refine their build process. It will highlight any major issues but the finer points will still be addressed as full production begins. The 500 will also allow us to thoroughly test for quality, we can test our firmware upgrade procedure, test a few units to destruction and continue making awesome videos :-). Anyway, just wanted to pass this information along. Have a great morning. Ivan @FlyZano

Feb 13 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon all, Regarding being contacted. This will happen soon. I actually have allocated resources to start contacting backers whose pledges were not successful first. This should happen this week. Once we have contacted those, we will send a broader email to all backers just to let you know the process and when to expect the survey's and what method we will use for collecting the additional information. Honestly this has taken us longer to get started than we expected but with 12,000+ backers to contact and some fairly complex pledges and reward selections, we need a rock solid process. This is something we are still working on. The gist is you will receive an email with a custom link in it. When you click on the link it will ask you to register and create an account, upon doing so, you will be presented with your chosen reward and if there is an over pledge a credit for the difference. You will also be able to see all the accessories and add-ons available and add these to your reward. It is all happening in the background here and you will all shortly be contacted at least to explain the process and when to expect the link etc. Hey Bernie. Regarding no-fly zones. May I ask you visit the forums and check out the threads covering no-fly zones. There is a great deal of discussion on there and I believe your question will be answered. (www.torquinggroup.com/forum) The crux is you can still fly but will be

asked to accept a small warning that will be displayed. Have a great afternoon. Kind
Regards, Ivan @FlyZano

Feb 10 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon everyone, I trust you all had a good weekend. I apologise for being a little quiet for the past few days, I have had a few family things to deal with. All good and back ready to go. Hey Rudy. Regarding the spare batteries, there is a pouch directly above the Zano fuel that is designed to hold your spare batteries and propellers etc. Is that what you were asking? Hey Mark S. That time will come around very quickly too. :-) We are waiting on the flight frame and top board to be loaded and sent back to us for testing (and videos). The top and RGB boards were delayed due to manufacturing faults, these were remade before leaving the factory. The RGB board being late won't slow us down at all. Things will start getting exciting. Hey Seif. Regarding the lottery, I believe the finance team are first contacting and waiting to hear back from all backers whose pledges were not successful. Once this information is received (or the cut off date arrives), we will then know all the actual backers who applied to be beta-testers and can run the lottery. I have asked for an update on this process and when I hear back, I will update you all. Hey Iain. LOL, I guess so. Do you want to see the British Prime-minister in a selfie video on Youtube? Unless they are away from their usual abode. I can just imagine a politician doing a Chicken Dance on a Zano selfie video (I have no idea why I suggested that.) Hey FE. Yes, you can override all but the hardcoded no fly zones. They will actually like virtual forcefields and if your Zano strays close, it will be reflected off. Hey Randy. Really good point. I know with the update about the case and the Zano fuel, I forgot to put my two pence in. We have made some fantastic progress on the SDK (which the APPs use) as well as major updates to the Zano OS to support the new code for all of our stretch goals. I'll formulate a proper update on all of this and publish it on the forums. Right, off to the forums for me. Have a great afternoon and I'll be back. (Couldn't help it, seeing as Larry a month or so ago referred to me as an AI computer and not a real boy)
Regards, Ivan @FlyZano

Feb 9 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi Navneet, We are UK based but will be keeping an eye on legislation in all major regions including BOTS to find the relevant publications as they get published. Thank you for your support. Regards, Ivan

Feb 6 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Auto correct changed USB to sub in my post below. Oops.

[Feb 6 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning all, Hey Tyler. Don't worry. You can charge the spare battery without Zano fuel. There will be a different small LIPO charger included for those without Zano fuel. Sorry for the confusion. Hey RL. Sorry for the confusion, see my comment above please. Included even without Zano fuel is a sub to micro sub cable for charging the Zano directly and a small LIPO charger that runs directly off the USB. Zano fuel includes a different LIPO charger. I hope that all makes sense. Hey FE. We (Torquing) manage all the legislation updates. So we keep an eye on legislation changes and when we are notified, we will update our system that then filters the information down to Zanos within that region by using the phone or tablet to update Zano. These updates and potential restrictions can be bypassed by the user by reading a small notice and accepting responsibility and acknowledging that you wish to use Zano anyway. We are still refining how this process will behave from a users point of view. There is a great deal of discussion about this on the forums. Maybe suggest you head there and have a read as I suspect all your questions will be answered. The crux is, by default Zano will meet the legislation but as the operator, you can choose to bypass those rules by accepting a noticed displayed on your handset. It is a difficult compromise. If you have any suggestions to our suggested process, please add this to the forum. We very much try and work with Zano users to reach the best compromise. Does that make sense? Hey Oliver. Yes, the legislation (apart from a few fixed no fly Zones such as White House, number 10 Downing st) can be bypassed. Ultimately, the Zano user has the responsibility. Eg. We are trying to provide assistance where perhaps kids are using Zano and provide some assistance to stop them doing something ideally they shouldn't. Hey Dom. I'll ask the question about the Camo case. Have a great morning all. Kind Regards, Ivan

[Feb 6 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi RL. There is a separate included charging cable that is USB to Micro USB. This connects to Zano directly and uses Zano's onboard charger for charging the battery that is installed in Zano.

[Feb 5 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning all, Hey Lucas. If your charger has a USB outlet then absolutely you can use this to charge Zano. Yes, Zano Fuel has a standard USB outlet and Zano

comes with a cable to plug Zano itself into a USB socket for charging. The Zano Fuel also comes with a small USB charger to allow charging of the spare battery whilst Zano is in use. Hey FE. The no-fly zones is only part of what we are doing, the total solution is more complex. Zano app connects to the internet just to download small updates including regional legislation changes. So if a region changes its legislation, Zano can automatically adhere to that legislation within minutes of it being published. Those changes to legislation might be maximum distance from the operator, maximum altitude, maximum ground speed. I can not predict what the legislation changes might be but we have built the entire Zano system to support dynamic changes across every region where a cellular connect might exist and your phone/tablet is able to download regional updates. Does that make sense? Have a great morning everyone. Kind Regards, Ivan @FlyZano

Feb 5 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi all, I just responded to questions on update 16. I keep forgetting to check the update sections so I apologise. If you do have questions, may I ask you check our the WIKI and the Forums as you should find answers to virtually everything there. Hey Bjoern, We have not confirmed with CeBIT as yet as there is another UK show that we are really keen to attend. The issue for us is time, we are making our priority the Zano project itself and delivering Zano in June but attending shows takes a lot of time and planning. If we can attend and not impact the project for June delivery, we will see what we can do but only if we keep to our project timeline. Hey Trevor. Regarding changes and additions. Yes to most things from shells, propellers, batteries, cases, camera modules etc. We are working on providing a pre-populated shopping cart for all Kickstarter backers as well as automated addition to a special Kickstarter discount group on www.flyzano.com. Once we have all this setup, your 'cart' will have your chosen reward and how much you pledged as credit. If there is other items that you want, you can add them at that point before completing the process and providing your shipping details etc. Does that make sense? Hey Brenson. We have looked at backer kit. We have a solution that will provide everything you are after and also add you to the discount group for backers meaning you will have lifetime discounts on all Zano accessories at the www.flyzano.com store. Right, back to work again for me. We are tidying up the Zano OS API and aligning everything on the SDK. The team had a quick play with a Windows mobile app today too, just initial functional testing but its all good and working using the SDK. Have a great afternoon. Kind Regards, Ivan @FlyZano

Feb 4 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi all, I keep forgetting to check this section for comments. Sorry about that. The carry case and the Zano Fuel do look fantastic. We are extremely pleased with the final designs. Thank you to all for your support. Hey Troy. LOL, An EMP might cause Zano issues too :-). Hey Mark. I'll mention that to Reece. Good point, thank you. Hey Heather. You will have an opportunity, don't worry. Our goal was to get as many backers (or Zano gift recipients) as beta testers as we can. We have a few people to contact before we can sanitise the beta-applicants list. When we send out the beta-tester emails I will post an update to let you all know to expect contact from us. At that point, if you don't receive an email, just let us know and we can manually look into the issue from our side. I hope that helps. Hey Brenson. You will get a chance to modify your reward selection from adding carry cases, ZanoFuel, batteries, propellers etc. This will all happen soon, we just are finalising the process before we begin. Hey Sheri. Sorry, I don't understand. Hey Larry. Thank you. Your email was received, I know as I saw it. I know the team here are working on the process at the moment and trying to keep on top of the emails. I wouldn't worry Larry, it will all be handled. If you haven't received a response to your email, please private message me on the forums and I'll chase it up. Hey Dave. Yes, you will get a chance to add a Zano Fuel to your pledge if you wish when we send out the emails with your 'cart' preloaded and the options available. Hey JB. LOL. So your happy with how it looks? Hey Laga. Thank you. Hey Laurie. The Beta-testing is for the firmware and software, the hardware won't change. If you want more information, please check out the forums and wiki (www.torquinggroup.com/forum and www.torquinggroup.com/wiki) Hey Dereck. The JST connector can handle 5a as you have suggested. Zano typically draws 2.5-3.5A with small peaks up to 5.5 but for short periods of time. Also JST was chosen as it is readily available so your not restricted to using our brand battery though we would suggest you do to protect your Zano. Hey Chris. The winners will be chosen shortly. We are contacting the pledges that were not successful to see if those people wish to stay involved or not. If they do wish to stay involved, we can then include their applications in the lottery of shorts. Sorry it is taking a while but with the sheer volume of information to process and people to contact, we are working hard to refine a process that will work hopefully seamlessly. Hey Randy. Thank you. Hey Caleb. Thank you. The next video will talk about the SDK and what you can all expect too from beta-testing. Have a great afternoon. Cheers, Ivan @FlyZano

Feb 4 2015 on #16: from the project ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon all, I trust you all had a great weekend. I'm going to confuse everyone and answer questions from the bottom up today. :-). Thank you everyone regarding the case, I agree and think Thomas has done a stand out job with it in conjunction with our case maker. The comment about it looking a little like a toilet did make me laugh and it

wasn't a picture I needed in my mind. Hey Steve Jr. The beta-tester form has been taken down. We will shortly put up the form for the remaining non-kickstarter reserved places (4000 were reserved for backers, 1000 are available for kickstarter and pre-orders). Once this is up, I will update you all. Thank you for your support. Hey Peter. Just provide your backer number in the comments section and we will ship them all together. Hey Derek. We had a project planning meeting today, its early days but the project is running to schedule at the moment. Actually slightly ahead but we have months to go yet. Hey Aziz. That is fantastic news and well done. We could make a baby rattle control for Zano? Could be some fun. :-) Hey Doug. Thank you. It is all coming along well. Hey Robert. No pricing yet on the FLIR camera. We have some great discussions with FLIR so as soon as we have some specifics, we will update you all. Hey David. Good question. To properly test the propellers actually have to be fitted to ensure the motors are pulling full current. The EM issues you refer too are not difficult to deal with so long as the PCB is designed with EM in mind. Moving power traces, providing proper filtering, moving components that are doing the switching away from sensitive components can all help move the major EM issues away from the sensors. Also regarding the magnetometer, this needs to be calibrated with the motors running at hover power as then the magnetic field is constant with in an error margin and much easier to deal with. As we release more videos, each function will be demonstrated including more in the lab footage showing specifics about the EM, calibration and other aspects. Hey Jel. LOL Thank you for that. Hey Tony. Zano has UV leds now on the frame so it can be glowing blue when you open the case and remove your Zano. Does that do what you want? Hey Michael. Thank you for your support. We are looking into the landing pad and are formulating a few means of Zano finding accurately its way home :-) Hey Doug. Thank you for your support. In answer to your questions. 1. The Zano you saw flying was the prototype I put back together for testing purposes. The pre-production boards were delayed by a few days but are due this week. As soon as they arrive, I will post a small video of the boards before they depart to Camtronics for the initial 10 build for us to test. So stay tuned. Regarding the cases, please see the Forum as I believe Thomas has responded there. Hey Byron. We are working with a few countries legislators regarding legislation on UAV's. There are things in the pipeline that we have built into Zano that is gaining popularity with legislators. I don't want to say too much until much of it is confirmed but I am still confident because of Zano's tiny size and weight and the fact we will be able to reference independent studies done in the UK that show sub 60 gram UAV's are harmless at terminal velocity to people, Zano will likely be absolutely fine. The autonomous and deterministic behaviour of Zano helps a great deal too when dealing with legislation. One of the main issues I believe you will find is the non-deterministic behaviour of non-trained operators. Zano having local regulations and legislation supported by the flight control system mitigates much of the non-deterministic nature of untrained operators. Hey Larry. Very good point. We are going to email every backer over the next week to explain what the process will be and that we will shortly follow

up with an email allowing you to confirm your reward and select what to do with the over pledged amounts and provide a list of the options and extra Zano's etc. We will definitely test the new system on a hundred or so backers before emailing it to everyone. Hi Mark. Regarding wind. We have the pre-production Zano's due back too (boards arrive this week then they need building) so with these and the larger motors etc, we will be in a position to test more thoroughly how Zano behaves in the wind and gusts. All of this information will be published too. Hey Daryl. That it is a good point. I will mention that to the guys organising to contact everyone. If a backer doesn't respond, we will work out a way that only the non-responders shipments are delayed so those who do respond get their units on time. Hey Uwe. You will receive an email shortly explaining the entire process from now including the survey, how you confirm your pledge etc. We need to get the process spot on to ensure all 12,000+ backers are contacted correctly. Expect an email in the next week to 10 days. Right, I need to go get lunch then back to work. Have a great day everyone. Kind Regards, Ivan @FlyZano

Feb 2 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon all, Hey Michael. Good question. I had a quick look at BLYNK. They are using WIFI from the APP to the Arduino so it absolutely should be possible but it would depend on the flexibility of their libraries, I know a few developers are planning to build various tools for the Arduino for controlling Zano. Certainly a project I would like to see. Hey RogerM. Sorry I couldn't be of more help. Hey Mark Mark S. Thank you. Hey Dooley. As Mark mentioned, it is coming. We are waiting on pricing for a few items so we can publish the next Creating Zano and the major update I have mentioned. I know our finance team have in their pipeline sending out all the surveys, collecting the information, allocating extra items and doing to the beta-tester give away of three glow in the dark Zano's. Please understand that when we start contacting everyone, we have to get it right as we need to collect information from 12,000+ people as efficiently and reliably as we can. I will ask for an estimate date when the surveys will be sent out and let you all know. We have been busy refining the project plan for Zano's. From tooling times to assembly process. Also finding small changes in the bill of materials that can really help with our project timeline and cost are important and all being done at the moment. Right, back to it for me. Kind Regards, Ivan

Jan 31 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning all, Hey RogerM. Sorry about the confusion.
http://www.torquinggroup.com/wiki/index.php/KS_Comments_Simple_WIKI Is the link to the copy of all the comments made here throughout the campaign. You can search

this for your username and see if you made any comments about what items you were after. Just a thought, I don't know if you did mention what you wanted. The survey's will be coming out soon too so as you say, may just be easier to wait for that. Hey Randy. Thank you. Right. back to work for me. Have a great morning. Kind Regards, Ivan @FlyZano

Jan 29 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning all, Hey Ashleigh. Don't worry, you won't miss it. We have some of the pricing back now on some items, I want to share photos of the new parts with you but then it would spoil the update. The update will happen within 24 hours of us receiving the final prices from suppliers. Hey Francis, Navneet. There will be a few surveys, one for over pledges combined with the survey to confirm what reward you want, there will be a survey for address which will be sent out closer to shipping in June as I would suspect out of 12,000+ backers, quite a few will change address between now and then. We are putting together the process to manage all the information. Possibly another survey if we have other questions or options to put to you all. Our concern is if we get our data collection process wrong, it is magnified by 12,000 so we better get our data collection process spot on :-) and we don't want to be asking you all again for the same information. Hence we are refining our process so we do it once and do it right :-) Hey Roger. Not to worry, the over pledged amount should add up to one or two combinations as the prices for additional parts are fairly different. Did you comment at all? Might be worthwhile searching the comments on the WIKI for your name and seeing if you did mention it there. Hey Creative. How could I forget the videos ;-) Thank you all for your support. It is so exciting to have changed chapter from the Kickstarter campaign and raising awareness of Zano to now the full speed project of production, planing, logistics, development (the SDK is massively exciting). The chapter after this will be full production then shipping and what a journey. To be able to share this journey with so many enthusiastic and passionate people is a real treat. (Thats all of you just in case you missed it :-)) Right, back to work. Before I do, the supplier day went well yesterday. We have the key suppliers all agreeing to deliverables and lead times with a few yet to confirm a few specifics. More motor samples arrived which need testing. Just generally great progress, all to schedule too. Have a nice morning. Kind Regards, Ivan @FlyZano

Jan 28 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening all, This is going to sound funny but this is an update to let you know a big update is coming. Make sense? We are finalising the production Zano specification. The bill of materials is virtually sorted and rationalised. We have a

suppliers day tomorrow Tuesday 27th at Camtronics and all the key suppliers. This is to set expectations for all parties so the suppliers know what we need and they can confirm lead times to meet the two production schedules. This is key to the project plan and will firm up delivery dates for the next 5 months leading up to Zano shipping in June. We are waiting on pricing on a few items, which when we receive this information hopefully this week, we can publish specifications and pictures of various parts from Zano Fuel, the spare battery charger, carry cases, batteries etc. We are also finalising bandwidth that will be available for sending video from Zano to your phone as well as putting the final specifications to the Zano OS API and SDK. We plan to release I. The next two weeks an alpha version of the SDK so developers can start playing. Solid documentation for the SDK is scheduled for March release along with a much more advanced pre-release SDK. We are also making great progress on the plastic part designs and these will be released hopefully in the next couple of weeks as CAD files in various formats. So it is all happening and we have some great updates for you coming. Just tying up loose ends on the final specification then the BIG update will arrive. You should all start being contacted over the coming weeks regarding over pledged amounts and what other items you wanted. We are looking at backerkit and a few options on how best to do this. We now have a list of which pledges were not successful and which were. This will allow us to contact those whose pledges were not successful and confirm this. Next stage is to finalise the beta tester list and also draw three lucky applicants to receive a glow in the dark Zano when they ship in June. Anyway, thank you all for your support and encouragement. Kind Regards, Ivan @FlyZano

[Jan 27 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning, Hey Zitao. Regarding the survey, we have not as yet received information from Kickstarter as to which backers pledges were successful and which were not. As such, we can't actually start the process of contacting all the backers with the first of two surveys. As soon as we have this information, we will begin contacting everyone. At the moment, it is out of our hands until we receive the information from Kickstarter. Hey Dag. Good question and certainly. What I suggest is making a comment on the survey when we contact you. Anyone who has two or more accounts, we can certainly combine the items. If you pledged for shipping under each account, we can either refund you the excess shipping or create a store credit for you on www.flyzano.com. Have a nice morning, Ivan @FlyZano

[Jan 23 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

Hello, Thomas here, We are in the process of designing a small badge to be

“ incorporated into the case, and also used as a logo. We have a couple on the short list ourselves, but thought it might be a nice idea for one of you guys to have something of your own as a part of Zano history. The final design will need to be circular, both 2D and 3D compatible and have the ability to be injection molded/cast... We want the design to be very "Zano" no text roughly 50mm dia (2inches for you un-metric folk) and awesome :) There will not be a prize as such other than your design being used forever more, and your name on the wall of fame as the badge designer (until we need to change it ha ha) Head over to the forums to post your ideas. Thomas, Design Director.

[Jan 22 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi all, Regarding the beta testing. We have not as yet had a list from Kickstarter as to which pledges were not successful and which ones were. As the Kickstarter beta-tester program is reserved for backers, we need to first sanitise the data we have collected and verify each applicant is a backer. Once we have this final list, we will randomly draw 3 applicants to receive a Glow in the Dark Limited Edition Zano. We will also then begin the process of notifying all applicants about the status of being a beta-tester. Not long now hopefully but I will keep you posted. Kind Regards, Ivan @FlyZano

[Jan 22 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening all, Hey Jeff. I'm sorry I missed your question. I don't get notified of new comments so I need to remember to check all the various locations. As a general update for everyone and hopefully to answer your question. I have some good news regarding Kickstarter backers and the www.flyzano.com store. We are going to create a special discount group on the store and automatically load all the backers into this group. This will give you lifetime discounts on all Zano accessories. This includes but is not limited too batteries, propellers, cases, ZanoFuel etc. As Jose has mentioned too, if your backer ID is provided, we can combine the shipping with your Zano. Until Zano's ship to you all, we will adjust this special discount group to have no shipping charge just to make it easier. Now anyone who has already pre-ordered through the store will receive a refund of the difference between the new pricing they would pay as an existing backer and the price they have paid already for the pre-order. Hey Aziz. I'm here from time to time. Goodnight all. Kind Regards, Ivan @FlyZano

[Jan 22 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening all. Hey Logan. Regarding the 3D files, as soon as we have them ready to send away for tooling, we will release them as they will be the most up to date and accurate files. The Alpha release of the SDK should follow shortly after our video about it. Robin (one of our developers) is planning to do a video and text tutorial on the SDK and building a wrapper. Thanks Ray. :-) Hey Randy. Keep up the chanting, its working. Thomas, Thomas, Thomas! Cheers all. Ivan @FlyZano

Jan 22 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey all, Sorry, I didn't respond to any comments. Thank you all for your support. There is so much going on behind the scenes here. I know I have said it, but there is so much cool stuff coming from details on the carry cases, to details about the pre-production units including videos of them being made (when the boards arrive back) etc. I'm like a kid at Christmas, I don't want to have to wait to share all the content but know I have too. Hey CMD. Thank you. Good point too. We are working on some new videos of Sparrow and Firecrest for you all too. To better demonstrate just what goes on behind the scenes here. Hey Patrick. I'm not entirely sure myself about those comments, we do professional content because we are professional and those videos show Zano flying. I think it is damned if we do, damned if we don't. If we didn't do professional videos, there would be criticism that the videos weren't professional. Anyway, moving on and upwards. :-) Have a great morning. Cheers, Ivan

Jan 21 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning one and all, Just a quick update. You will be getting much more detail shortly. 1. We have some fantastic progress with the carry cases. I would love to post pictures of these now but I didn't have anything to do with the cases, the cases are a result of work from Thomas so he will update you all later. They do look so cool. Much better than our original ideas for the cases. I won't spoil the surprise though. 2. Really good progress on the SDK and LibZano. We are planning to publish video tutorials on using the SDK as well as lots of supporting documentation. So not just covering what the SDK is, the interface but loads of examples in different languages of how to make use of the SDK. 3. We are working on a live (video of flight, controlling and showing the SDK) example of controlling Zano using the SDK with full details to show developers what to expect. 4. The prototype that was built had a faulty MEMS sensor on it (never seen this particular issue so its a new one to us), one of our production engineers believes it may have been as a result of incorrect package from the supplier and moisture ingress into the MEMS sensor itself. Either way, it isn't working, so we have built a brand new one using another one of our initial 10 prototypes. 5. An idea

was floated about us (Torquing Group) making a swarming test facility available for developers. So rather than every developer having to have a swarm available, we could provide access to a swarm via the internet. The SDK can easily be configured to talk to an external IP (our external IP) to allow you to control the swarm. Developers could book time on this like you would with an HPC to test your ideas and applications. Any thoughts on this? Anyway, I'd better get back to work. Have a great morning. Kind Regards, Ivan @FlyZano

Jan 21 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi All, Thank you for your overwhelming support. It certainly helps mine and my teams enthusiasm. There is so much wisdom from backers here and we will do our best to take this on board and simply stay focused on the job entrusted to us. Got some interesting news for you regarding batteries. We have a sample of the 800mAh battery coming soon. It will be a custom battery to get the right shape we need to fit into Zano. On receipt of the sample batteries, we will test and confirm this size can be carried, does not overly adversely affect lift, performance and general flight and its costs per minute of flight makes it worthwhile to you all. No point only offering a minute or so more flight time than the 650mAh battery for an extra 30% in cost. It is looking good that we will be able to offer 350mAh, 650mAh and 800mAh (all custom made in the same footprint) to fit Zano. Onto the motors, You all know the pre-production version has larger motors than Zano. We have been busy in talks with quite a few motor manufacturers and have a number of different suppliers providing samples. We will evaluate all of these for performance and reliability which is paramount to all of us. Right, I'd better get back to it. We are working on the SDK/API integration to Zano itself and expanding the Zano communications protocol to handle new capabilities that have been suggested here and ones we have planned for. We have a 'creating Zano' chapter coming too purely focused on developers so some cool stuff just around the corner. Back to work for me, we are also working on the final mechanical design. Once done, we will release these CAD files. Kind Regards, Ivan @FlyZano

Jan 19 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon all, To Bo Chen. He backed this project for £1 on the 30th of December. He was refunded his pledge. He has taken a personal vendetta against me, my family and my company. It is not fair, nor justified. Anything he has posted is all in the public domain and not once has he/she actually identified who he/she is. Easy to attack when you hide behind an anonymous user name. Now onto video footage. The campaign videos were shot in September, that footage is 5 months old. we want to give you footage of where we are now, not where we were. We want to

represent the technology to the best we can, we are a business. As stated, we have rebuilt a prototype for more development whilst waiting on the preproduction boards. You will get footage of this shortly. I have mentioned this already. We plan to do a short video showing the SDK and talking to Zano to show how easy it is, launching, landing etc all through the SDK with simple one step commands. We also hope to release an alpha SDK soon. It is all happening. This is a massive project, so much is happening behind the scenes. Please appreciate that. Also, I am in contact with a few backers who we will be offering the chance to be the very first to play with Zano when we get the preproduction version back, programmed and tested. How could we be more open? These backers will appear in a creating Zano chapter too as impartial users. Also remember, we have been open and honest about who we are right from the outset. I can't say that about Bo Chen. I'll repeat for anyone who may have missed it. I started Torquing as a small business when I was 14 and living in Australia. I closed this business when I changed fields to another business, which grew into a small company. I left Australia and came to the UK where I started Torquing Technology Ltd in memory of Torquing my business I started and ran for years during my early stages in my career. If I wanted to hide anything, why would I deliberately tie my entire life together? Videos are coming, we wanted to surprise everyone not be harassed into releasing them before we were ready. Even when we do release these videos, baseless accusations will still follow. We also have plans to show Sparrow and Firecrest as they are being built too. My final word on this, because someone can't see how it is possible, doesn't mean it isn't possible, just means they don't know how. That is why intellectual property is so fiercely guarded. Anyway, I won't be responding to these acquisitions anymore. We are simply going to focus on delivering what you all want and what we have promised to do. Yes, videos are coming and soon. Kind Regards, Ivan @FlyZano

Jan 19 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi All! Reece here. This isn't normally my space for dialogue. However, I felt compelled this morning to post. First things first. @Creative Apparel. In a past life I was a footballer (soccer player). Obviously not a very good one it seems! :P I only lasted 5 years before hanging up my boots due to injury! I still enjoy a kick with my friends on a Saturday. If you're ever in the Pembrokeshire area, feel free to come down, I'm sure if you bring your boots you'll get a game!! OK. No onto the main point... No matter what we post. There will be criticism. We take time to answer every single comment and message across all of our social media platforms, as well as Kickstarter. It's part of our ethos as an organisation to provide 100% clarity to our backers and supports. You guys have entrusted us to deliver on our promises, you have given us your money, which means to us "We love your idea, we love your product, we believe in you, go make it for us!". That's what we're doing right now. We're working our tails

off, day in day out, to ensure that come June we supply you all with the best ZANO it can be. We're not going to get bogged down in mud slinging affairs with a few particular individuals, who may or may not be threatened by ZANO. Perhaps they own their own quad copter business and they see ZANO as a threat? Who knows? It's none of our business. Our business is to provide our backers with the best ZANO experience possible. Anything else is simply a distraction to us. We've got nothing absolutely nothing to hide. If you have genuine questions of our company or it's history, please head on over to the forums at torquinggroup.com/forum/ and we'll be more than happy to answer any questions, in as much detail as you like! As for the stolen laptop incident. I'm not sure if you have ever had your personal property stolen? It's not a nice feeling at all. Especially not when 10 minutes after realising your laptop had been stolen, you were due to be interviewed for a live broadcast! A detective from the Nevada state police was on the scene within half an hour, he filed a police report, which I have requested be posted to me. I will be more than happy to publish this report when I receive it! Any notion that this is not the truth, is erroneous and quite frankly slander. Now... Onto the question on everyone's minds. Flight footage of ZANO! It's coming guys, I promise you. *cough* Creating ZANO Part 6 *cough*. As Marketing Director, it's my responsibility to release footage as and when I see fit. I envisaged Creating ZANO as a video journey, taking you all from the early developments of ZANO, to the progress of our campaign, to ZANOs manufacturing, to delivering your ZANOs to you all in June. So, look forward to Creating ZANO Part 6, which should be released at the end of this month, or early February. I hope this helps! Again, anymore direct questions. Please feel free to e-mail us at hello@flyzano.com . You can also contact us via our forum, Twitter, Facebook or via my own personal Twitter [@reece_crowther](https://twitter.com/reece_crowther) Thanks! Reece

Jan 18 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ @Jel Nice idea. I'll put it forward to Phil B and the operations team! -Reece

Jan 17 2015 on #14: from the project ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi Thomas! Reece here. About 10 minutes before that interview my laptop was stolen off our stand at CES! It was not a pleasant experience for myself and due to this incident of theft, I was quite late for the interview. I made my apologies regarding my lateness, and obviously told the producer why I was late. (My laptop being stolen). There must have been a miscommunication between the presenter and her producer regarding the reasoning behind us not flying ZANO at CES, he obviously blamed the stolen laptop. Bearing in mind, these guys are doing 4 interviews an hour, 12 hours a day, for 4 days straight. I don't blame them at all! As this was a live broadcast, it was

quite punctual and fast paced. I didn't have time to clarify the issue. This happens all the time. I am more than happy to clear this all up in a video update on Monday. Thanks for your die-hard support of ZANO! I'd be more than happy to answer anymore of your queries. You can either message flyzano on facebook, hello@flyzano.com or message me directly on twitter. [@reece_crowther](https://twitter.com/reece_crowther)

Jan 17 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi Thomas! Reece here. About 10 minutes before that interview my laptop was stolen off our stand at CES! It was not a pleasant experience for myself and due to this incident of theft, I was quite late for the interview. I made my apologies regarding my lateness, and obviously told the producer why I was late. (My laptop being stolen). There must have been a miscommunication between the presenter and her producer regarding the reasoning behind us not flying ZANO at CES, he obviously blamed the stolen laptop. Bearing in mind, these guys are doing 4 interviews an hour, 12 hours a day, for 4 days straight. I don't blame them at all! As this was a live broadcast, it was quite punctual and fast paced. I didn't have time to clarify the issue. This happens all the time. I am more than happy to clear this all up in a video update on Monday. Thanks for your die-hard support of ZANO! I'd be more than happy to answer anymore of your queries. You can either message flyzano on facebook, hello@flyzano.com or message me directly on twitter. [@reece_crowther](https://twitter.com/reece_crowther)

Jan 17 2015 on #14: from the project ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi all, Just a quick response here. Hey David. We have a lot of video content coming your way. Please understand that we have project milestones that we absolutely have to meet to hit our June deadline. We are recruiting at the moment various roles to help with the logistics but until these people start, we are absolutely flat out. Examples of milestones that simply must be hit are finalising the mechanical shape and design, finalising the PCB designs, ordering tooling for injection moulding to name just a few. As we hit these which we are doing well, the natural progression is to provide more content to backers. I ask you to consider, how would backers feel if we provided videos every week and in response to excitement showing every piece of functionality only to miss our June deadline by a month or two. Video content is coming, please see my update earlier today not far below this message. You will see video to answer all your questions but as time permits. We have to set the priority as delivering what we promised in a product and share videos of the process and progress as we move along. Hey Thomas. Thank you. Really appreciate that. Yes, you certainly could 3D print virtually any attachment you want. Be great to keep fingers away from the props more than to stop Zano bumping into things. :-)) Hey JP. Thank you. The 3D files will

be available soon. We need to finalise the shape then we will release these. About the same time as we send away for injection tooling. Hey Doug. I hadn't actually thought of that. Your quite right, I tend to answer questions there and post updates here. I'll ensure I update the forums too. Thank you. Hey Arnel. Yes, different coloured propellers will certainly be available by June :-)

Ok, back to work for me. Kind Regards, Ivan @FlyZano

Jan 17 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon all, Hey Doug. Ideally the forums for specifics. I'm going to do updates here too but trying not to answer questions here as it is duplicating answers on the forums already. I want to keep backers from Kickstarter who aren't using the forums up to date hence my posts here. Hey Tom. The pre production boards have been orders with all the discussed improvements. We will be providing loads of video of and from these as soon as we receive them and have them working. Remember the prototype used a very different camera to the production version and also smaller less powerful motors. However, I am rebuilding a prototype Zano with special adapters to allow the larger motors to be fitted. It looks very odd but gives me a chance to work on refining internal control configuration to deal with the different motors and weight. Give me a little time but I'll get some footage taken of this flying and doing things during my testing for you all. I've lost 4 prototypes to modifications to date. The density of the boards means some modifications don't work and end up damaging the boards. I've got a few left but we are refining values used in the mods ready to order the parts for our initial build of 500. Hey Sheri. Yes, this will be available. Only a few have asked for this. It won't be an issue. Have a great day folks. Kind Regards, Ivan @FlyZano

Jan 16 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, Let me explain what we are working on. Firstly, as soon as Kickstarter provide us with a list of who paid and who has not, we will contact those who not just to verify they no longer wish to be involved. We will then import all backers into our store and automatically created user accounts on there and assign backers to a special group. That group will have access to accessories at Kickstarter prices. Combined shipping with your Zano in June and also a list of remaining limited editions. Remaining limited editions are those that are remaining after we have allocated preferences to backers that over pledged wanting more than one reward. To sort this part out we are looking to use backerkit or something similar and the over pledges will be allocated limited items chronologically. That is who upped their pledge first will have first dibs on an item. Now apart from LE red, I think this will work really well. I have checked the numbers and I'm largely sure everyone will get the limited

edition glow in the dark or Camo Zanos their were after. I don't know yet how many LE red there will be remaining once unpaid pledges are worked out. We do have a small number of LE red for internal marketing so as before, I'm hopeful we can get everyone exactly what they want. We have not yet received the information from Kickstarter so we can not yet start the process however it shouldn't be long until we can so stay tuned. Hey Midhun. I can't answer yet but as soon as we know what items are unallocated, we will see what we can do. Hey Tomy, Hey Nanobot9000, Hey Aziz. Thank you :-) Hey Sheri. The camera will be manually tilt able and I'm hoping to be able to offer a fisheye lens as an option. This would allow you to use effectively tilt the camera remotely but done using windowing through the firmware. Hey John. Love the idea. Could you raise this on the forums. Lots of developers are there and ideas like this help plant seeds of thought for the community. Anyway, back to work. Have a nice morning. Kind Regards, Ivan @FlyZano

Jan 16 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening all, I trust you understand that I am not going to respond to negative comments. Hard questions, comments, queries etc, bring them on but someone just stirring trouble is just taking resources to respond too and deal with and we have a strict project plan to adhere too so we deliver on time. Anyway, to positive things. Lots of progress happening. Ok, are you ready for a brain dump? (That's what I call it when I download a load of thoughts in rapid succession) As mentioned production panels all ordered. 3D models of the production boards are being used to finalise the plastic parts for Zano. These will be released as soon as we receive production boards and can verify everything fits. I am rebuilding one of the prototypes for some detailed testing of all the mods, motors, battery etc and to allow us to concurrently refine the SDK and the firmware. We will publish some details (inc video) about the SDK and how it works with Zano as I know developers are very ready for this. We will also demonstrate single command launch, land, hold position etc in video then hopefully publish the alpha SDK soon after to developers who sign up. Also should have various battery options confirmed any day. Carry case designs for Zano look awesome. Refining the specifics with the manufacturer and they actually look better than our renderings. No spoilers but you won't be disappointed. More to come over the next few days. Loads happening here and I thank the genuine supporters, we are still sorting through everything from CES, Reece has an update or two coming to you all. Anyway, I'd better finish for the day. Have a great evening. Ivan @FlyZano

Jan 16 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

Good evening everyone. Been a day or two since I posted here. Just a really simply

“ update for those who may not have read it on the forums. 1. The Production revisions of the boards have been completed, panellised and ordered. 2. When they arrive back we will be visiting Camtronics to get the first 10 production Zano's built. 3. When we take receipt of those first 10, the real fun begins. We program them and then start or rigorous testing, making sure everything including our modifications from the prototype are working. 4. Then we start on the videos and showing you production Zano's very first flight. So stay tuned. We have two video updates coming. The first one is about CES, I am desperate to see this video as I have only seen the content the public has seen on the news etc. Anyway, next wednesday I expect we will receive notification from Kickstarter as to who has not paid for their pledges etc and we can begin the process of surveys and contacting those of you who have pledged for more than one reward. We will also collect more information to allow us to stay in contact with you so we can verify your shipping address closer to June. All in all, lots happening here and even more updates to come. Have a great evening. Kind Regards, Ivan P.S. Sorry to hear you haven't been well Larry. I hope your on the mend.

[Jan 15 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi Frederik, Regarding the password reset, there does seem to be an issue with emails and some domains like gmail. We are not sure why and are working on it. If you could Private message Robin who is an administrator he can assist you with this. Hey Dooley. We will send out the survey once Kickstarter notify us as to who has pledged what amount and if they have successfully paid for the pledge. Once we have this information, anyone who hasn't paid will free up their pledges to allow us to re-allocate them to other backers. So we will end out the survey shortly and then start the process of allocating rewards to backers. Kickstarter states that we need to allow 2 weeks for pledges to be collected and for that information to be available to us. Does that make sense? Hey Yang. Zano is scheduled to ship in June. Thank you for your support. Hey Tony. I can imagine their look the first time they see Zano. Kind Regards, Ivan @FlyZano

[Jan 13 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Wow, i go to have dinner and come to 5021 comments. That happened quickly.

[Jan 12 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey Aziz. Uh huh, I believe you. Honestly I do :-) (seriously I do). See I've added 3 more comments. Lol. I enjoy the banter so please don't worry. My odd

Australian/British sense of humour.

[Jan 12 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey Ls. Yes, a nano GPS from OriginGPS. Check out the forum
[Http://www.torquinggroup.com/forum](http://www.torquinggroup.com/forum) Hey Aziz. Noted :-) I can take a hint. Lol.

[Jan 11 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Thanks Larry. We will massively expand that site over the coming months. Great to see you on the forums too.

[Jan 11 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ 4889 :-)

[Jan 10 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey Richard, Hey Aziz, sorry, I didn't see your posts. Thank you to you both. Kind Regards, Ivan @FlyZano

[Jan 10 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning, Hey Peter, thank you for your post. Really great post and thank you for your support. As Peter has said, we will continue posting updates, Reece and the team are due back Monday and I know they have taken loads of video. Just need to edit it into form then we can publish it. My update yesterday morning is still current, the PCB production revision has been completed and sent off for panelisation. The forums are very active as is the wiki so any questions, please pop there first, the community there has been busy answering questions as have Marcos, Robin and myself.
[Http://www.torquinggroup.com/forum](http://www.torquinggroup.com/forum) [Http://www.torquinggroup.com/wiki](http://www.torquinggroup.com/wiki) Have a great weekend. Kind Regards, Ivan@FlyZano

[Jan 10 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey Chris G. Just to clarify. You as a backer receive; 1x ZANO Camouflage 1x Limited Edition Camouflage Carry Case 2x Batteries 2x Full Sets of propellers 1x MicroUSB

Charging Cable 1x ZANOfuel Charging Stick You get two batteries, one for Zano and one spare. Two sets of propellers, one fitted and one spare and all the other items. As mentioned, those were never meant to show on the www.flyzano.com store and have now been taken down again. Honestly, I don't know how they showed up, they were in the database for our management reasons, not for sale. Kind Regards, Ivan

Jan 9 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone. Thank you everyone for your congratulations but more so for your support. I will head over to the forums shortly, I am blown away by the response to the forums and WIKI, they are so alive and buzzing. Regarding questions and comments, please now use the forums; <http://www.torquinggroup.com/forum> Regarding updates, those will be posted here as well as on the forums. There was a question yesterday about propellers. They are friction fit but a very tight friction fit. Because Zano can reverse its motors and it is tiny, friction fit was the only option. As you can see from the various tests I have done, constantly reversing the motors, never had a single propeller come loose. I am confident the propellers will be fine so long as when you take them off, you fit a new set. Regarding the red LE and some other items, I suspect that not 100% of backers will actually complete the payment process. We will find this out in about two weeks I believe which is when we receive information from Amazon as to who paid what. Those who haven't actually completed the payment process and their chosen rewards will then become available for re-allocation. Once we have this information, we will compile a list of what you have pledged and what reward you have chosen. If this doesn't align, as in you have pledged for more than your reward, we will flag each such backer then contact you through the survey tool (Backerkit?) and obtain what other rewards you want. We will then begin allocating things spare limited editions to the first people who upped their pledge to cover it etc. IF we run out, we then we will look into our back up plans which I have previously mentioned. My engineering teams plans today are as follows; 1. Continuing development on the libraries and SDK 2. I am reviewing the production boards and planning to order today or tomorrow on a rapid turn around. 3. Working on the iOS app. 4. In between that hoping onto the forums etc. Hi Chris G. The limited editions are NOT meant to be available on the www.flyzano.com site. We turned those off but somehow they are back enabled. These have been taken down with immediate effect. The limited editions are for allocation to backers first and foremost and the price listed on the www.flyzano.com site is wrong, that is the Kickstarter price not the retail price. Anyway, I apologise for the confusion and these have now been removed again. Kind Regards, Ivan @FlyZano

Jan 9 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey all, As promised, just a quick and dirty render of the new production PCB. The render is done by the PCB CAD software itself so some parts are just shown as blocks but it shows you how crammed the main flight frame is. The large block at the back is the Micro SD card. <http://www.torquinggroup.com/video/render.mov> Have a look. Kind Regards, Ivan Hey Peter. Sorry, what question?

Jan 9 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ A quick update for you. We have 4161 applications for Beta-testing with 3962 distinct email addresses. So at the moment, everyone who applied will become a beta-tester. Have a good afternoon everyone. I am going to try and get the rendering of Zano new PCB up today. Kind Regards, Ivan @FlyZano

Jan 9 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ WOW, absolutely incredible and thank you so much. As Peter has so nicely said, thank you to the backers, all the supporting companies and the team at Torquing Group for what has been an incredible campaign. We will stop and take stock of what we have achieved then get right back to work on delivering you all your Zano's. 12,072 backers have raised £2,335,119 in 45 days and that is an incredible achievement. Let me outline what is going to happen now. 1. The volumes for manufacture are high enough now to really bring the cost per unit down to a point where we (Torquing Group) can pour enormous resources behind the functionality, SDK, support, forums, apps, hardware add ons etc. For us the goal was always volume up, cost price down so we can focus on what we do best, that is innovate and give you the very best we can. 2. I have completed the PCB layouts and will now spend the next day checking them thoroughly over before turning them into panels and ordering them on a one week turn around. 3. Upon receipt of the PCB panels, we will deliver these to Camtronics to build the first pre-production batch. This should happen in the 4 week of January. 4. When we receive those first units back we begin testing and double, triple checking EVERYTHING. If this final revision (considering there are loads of changes based on your requests) are perfect, we will sign off and start ordering everything for the 1,000 unit build in April followed by the main build starting in May/June. If we encounter any issues with these first units back, we will modify the PCB's and resubmit, only a two week cost in time but we have plenty of meat in our project plan to allow for this. 5. We finalise firmware and app development along with SDK and continue giving you 'Creating Zano' videos showing you the entire process. So in 6 months time you can start at Chapter 1 and relive the entire 'Creating Zano' process that you all helped make possible. 6. Loads more stuff and we will keep you all well updated. Thank you again from the entire Torquing Group and the Zano Team. You

have made this a remarkable experience and really helped energise the team here and at CES. Kindest Regards, Ivan @FlyZano

Jan 9 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey all, Two themes here at the moment I think. 1. The hook or attachment. We can easily add something in, the issue would be the oscillations of whatever you are carrying on a string etc. If mounted firmly beneath Zano this would have little impact on the flight. Zano could easily counter the pendulum effect but it would result in less granular control of position if moving at speed. Imagine you try and stop then the object your carrying, continues, easily countered by Zano but it will affect its behaviour. I'll get something added to the bottom shell to support this. Even if this is just a mounting hole like we are doing on the bottom of the feet. Would that suffice? The other question is about shirts. The items for Kickstarter backers, as a backer, we can make certain things available only to you. If you wanted the shirt later, and I completely understand, we can still ship with your Zano to save shipping. You would need to let us know in the next few months before we order shirts etc and we could accommodate this. Regarding the forums and WIKI. WOW, these are buzzing. Robin from Team Zano has been busy answering SDK related questions too and once I finish the production revision PCB, I will pop on and answer as well. 3 hours to go and nearly £2.3m, this is staggering and it is thank you to you all. I can not express my personal gratitude enough, I love this technology and have been doing it for some time for the Military, Law enforcement etc. However Zano is so exciting for me, the speed at which this community moves and accepts new ideas and concepts is so refreshing and encouraging. This is already fantastic but is only going to get better. Ok, now I really must stop typing and go finish the PCB. Literally down to 7 signals to lay. Nearly there. Kind Regards, Ivan @FlyZano

Jan 8 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey everyone. Forum is up and running again. Sorry, there was a permissions error on a file that brought it down. We have fixed this now.

Jan 8 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi All, we noticed an issue with the forum. We are working on it now, sorry for the issue. WIKI is running though as is everything else. As soon as we have the forum working again, we will notify you all. Really sorry for the issue.

Jan 8 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ One quick post. Hey Bernard. Give in, you know you want too ;-) Hey Florian. You could upgrade one of the batteries certainly but we are keen to keep the standard Zano below 60grams for legalities and as we don't have the production version back yet, I can not be certain if the extended battery will push Zano over the limit. Hey Aziz. Really appreciate your comment, thank you. Regarding the forums for everyone, once you log in, under quick links is a 'new posts' section that will show you new posts that you may have missed. This is a great way of seeing where the activity is. Have a great morning. Kind Regards, Ivan @FlyZano

Jan 8 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, Down to the last 6 hours of this campaign and what a campaign it has been. The forums are up and running, the WIKI is as well and the content on both is growing thank you the fantastic Zano community. This is the first time during this campaign that I am going to have to admit defeat on responding to every comment, with over 610 in the last 24 hours, it would take me much of the day so if there are questions here, please move those to the forums and WIKI and help all of us build the community there. I did notice a few comments, negative comments that have been floated around. To me this is really exciting. If some people feel the need to spread rumours that this is all one big scam then that is fantastic news because rumours like that can only come from one place, competitors. This isn't the first time I have been told what we are doing is impossible. To me that is simply more of a challenge than a statement of fact. When you release step changing technology like Zano and for the price we have done it for, there are going to be a great deal of very unhappy people, certain competitors. We are all for competition on fair and even ground, we innovate, they innovate and the consumer benefits but when some start flinging mud, it shows they have nothing better to say. So as I mentioned, if people are spreading rumours, to me this is fantastic news. Consider from competitors points of view. Zano was launched to the world 45 days ago and in that time Zano has an incredible community, brilliant ideas and suggestions, a charity marathon being organised and on top of that, step change world first technology. How do you counter that if your a competitor that doesn't innovate, you smear. Now please don't think I am saying all competitors, we have spoken to some and they are really top people. Genuine and honest like ourselves, believe in open innovation and competition. Some however want what we have built and don't have it. We (Zano community) are also taking an ethical stand and developing an acceptable use policy and code of conduct. Now there is a few larger UAV manufacturers I think could contribute to this and conversely benefit from this. Anyway, enough about that, we have nothing to hide and are incredibly excited about the entire campaign, Zano itself and what is in store for

you all for the next 6 months. Videos, content, photos, more 'Creating Zano' chapters. I know we (including me) are eagerly awaiting another video from the Zano guys at CES, I have spoken with Reece who after the first day was exhausted and I know he, Sam, Thomas, Ben etc are doing their best to get that video finished and published. I'm here in the UK, never having been to CES and believe me, I want to see the video as much as anyone. Just a little update, we have the electricians in both yesterday and today installed two 3 Phase 30Amp supplies into our server room for one of our HPC nodes (development). These HPC nodes use serious energy but do delivery enormous processing power. Once that is all installed and built, we have to assemble the node next, I would expect in the next two weeks this should be completed. I will post photos of the HPC node as we power it up and I suspect this will form part of one of the chapters in the 'Creating Zano' documentary series. Right, I have only a handful of PCB traces left to lay and I desperately want to get the 3D rendering to you all today. Also, Robin (one of our software engineers) is popping in and out of the forums today to answer SDK related questions. Its all coming together. Have a great morning. Kind Regards, Ivan @FlyZano

Jan 8 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Quick additional update. Hey Ray. Soon :-) Hey Ben. Thank you. Hey Doug. Regarding the links, absolutely. I thought of this as I left the office this evening. We will sort it in the morning. Hey David. Yes, Windows Phone will be supported if not on release, very shortly afterwards.

Jan 8 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone, The forums have taken off with a blast, some great content already in such a short time. An excellent example and thank you to Simon Chapple for his code of conduct. I can't stress enough how important it is that we collectively make an ethical stand and show the legislators there is no need for knee jerk ill informed decisions and that sensible communities do exist that wish to use this technology properly. Another huge thank you to everyone who has joined the forum, registered as beta-testers and helping with the WIKI. We (Torquing Group) will work with the Zano community and drive from a technology perspective but need you all to drive Zano from a user and developer perspective. You tell us what you want in Zano and we will do what we can to deliver, this goes for users and for developers. Our SDK is coming along well and when I have the first draft available, we will launch the developer section of the website. Regarding moderators, we will be watching the forums over the coming week and have a list (those of you who volunteered) and will mark people as moderators as you register and post content. Does that make sense?

Thank you for volunteering. I am also about to publish an update covering a few things including prices for add-ons. Stay tuned. Give me an hour and this should be up. Hey Zoriel. Regarding the camera, if you wouldn't mind moving these questions to the WIKI and to the Forum. I would rather people start growing the forum etc by asking these questions there. Is that ok? Hey Sheri. I have something in mind. :-) I need to check with the team though so can't spoil it yet. Regarding a charging base. We had a proof of concept station for Swift but have not progressed it beyond that due to our commitments to Zano. Hey Doug. Thank you for the Lantronix post. Really nice guys from Lantronix and we have been working with them on projects for 5 years now. Excellent quality embedded connectivity. What more can I say :-) Hey AngusCNH. I have something in mind. :-) Hey Thanos. Regarding the beta-tester. If you saw the page that said thank you, your details have been submitted then we have your details on file. Once we close registration, we will run a sample on the database and get a good spread of beta-testers then notify everyone. Regarding the LE ones, each one will come with a certificate showing model, build date, number and who built it. The serial will be on the certificate and align with the serial marked inside Zano.

Jan 8 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey ThomasDN. WIKI up and running and me thinks its a good idea too :-) Hey Jamie. Regarding microphone, yes there is one. However at the moment we don't have very good noise cancelling for the propeller noise built into the firmware. This is an important update we will release as soon as we have refined the noise cancelling and have it working to our satisfaction. Hey Voripteth. Regarding avoidance. Zano can easily fly with 1ft (300mm) clearance on any face. Should be able to do much closer flying but I haven't tried it. It would only involve tuning the avoidance engine to deal with the smaller distance so not hard to configure. Regarding charging. Zano has to gold plated charging pads on the flight frame arms to accommodate automated landing and charging. Hey Peter. Thunderbirds are go! Nigel what are you doing? Are you taking your Zano on this serious mission? Hey V. Thank you for your support. I'll take your suggestions onboard. I think the next 12 months is going to be very exciting. Hey Mark T. I like the carbon grey too. It was an idea we were playing with. Hey Special. Regarding changeable lenses. I agree, this would be my ideal situation and something I will look seriously into. Hey Doug. Captain slow would be perfect. I like the idea of the social experiment but, I agree with you, doing it to raise money for children's charities for me is important and what would really encouragement my involvement. Hey Brent. Regarding the SDK. Yes, we have in house developers and are recruiting more to our ever expanding engineering team :-) We will notify everyone about beta-testing when we close the registration. The iPhone app, Android app and Windows app will be developed in C Sharp. Hey Randy. I think its really exciting, both the social experiment and raising money for a good cause. I wonder if the charity that

gives kids with cancer and other illnesses a dream come true, I can't remember the name, would like to get involved too. Hey Mark. Thank you. Low countries? as in further south in Europe? Hey Robert. Regarding ceilings, Zano has IR sensors on the front, back, left, right and top. So is specifically designed to avoid bumping into things above including ceilings. Sonar is used for downwards facing sensing as gives better range. Does that help? Matthew is quite right, to the left and right of the speaker are the IR sensors for the top. Hey Bernard. Excellent, we could make this marathon something really cool. Beautiful place for filming too. If we are able to get constant cellular coverage, we could provide a live stream of what Zano is seeing to the world as it travels. Hey Yannick. Thank you. Really appreciate it. If it helps, I am SO excited myself. This has been a long and exciting road and we are now really building up momentum. The day in January I get those production versions back, is going to see one very happy Ivan :-)

Hey Ben. Thank you. The aqua blue could look really cool too, maybe even have a floatation method attached. Hey Doug. My concern about using Zano owners Zano's is the logistics of organising that many owners. We could perhaps have a few Zano's running a relay as you say. All special built versions to deal with whatever is thrown at them. Hey Matthew. Regarding the charging. That could be really neat. Heat in the batteries would be my concern though as they do get warm during flight anyway. I'm going to have to do some serious thinking about the logistics of getting Zano's to fly this distance, what a challenge though :-)

I'll get you those cad files soon, sorry for the delay. I have to get them off the network at work at it's quite a manual process as you can imagine. Keep up the good work too and thank you for your support. Hey Larry. lol. Have you slept today? :-)

Excellent and noted. Thank you for your support throughout the campaign too. Hey Peter. On the fly recharging, I'll look into it :-)

Hey Special. On the fly recharging, that is cool and I'm sure with some thought we can make something reliable. We could build a big UAV with Zano's smarts in it and this would allow the two to mesh and co-ordinate the dock/undock. Got me thinking now :-)

Hey Sinar. I believe someone has posted an answer to your question. If you need further clarification, please let me know. Hey RL. Zano has comprehensive obstacle avoidance sensors so yes, shouldn't ever crash unless a catastrophic failure occurs. Hey Emmanuel. Regarding your camera questions. Yes the camera is autofocus and the modular camera replace the standard Zano camera not the RGB display though larger camera modules may well replace the RGB display. We may even be able to build a nano gimbal for Zano. Now that would be neat. :-)

This is my final evening update whilst the campaign is live. This time tomorrow the campaign will have finished and we move to the next stage. We work like made to get Zano's for you all and we need your help in building the community on the forums and WIKI. I will continue to post updates here, we will also continue with our creating Zano videos right up to and including when Zano's ship so stay tuned, this adventure has only just started and we are about to finish chapter 1. Just imagine what the next chapters have in store. I want to say a genuine and heartfelt thank you to you all for your support and enthusiasm throughout this campaign. It has become

such a part of my life over the past 45 days. Anyway, if you could help us build the community in the forums and WIKI and we will be releasing developer documentation much sooner than originally planned so stay tuned. We will also release a Zano emulator for developers to start playing long before they receive their Zano. Have a great evening everyone. Kind Regards, Ivan @FlyZano

Jan 8 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey all, The WIKI is now up too. <http://www.torquinggroup.com/wiki> We wanted to link the user accounts but this didn't work easily so in the essence of expediency, we are running them independently. Please let me know how you get on. Kind Regards, Ivan @FlyZano

Jan 8 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey Special. No, not Lantronix. They simply supply the WIFI module. Torquing Group designed Zano. We do work closely with Lantronix but their input is connectivity. Yes, it is a misprint or a journalist error. Do they have a feedback section where we can ask for it to be corrected? Thats everyone. Noted regarding names.

Jan 8 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Thank you to everyone volunteering as a moderator. Are your nick names on the forum the same as here?

Jan 8 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey all, regarding a WIKI. This is a really good point. Robin (one of our software engineers) is working on this at the moment. Can I have a show of who would like to be moderators? We can amend your accounts accordingly. Remember being a moderator does take time and commitment and would be important to the Zano community. Regarding final retail price, it will be at least the retail price mentioned underneath the rewards, possibly more but never less. Kind Regards, Ivan

Jan 8 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

Regarding registration emails, we have disabled this for now so you register and get

“ immediate access. We are 99.9% sure the emails are being sent but for now, will just disable email registration confirmation. Hi Doug. What about putting this a sub group of the events section in the forums?

Jan 7 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Everyone is being bulk approved whilst we iron out issues. So you should be fine to log on.

Jan 7 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Found the error. That invalid referred is only on the www.flyzano.com/forum site. Try www.torquinggroup.com/forum whilst we fix the error.

Jan 7 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ We have bulk activated everyone who has registered already so even if you didn't receive an activation email, you can now log on.

Jan 7 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi Christoper. Can you expand on what your seeing?

Jan 7 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi all. We have noticed during testing that the registration emails sometimes get dropped into trash or spam folders but they do get sent out. :-) Special. Can you check your spam folders?

Jan 7 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey all, As promised, the forum is up and ready. Please see;
<http://www.torquinggroup.com/forum> or <http://www.flyzano.com/forum> Both are the same forum. I will post this again in an update when I post the prices. Have a good morning everyone. Kind Regards, Ivan @FlyZano

Jan 7 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, A few things before I get to answering questions, I have had a rummage and thought the following two videos may be of interest. Remember the Swift we used in the videos is actually the Zano prototype. I haven't been able to find loads of footage simply because we haven't taken loads. As a small team, we are focused on delivery and our in the lab videos will take you all the way through from start to finish. Future 'Creating Zano' videos will include the first run of Zano being built by Camtronics, then us receiving them, programming and powering them up for the first time. We will step through the entire process including the final creating Zano video which will show the full production run and Zano's being dispatched. Anyway, I thought you might like these. Swift concept video https://www.youtube.com/watch?v=83uiUkrSZSQ&list=UUvcY-R8G_0NB60TD_KleCPg (Zano prototype in flight, Swift used in these videos is the Zano prototype but in black) Snippets of Zano flight <https://www.youtube.com/watch?v=i4APO0jKAqs> (All the best bits of video cut together. Landings, launches, holding position etc) I will try and get some fresh photos from Zano taken today and post links to those too. Regarding the standard case; http://www.flyzano.com/zano-pics/standard_case01.png http://www.flyzano.com/zano-pics/standard_case02.png http://www.flyzano.com/zano-pics/standard_case03.png The carbon grey Zano is just an idea. This case has the logo thermo formed in the lid, the LE cases have it embroidered. If you look closely this case is thermo formed foam, see the texture difference up close. The LE cases are all fabric wrapped thermo formed rubber. There is quite a few difference that you won't see in our renderings. Remember, these are renderings and won't show the show, the shoulder strap supports, the stitching etc. We will post real photos of the cases as soon as we receive samples and you will see the differences then. Regarding CES and the next 'Creating Zano' I believe is coming out soon and is based around Las Vegas and CES. I am looking forward to seeing it too so as soon as it is available, I will let everyone know. I will also post a price list today for the add-ons as promised. Hey Holger. Regarding the battery. They are from a supplier that we have worked with on our Military UAV's and have consistently produced batteries that meet or exceed their stated capacity even under high load. Zano Batteries are not dissimilar to other LIPO except our batteries are very good quart, have battery protection circuitry in them and are specifically chosen for Zano. They are also custom built to fit the Zano shell. You can buy other batteries that will work but like anything, if you do, we can't guarantee performance or safety of Zano. Hey Larry. Regarding the selfie angle. It is a marketing thing only. Zano as we all know is exceptionally capable and so much more than a selfie drone. However, to convey the thousands of possible uses just wouldn't be feasible so we had to pick one and run with it. We picked selfie because of the social network culture and people posting selfies. Selfies is what is hot at the moment in the media so we ran with that angle. We fully expect Zano to become a favourite of outdoor enthusiasts, extreme sports people, people out partying, down at the beach, scenic photographers,

inspectors of roofing and gutters etc. All that sort of thing, we had to start somewhere so we started with the selfie angle. Does that make sense? Hey Bret. Regarding manufacturing and shipping. Our project plan allows for the first 15,000 Zano's to be built within 4 weeks. Considering the logistics of shipping pallets of Zanos all over the world. Once we start production, all Zano's will be built and dispatched very quickly. Does that make sense? I want to echo Laryr's thoughts, Larry, Doug, Peter, Matt, Matthew and so many more, you have made a MASSIVE difference here and taken such a huge load off me. I scroll through and most of the questions are answered. Thank you to you all.

Jan 7 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey Garvani. Regarding flying down a hallway. Excellent question. Zano will control it's rate of approach so even if you try and fly like a looney, Zano will slow the flight down and then stop you hitting anything. Zano flies itself, you don't. You just get the sensation of flight in free flight mode so Zano doesn't override your controls per say, Zano simply limits your authority when needed. Does that make sense? Hey Kevin. Regarding range, we will release a range extender module. Specifics of which are not defined but this will increase the range to >500m in most situations. Hey Socrates. Regarding the camera, the camera is modular and we will be making various camera upgrades available at www.flyzano.com. Thank you for your support. Hey Robert. Regarding your question about Zano autonomously climbing to maximum altitude, take a photo and video, absolutely. You could even do the same, film a 360 panoramic video then land. Whatever you wish. Hey Logan. Regarding the Creating Zano video part 4. Really glad your enjoying them. We enjoy making them. I expect the next video today or tomorrow. It will be about Zano at CES. Part 5 will be about a small production version of Zano's being made in January for us to test. If everything is spot on, we can sign off and move to production as soon as the parts arrive. Hey Gareth. Thank you and welcome. The nixie is a cool idea. For me, until we can move away from propellers for flight, wearable drones not in protective cases will be too vulnerable to damage. I don't wear a watch because I am always getting in caught on things. Maybe it just me and I should stop putting my hands in so many tools and electronics. :-)

Hey David. Regarding voice commands, we certainly have the processing power to handle voice recognition. This will probably be an functional update in the future as I agree, it would be cool. Hey Aziz. Well answered regarding shipping costs. We do try hard to be fair and though a standard shipping charge worldwide was the fairest thing to do. For the UK and Europe, we have VAT components to pay as well as the UK/Europe shipping charge help towards the VAT on Zano. For the rest of the world, there is no VAT so the shipping charge covers shipping. Hey schlep. Regarding following you into a tunnel, this shouldn't be an issue so long as you don't have Zano flying well above you in which case it will fly above the tunnel and try and meet you out

the other side. If the route is blocked, Zano will stop, hold its position and if you lose signal it will land or return to the last known position of your phone. Does that help? The avoidance systems are active at all times. Inside a tunnel it will use calculated relative movement to try and track you. This will keep Zano following you for a period of time before inertial drift either has Zano overtaking you or falling too far behind. I would expect you would have a minute or two of decent following in a tunnel without GPS. Hey Simon. Regarding the pico projector. I think that is such a cool idea. Very sci-fi. A nano drone that can project onto the wall. You really could video conference through Zano then :-)

Hey Doug. Regarding LE reds, we have an internal allocation for marketing reasons and I think we will be close. However, I have a few ideas up my sleeve yet. I like your waterproof version. Well water resistant anyway as we could conformal coat all the electronics and do a LE Aqua blue version. Thoughts?

Hey David. I like the boomerang idea for toss to launch. Quite doable too. Leave that one with me and keep your eyes peeled for functional updates once you get your Zano. :-)

Hey TJ. Most Android tablets, phones, iOS (ipod, ipad, iphone) and we will also soon be adding Windows mobile device support. Hey Michael. Regarding secured WIFI. Yes, once you configure your Zano for the first time, you set the WPA2 encryption key. If flying in a saturated environment, to be honest, I have only ever experienced this at BIG trade shows, you would still be able to fly and task Zano but your video stream to your phone would suffer badly. Local recording would still be ok.

Hey LuAnn. Sorry about the tickets. I honestly don't know what the rules are from CES regarding those as I have never been myself. I'm just a humble engineer locked away in the office. They throw me food and coffee sometimes :-)

Hey Jose. Thank you for the link. Hey Jeff. Regarding equipment levels. The standard case is the same shape as the LE cases but made from different material. I have posted links above to our renderings of the standard case. The standard case is a formed high density foam with good zip, shoulder strap support and stitching the same colour as the shell. The LE cases are a fabric wrapped thermo formed rubber with a premium zip, contrasting stitching, embroidered logo and a few other really neat touches.

Hey Dave. Thank you for your support. My comments are my timestamp so I know what you mean. I just start answering questions until I reach my previous comment :-)

Hey Christian. I think your question has been answered. If you need further clarification or have additional questions, please let me know.

Jan 7 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey Doug. Thank you for posting that. Good piece of publicity. I just reached the section in the comments from last night regarding a Zano marathon. I have an idea to put to everyone. I could personally build a special Zano, perhaps Zano-mega and base it on our larger 120g UAV. I could strip out all the weight but leave all the functionality specifically to allow the longest duration flight. Fit it with the biggest

battery we can support to get the maximum flight time and we could do the worlds first autonomous flight for a nano UAV from our office in Pembrokeshire to say London as a fund raiser for a children's charity. I would personally donate my time later in the year (after Zano's have shipped) to build this custom Zano for the purpose. Obviously Zano would land every 30 minutes etc to have the battery replaced but then would fly autonomously to the next waypoint. We could do this along back roads to avoid causing issues for motorists. Who would support such a charity run? Would make an awesome documentary too. Hey Bryan. Regarding your sites etc. I would like to offer support to any developer or supporter doing such things. We could offer free hosting within our HPC environment and host the sites on the same network as www.flyzano.com. Regarding having separate sites or one site with sections, I guess that is a personal preference. I like having everything in one spot as sub domains. So we could have sdkgroup.flyzano.com, zanomodders.flyzano.com etc. What do you think? Would you also be interested in being a moderator on the forum we have setup? I already have lined up Matthew C as a moderator and I hope he says yes. Hey Mark T. Thank you. Really appreciate it. Hey Yannick. Regarding if you miss out because I post the list a bit late (sorry firstly), secondly, don't worry. As a backer here, I would ensure prices here are honoured for you even if you want them after the campaign finishes. Sound fair? Hey Randy. What do you think of my charity run expansion on the ideas bouncing around here? Awesome experiment too and any backers here that want to get involved could directly contribute to the project if they wished. Hey Guiseppe. Regarding the camera, sorry I missed your question. The Bebop camera lens itself is about 6 grams in my reckoning. That is 10-12% of the total weight. I am looking into smaller fisheye lenses and then providing similar functions as those you mention. This will probably be a camera module itself as many have expressed the desire to not have a fisheye lens so it provides better photos. Zano already does a digital version of OIS so rather than moving the lens, it moves a digital window within the camera itself based on inertial sensors so the stability should be very good. We will look into OIS camera modules too and make these available on www.flyzano.com Hey Jim. Regarding videos, we don't have loads but have a look at the various videos here and the ones I posted at the beginning of this response. I know the guys are working on more videos as I have requested this but they are flat out at CES. As soon as I receive any videos, I will post them here. Hey Sheri. Regarding videos, this is a lot easier to keep you focused than with pictures. You can always crop a picture but pictures will be taken using the maximum resolution of the camera so our windowing for tracking you in more detail will be very limited. For videos as 1080p is less than half the pixels of the sensor, we can easily zoom a little and use windowing to keep you in the frame with fairly decent angle changes of Zano absorbed. If Zano is following you, it is less susceptible to smaller gusts so the angle of incline and tracking will be more stable because the inertia of Zano will help. Holding position accurately it does have to pitch and roll to keep position so the tracking could be slightly less effective. Does that help? Regarding zano red, the LE

red's are all gone, that is largely the LE case, FuelStick and goodies. The Zano RED itself will be available with out case, it will be slightly different to the LE version and won't have the LE certificate for the Zano either but yes, Zano RED will be available if you want to swap a super early £139 from black to red for example. Just not a LE. We have a small internal allocation of stock of each LE for marketing reasons to help fulfil the LE pledges not recorded by Kickstarter. Regarding the regular case, it was meant to be £25 but for Kickstarter backers we will honour our price whoopsie and make these £15. Beyond Kickstarter, all prices will revert to retail with the exception of add-ons for backers here. Hey Logan. I will get the 3D rendering of the PCB up today or first thing tomorrow, just want to finish the layout first :-)

Hey Loran. I believe your question has been answered. If you need further clarification, please let me know. Hey Mark. Regarding a module for cellular. I really like this idea. Leave it with me as I suspect this will definitely be a module we will release. LOL regarding the job vacancy. I am however always looking for good software engineers, software developers. I also need a personal assistant. Hey Simon. We have created the ethical forum now, when you register, please add a note and I will get you approved as a moderator. Hey Roger. Thank you, the speed it hit the final goal was incredible. Hey Special. Brilliant, I laughed at your story. really put a smile on my face. The funny thing as I read your comment I pictured a poor lost Zano with a sad face on the display begging for power. :-)

Hey Roman. Thank you. Good post too. Hey Robert. Regarding uncompressed photos. You can choose the compression level used by the camera JPEG engine so if you want to turn it off, you can and Zano will store a HUGE image on the SD card but your quite right, the quality would be optimal. Thank you for your support and noted :-)

Hey Mark. Regarding the sad look, I see it now. Leave it with me, its just a matter of finding a vertically swapped micro USB socket. Easy fix :-)

Hey Matt. Thank you. With the activity here, I suspect the forums will grow quickly and we will need quite a few moderators so the offer is much appreciated and we will likely take you up on that :-)

Hey CanadianCoffee. Noted, thank you. Regarding sand, sorry I missed the question. I believe Matthew C has answered this, he is quite right sand should be no problem. The motors are sealed. There are a few openings in the shell for the IR so if you do a lot of flying close to the sand you may end up with a little bit getting inside the shell. Just unclip the shell and blow it out, then put it back together and you should be fine. Wet sand is even better as it is heavier and won't blow around. Hey Holger. A lottery it is. Three GITD Zano's will be the prize. We will randomly select 3 beta-tester applicants to win one. Just make sure you are a beta-tester applicant. :-)

Hey Peter. Noted, this should be fun. :-)

Have a great morning everyone. Kind Regards, Ivan @FlyZano

Jan 7 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

Opps, I did it again, my posts are out of order. Sorry everyone. We have definitely hit

“ the limit of the comments section. I am now having to post three entire boxes to fit everything. :-) Have a great evening.

Jan 7 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ The SDK will have full control over virtually everything. You can send messages through the IR sensors, have you got something else in mind? Bear in mind they have to pulsed for short duration otherwise at the power we sink into them, they would burn out if left turned on. So there are limits to what the Zano OS will allow to keep the hardware safe. Does that help? Hey Larry. I've onto just got to your message, what am I missing? I saw something about a prank? What are you all up to? ;-) Hey Holger. Oh, a lottery. I have an idea. How about whomever has signed up as a beta tester before the end of the campaign, we will randomly select 3 to get a free GITD Zano. What do you think about that? On the beta tester front, we now have over 2,000 beta-tester applications, still plenty of places. Hey Ken. Regarding nationality. Reece and myself are Australian but are British nationals (says so on our passports), most of our staff and directors are born and bred in Wales and we also employ a very polite gentlemen who is a mexican national. This could be the start of a good joke, An Australia, Welshman and a Mexican all go into a bar..... When we started this, we though, great, the £125k target, now we can get Zano into production. Then £250k came and went, then 500, 750 and the £1m mark, we were blown away. We hoped but didn't expect anything like the response we have had. Thank you for your support. Thank you for the post. Hey Holger. Regarding your suggestions, we have the speaker installed already :-) Hey Louis. Lifting lady gaga, that would be an entrance :-) Hey CanadianCoffee. Nono's for Zanos'. Love it. Hey Tuxzek. We try :-) You would run the battery flat pretty quick though. Hey Joakim. Thank you. We will keep you all well updated beyond the end of this campaign. Regarding another stretch goal. If we hit £2.5m, we will think of something cool for everyone. Hey Thomas. Thank you. Can you expand on your question. I think I understand and if so, yes, definitely. We will also be releasing 3D cad files for all the plastic parts so people can modify them and create all kinds of cool creatures to turn your Zano into. You can also upload and share your creations on www.flyzano.com for other Zano enthusiasts to download and 3D print for their Zano. Hey ksc1333. Yes, a small separate USB battery charger for the spare battery will be included. Hey Michael. Regarding your question. It is handled through Amazon so I would expect the name Torquing Group should be in the transaction and possibly kickstarter. Does that help? Hey Mark. Regarding the LE battery upgrade, I am waiting on confirmation of pricing from our battery supplier. Communication has been difficult with Christmas and New year. I believe everyone is back this week so I am hoping for a response quick smart. :-) The plastic parts will be finished in Matt but the Red plastic itself is going to be VERY close to the rendering. The final look is very much based on both the injection tool but also the plastic used.

Hey TimZ46. Your very welcome. Hey Larry. I would say sleep well but I think I have missed that opportunity, so I hope you slept well and nice to see you back :-)

Hey Mark. Regarding the USB port, I'm a little confused, sorry. The charging port on the side? Micro USB? The orientation of the socket is fixed by the part itself. I can always look for a different part. :-)

Hey Simon. Thank you. I will take you up of your offer. As soon as the forums are up and running, I would suggest we create an ethical usage discussion forum to progress this further. Thoughts? Wow, I think I'm done. If I missed anyone or anything, please let me know. Thank you all so much for your congratulations and support. As I finish this we are now at 10,664 backers. Absolutely fantastic and welcome to all the new supporters too. Have a nice evening and I am keeping my eye on you Larry, you too Mark. :-)

Kind Regards, Ivan @FlyZano

Jan 7 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey Walter. Thank you. Hey Marc. Thank you. This is our very first Kickstarter campaign. Many of the team here have backed other projects but this is our first project of our own. Hey Paul. Thank you. Hey Peter, Hey Dooley. Regarding the SDK, typically the SDK refers to Software, your quite right, however as we are support hardware third parties too, Matthew referred to our SDK as our Standard Development Kit covering both hardware and software. I think this is a good call from Matthew as we will provide hardware information too to allow people to build stuff for Zano as well as software. Hey Ben. Thank you. Really appreciate it. Hey Matt. Thank you. Hey Mathis. Thank you. Regarding the range extender, I am planning to allocate one of our engineers to this task as soon as possible so we can have it ready hopefully for June but can't promise yet. In a month or so, I will be able to update you all on the progress of this. Hey TimZ46. Thank you. Hey Jon. Thank you. If we hit £2.5m, we will think of something cool for all backers. Hey Doug. Regarding stonehenge, absolutely, especially as they don't let tourists anywhere near it now. Would be a great way of non-intrusive tourism :-)

Hey Logan. Thank you. Remarkable how quickly it happened too. I was working away and we were £20k away next thing I noticed we had flown past £2m. Absolutely staggering. Hey Mura. Thank you. Hey Shaun. Thank you, I'm quietly confident ;-)

Hey Holger. Neat, did you tell them about Zano? If so, thank you, if not thank you for your support anyway :-)

Hey Stevens. Thank you. Hey Simon. Thank you. Hey Peter. I believe someone did pledge for 10 or so in one hit. I hope your boss isn't watching these comments? ;-)

Hey Yannick. LOL. I think the time for being quietly confident has passed. This is incredible and we are all so blown away by the support and enthusiasm from everyone here. Thank you. Hey Midhun. Thank you, all we have done is be responsive, listen, be involved and try and share our passion. It is all our backers that have helped us fly past the £2m goal. Absolutely awesome. The sheer volume of Zano's going into production which is what this is all about is incredible. True to what Kickstarter stands for, you have all helped Kickstart Zano. Hey Peter.

Thank you Hey nanobot9000. Thank you. You are all part of the team, so many ideas here are now part of Zano. It is a better product because of you all. Hey Stefan. Thank you. Hey Dmitri. Thank you for pushing it over the line and for your support. I have been asking for the guys (all at CES) for a video of some more examples for you all. I know they are/have put something together but I haven't seen it yet. To be honest, the production version is so different to the prototype there really is no comparison. The prototype used a different camera, smaller motors and less refined firmware so its a bit like chalk and cheese. The production camera will give you video virtually identical to that of an iPhone 5 or 6. If that helps? Hey Holger. Thank you. Hey Paul. Thank you. Hey Simon. Thank you. Hey Doug. Thank you, your comment means a lot. Just speaking for myself, I have spent on average 4 hours a day responding to queries and comments and I have done so willingly. You have all chosen to back this project and the least I can do is answer any questions and queries, that to me is just the right thing to do. Hey Piero. Thank you. Hey Rupert. Thank you. We (Zano) will keep you all updated too with little milestone big or small from when case samples arrive, posting photos of that to when pre-production Zano's arrive and we launch them for the first time. You will all be kept up to date. That is my promise to you all. Hey TimZ46. Thank you, awesome and we are all so delighted. Hey ksc1333. Thank you. Hey Tuxzek. Thank you. Hey David. Thank you, really brilliant and for a company based in the far west of Wales, we are pretty proud. Hey John-D. Thank you. We are on target for June and we will continue to update you as we progress. Once parts arrive, once tooling is made etc. Hold onto your socks because we are now really gearing up. Hey Shaun. Thank you. Really nice comment, much appreciated. Hey Peter. Regarding these comments. LOL. Its my evening reading :-) I started an hour ago and am now responding to your message from 3 hours ago. :-) Hey Miguel. Regarding night vision. This comes in two forms. Near IR which is a visible light camera with the near IR filter removed and a visible light filter installed. Or a thermal imaging camera. Both options will be available as camera modules on the www.flyzano.com site when they are available. Does that help? Hey Logan. Regarding Zano apps and developers building apps that they can charge for. Absolutely. We will very strongly support the development community and make www.flyzano.com the central place for everything Zano related. We will market and promote the store for developers to sell their software, apps, add-ons, hardware etc related to Zano.

Jan 7 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening all, I'm back, not quite finished the PCB layout today but getting close, only 30 signals left to route, then checking and panellising before ordering. Not long now. If it is of interest, I could post a short video of the 3D rendering of the new circuits? Hey Simon. Thank you and really appreciate the support. The risk to our IP is enormous and we have had so many big players approach us already about licensing

our technology, we have to protect it so carefully. Hey Garvani. Welcome :-) Hey Mark T. Regarding us not flying Zano at CES. Yes, good question and I am happy to explain. We are perfectionists and if we do a demo that goes wrong, we will never live it down so we would rather not do a demo. We have solid prototypes that work beautifully when we are operating them. Zano also runs on 2.4GHz and in EVERY trade show I have ever been too. 802.11b/g/n on 2.4G is so cluttered it is useless. On top of that, the risk to our intellectual property is huge. The prototypes do not have the Zano OS fully secured and as such, it is easy to download. Until the production Zano OS is ready, the full code protection features can not be enabled. Imagine if we sent a fully live prototype and it got lost/stolen? Everything we have worked so hard on could be gone in an instant. Our reputation is at risk if we do a bad demo, our business is at risk if we loose a live prototype. I keep those in a safe at the office and they are signed out and back in be me :-) Does that make sense? Hey Joakim. Final stretch goal, that is a good idea. Leave that one with me. Hey Juan. Regarding a range extender, absolutely. We will be build and release a range extender that should provide better than 500m in most situations. Zano can fly with or without any communication though the software failsafes will by default engage if loss of signal and return to home. Using the SDK you could send Zano on a fully autonomous long range flight. Hey Special. Thank you for the post. Always nice to see. Hey Doug. Regarding the weight of the RGB display, I recall it is only 3 grams. So around 6% of the total weight. Not significant. Hey Logan. Regarding the IR leds, point to point as in one Zano to another, you easily get better than 8 meters. Is that what you are referring too? Hey Bosco. Regarding a plastic film, Shaun's response is quite correct. One of the issues with something like this is the openings for the sensors, IR and Sonar to work. Anything in the way would have significant impact and would reduce their sensing distance ability. Exactly as Shaun has stated. The best thing is conformal coating which provides a water proof barrier over the electronics themselves without any impact on the sensors. Hey CanadianCoffee. Thank you. :-) Hey LuAnn. Thank you, have you received an answer to your email? I know Anna has been on top of emails for the past few days with Reece in the states at CES. Hey Derek. Regarding ZanoFuel. I will publish a list as an update before the end of the campaign with the add-on items and their prices. Hey Daethstar. GPS locations tend to follow a figure 8 throughout the day. If you compare a GPS location from one hour to the next they do move, if you compare it 24 hours later, the accuracy will be within +-1m as Bosco has mentioned. Hey Ken. Thank you. What is next for Zano? Firstly we are going to be very busy getting Zano into production, beyond that, we are planning a step change in functionality capability for Zano, no spoilers just yet :-) Hey Matthew. Thank you. Regarding conformal coating. Our EMS I believe is back at work so I will ask the question tomorrow about the cost of conformal coating 12,000+ Zano's and see if this is possible. Hey Michael. Thank you. Hey Ratio. Well done! They do pop up from time to time. Hey Mark T. Thank you. Hey Special. Thank you, really appreciate it. I am very focused on completing each milestone and will continue providing updates to

everyone as we progress. Getting really exciting now :-) Hey Barry. Thank you. Really nice comment. Hey Sheri. Regarding the clam shell, the price for the standard case is £25. Hey John. Regarding the Zano distribution. When we get the Zano world map live and people start registering their Zano's, if they choose to share the general region (nothing specific, just town, city etc) then that will be fascinating information to see the map update over the days as people receive their Zano's. Hey Andreas. I think someone else answered your question, if you need further clarification, please let me know.

Jan 7 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ HEY EVERYONE!!! Wow, £2m target hit and smashed. I was working away quietly on the Zano production circuit, swapped back to this window and my jaw hit the floor. WOW. The support, enthusiasm and encouragement is enormously important and has been so critical to this campaign. I have been scanning the comments and thank you all so much for your congratulations. The congratulations should go out to everyone. With the number of Zano's we will now produce for our first run, means we can now get the cost low enough and really focus on functionality. We are working on the SDK at the moment and for developers, a Zano emulator so you can test your Zano SDK connected app and program against it. Unity3D for gamers will be supported too right from the initial release as the emulator is going to largely use Unity3D for the graphics. I will come back later and respond to any questions, if you would excuse me now, I am in the final hours of the Zano flight frame revision and being the insanely focused individual that I am, I want to get this finished so tomorrow I can review and check it before sending them off to be made. Things are really going to start coming together quickly now. Before I go, a genuine and heartfelt thank you to you all for backing this project, backing us and this campaign. We have so many things planned, new videos, updates etc that we will continue keeping you all very well informed well beyond the end of this campaign. We are aiming to have the forum up and ready tomorrow so I will post an update about that when it is ready. Have a great afternoon all. The guys are at the stand now in CES and I wish them all the best. Kind Regards, Ivan @FlyZano

Jan 7 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, What a day yesterday. I know Reece was flat out until just before midnight talking with the press etc and 584 backers joined this campaign yesterday. We have the forum up and running but will launch it in a day, we want to do some more testing and refinement but it is all but there. Right, down to business and to answer your questions. Hey Peter. Thank you for raising this. Regarding the

production units, we expect to have the loaded PCB's back mid to late January. From there we will adjust the 3D models, print them and test fit. Once happy these 3D models (from CAD) will be sent away to have the tooling made for injection moulding. This tooling takes 60 days and another week for us to have samples back. Once we have samples back, we will build the first 20 or so Zano's and then start releasing LOADS of videos and photos to you all. These will be the production units and the only fair way of showing Zano's capabilities. Remember everything else so far has been on and from prototypes with less powerful motors, different camera to the production units, less refined flight control and video stabilisation algorithms. Our time line shows us receiving the plastic parts end of March to early April we will release photos of production units. This is about the same time the first 1,000 Zano's will be built. This will help refine the production process before full production begins in May to ship in June. We can release photos of the 3D printed shells in January before we send away for tooling and this will give you all an excellent indication of the final product. Does that make sense?

Jan 6 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey Tuxzek. Regarding payload. I can estimate this but we have not got the pre-production versions back yet, we have been doing all our work with the prototype units. The two are quite different in that the production units have 30% more powerful motors and this is a substantial increase in lift. I would say 30grams for production unit to lift wouldn't be unreasonable. Regarding the old logo turtles, absolutely you could. Some code would be required but as the SDK will support everything from web sites on PHP/ASP to Unity3D and native iOS, Android and Windows apps, it shouldn't be too difficult. Hey Bryan. regarding first person view, as in seeing what your Zano is looking at, yes, this video will be presented on your phone/tablet screen within 100ms of actually being taken so very quick. Hey Mark. Regarding the extra footage, I have I promised asked and chase the guys for this. You will get to see more footage. Hey Simon. Really good point about an ethical stand. I really like that idea, leave it with me and I will get that worked into the forums and www.flyzano.com generally. Hey Larry. Regarding a review, not sure if this helps; <http://www.pcadvisor.co.uk/reviews/smartphone/18/> There are a few of these types of reviews out there. I have looked but couldn't find a direct WIFI capability comparison of smart phones. Sorry. Hey Mura. Thank you. Hey Mark. You certainly could. To make room though the RGB display would need to be detached and from there assuming your cellular device supports SPI and can run on +3.3v you could easily integrate it in place of the RGB display. Really neat idea. Hey Sair. Regarding a dock for the battery, yes a charger will be provided to allow charging of the spare battery with all Zano's. Hey Holger. Regarding 345 comments, incredible. I'm glad not all are asking me questions :-)) I love the general chatting that goes on in here. Hey Varun.

Regarding the 800mAh battery, I have not yet confirmed this size will be suitable, the 650mAh certainly will be. Once I get the production Zano's back, I can run a series of flight tests with the 800mAh and make sure performance of the flight system is not adversely affected. To upgrade to the 650mAh or the super big one that I have yet confirmed, you will be able to do this anytime before we ship using the survey at the end of this campaign. Hey Ulrich. Neat. Thank you for posting this. Hey Michiel. Regarding the following me settings, no worries, I'm glad we could find a solution. Really looking forward to seeing videos from all the Zano users, the ones you want to share obviously, as it will be a huge buzz for us to see Zano doing all manner of cool stuff all around the world. Hey Simon. Hope you had a nice holiday and thank you for your support. A pico projector? On Zano? Hmm, I'll have to do some thinking about that one. Regarding indoor flying. We are going to create indoor beacons that broadcast their location to Zano so it continuously gets absolutely position information as it flies around internally (say your home or office) That would do what your after? Voice recognition is something we certainly have the processing power to do, maybe as a future functional update we could build this in. Hey Special. Thank you for posting that. It is looking good for that final goal to fall today. Very exciting. Hey Mark. Thank you again for keeping your spreadsheet up to date. Hey Brogan, Hey Kai. Regarding the Fuelsick, only LE bundles include the ZanoFuel and even the red LE version is the same price as the black and white. There is no cheaper options available. The super early bird price was our break even cost if we hit the £125k mark so they are crazy cheap considering what you get. The Fuelstick is available (a different version to the LE) after the campaign at a higher price than it is if getting the LE bundle. Does that make sense? Hey Bosco. Regarding the cellular module. I know the one you are referring too. Unfortunately there just isn't room. The current GPS is 10mm * 10mm and that is a squeeze :-). If we make a cellular module as Mark has also suggested, we could make this a swap out module for the RGB display and then it is certainly possible as the display is 23mm*23mm so could fit the cellular device. Hey Roger. Thank you. Yes, the RGB display is 100% programmable. There will be a pixel art designer and you will be able to download artwork others have created and shared through the www.flyzano.com site using your ZanoApp. This display supports 100fps and can store internally 250 icons and Zano can store an additional 57000 icons. So you could play animations, normal icons or whatever artists can think to do with it. Hey Jeff. Regarding time lapse, that is a neat idea. Should be quite easy to implement. Thank you for mentioning this. Hey Caleb. Regarding the LE ranges, if you take into account the bundles of two LE (say two camouflage) you get typically 1100 LE of each one. When we put the first notification about the LE, we miscalculated and said 1,000 not 1,100. I think one LE range has 1,200 but that is it. We have a small internal buffer stock reserve for marketing reasons so if needed, we can dip into those to fulfil backers requests. The primary thing about the LE ranges is they will never be re-produced, we have done them for Kickstarter and we will never make the same units again. The Kickstarter business model doesn't allow the selection of more than one

reward because technically you are backing a project not pre-ordering a product. As such, we work with every backer to get them what they are after at the end of the campaign and as I have mentioned before, if we are short on LE red because more people want them than units are available, we will contact all LE red backers to see if any of them want to take us up on a free upgrade or swap to another LE version. If they do, that free's up LE red that we can allocate to other backers. Make sense? There is no hard or fast way to do this, all we can do is continue to be open, honest, communicate with our backers and work with everyone to find a solution that gets you all the Zano's you have asked for. Does that help? Hey Roger. Regarding shipping date. To produce the huge volumes of Zano's we need to, production will occur in colour batches. Black is the single most popular, followed by white, then red etc. So we will produce say 1000 black, 1000 white, 1000 red then perhaps the Camo and GITD then loop around again. We will pallet up Zano's and ship to each country where our shipping agent will break the pallet into individual shipments and ship directly to you all. For us there is no order per say, its about being efficient in production which is how we can get the cost down. It is also the only way to handle the logistics of something this size. Does that make sense? Hey Kai. I believe I answered your query above? If you need further information or have any questions, please let me know. Hey Sir_Celica. Regarding follow me without the phone. We are going to release a range of tags and bracelets that you can bind to your Zano and Zano will follow that bracelet or tag much as you have suggested. Does that help? Hey Sheri. Regarding a 2.5m stretch goal. I'd love too but honestly we have been thinking hard and any goal we create, we want ALL Zano backers to benefit. Most of the ideas we came up with were for things like the follow me bracelet but that would be an additional cost and not fair to put as a stretch goal. If we hit 2.5m, we Torquing Group, will find some way of showing our appreciation to all our backers, something all backers benefit from, not sure yet but we do love a surprise :-)

Hey Larry. lol, are you tired? Hey Walter. Thank you for your support. Hey Dave. Regarding beta-tester sign up, you will receive notification when we close and review the sign up requests. This will be automatically and a statistical sample with some weightings will be gathered to ensure we have a good spread across the globe. Does that make sense?

Jan 6 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey David. A reward, does ‘Thank you for your support and enthusiasm’ count? Hey Stefan. Regarding beta-testers. If you wouldn't mind seeing my response above to Dave. Does that make sense? Hey Roberto. Thank you for being involved from so early on, 19th is within the first hour or two of the campaign I think. Really appreciated. Hey Matthew. £3m, we could probably conformal coat every Zano. It would require those sorts of volumes to get the price down. Hey Paul. Thank you for being involved from number 40, thats cool. Really appreciated. Regarding a friend flying Zano too,

yes, very definitely. The mesh networking will connect the two so you will see on your map, where other Zano's are in your vicinity and Zano's will interact natively too to avoid each other and avoid colliding flight paths etc. Hey Thomas. 10,000 Zano's in the air, what a sight to see. Imagine the droning noise, like a swarm of bees. Hey Creative. Neat post. Lithium based batteries are still the one of the lightest reliable energy storage mediums we have at the moment. We have looked into a gas turbine powered UAV (Quad) that could fly for >5 hours and is powered from liquid fuel. No reason compressed natural gas couldn't work too except I recall there are issues around compressing natural gas. LPG can be compressed. Anyone here want to comment? Can you compress natural gas to liquid form? I guess > 1000 PSI? Or a Fuel Cell powered device but again, weight is our killer. Given time, I know these issues will be solved. Hey Mark. Thank you for your support and I know you will enjoy the GITD :-)

Hey Mike. Thank you for being involved from so early on, that is still very early day 2 I think. Hey Peter. Thank you for your support, I have noticed how many questions you and others have been answering, it really helps me, thank you. I logged on this morning and my jaw dropped. 345 comments yesterday and already 40 something today. The help and support from this community has allowed me to actually respond to all the questions aimed directly to me. Thanks everyone. Hey Creative. Thank you. We took a moral point when we launched Zano in that the hardware will be current for years and that updates would be done through software. You wouldn't have your Zano becoming obsolete within months because we have released a version 2 etc. That meant everything that was reasonable had to be included in the hardware so we could meet our promise. Now virtually every square mm of the board is used, virtually no space remains and nothing else needs to be added to the standard Zano to allow us to keep our promise to you all. The rest of the directors here at Torquing Group are the same as me, we make a promise, we will stand by it and make it happen even if it hurts us. This isn't that dramatic but I hope you get my point. We genuinely believe in doing business fairly. We want our suppliers to want to do business with us because we are fair, we want our customers to get a good and fair deal and if we promise something, we will do whatever is required to deliver. We are a stubborn bunch but genuine, hardworking and honest. Your comment is really supportive, thank you. Regarding coming back to you. You can do either. Return to a dynamic point which is you, or return to a fixed safety point such as the shore line. These options will all be easily configurable through the app. Hey Lukas. Regarding the case, yes, I will publish a list of extra's tomorrow I hope which will include batteries, propellers, fuel sticks, cases etc etc. Hey David. Thank you. The DJI guys are really nice guys too, we have had some direct conversations with them. I genuinely wish them all the best and say keep up the good work. Regarding floatation. We are putting little mounting holes into the base of each foot of Zano. You could quite easel attach foam pontoons to Zano. If you keep them small it shouldn't mess the flight characteristics up too much but would provide buoyancy in case of splash down. Regarding the 2M goal, actually this will impact every single Zano user as your Zano

will be able to interact with Zano's you encounter such as avoiding each other and other cool functions we will build in. Hey Pietro. Regarding video by Zano, much of the video using in the campaign videos is from Zano. Have a look and you can see the video from Zano and the videos of Zano. I have asked the guys for more video from and of Zano, I know they have/are putting something together but they are all on the CES stand all day today. As soon as I have the video, I will get it posted. Hey TimZ46. Regarding Red Zano, probably not the red you see now, but a red will likely become mainstream. We are toying with the ideas of other colours but it will be in response to demand from you all. Hey Beezhan. A really good 3D Axis gimbal will be better, I would expect for lateral movement than Zano, this is also down the generally superb camera's you can use on such gimbals but Zano will be better at dealing with vibration and rapid movements in all axis as Zano digital stabilises the video stream making use of onboard sensors. Does that help? Zano is tiny, keep that in mind :-)

Hey Randy. Regarding MYO. I sure hope so. This is very possible and we would hope developers out there will take on this challenge and build an interface for MYO. Also various VR headsets would be equally easy to connect. We are very supportive of the development community and will support developers integrating all these kinds of neat gadgets. Regarding competing against each other, the mind boggles, there are so many

Hey Nicholas. Regarding purchasing of more items, yes, the www.flyzano.com site will go live immediately after this campaign finishes and will have all the standard extra's available there. We can ship these with your Zano in June to avoid additional shipping charges. Hey David, Hey Randy. Regarding Unity3D. One of my developers here lives and breathes Unity3D and is delighted at the thought of building the SDK to support Unity3D. So the answer is definitely yes, this will be supported and fairly early on. Hey LuAnn. Regarding tickets. I honestly don't know. I have never been to CES myself and am back in the UK with my team. You could try emailing hello@flyzano.com and asking the guys. I believe Anna will respond but she can contact Reece and the team in CES. Hey David. Regarding raw footage. I have asked for some and I know the guys have/are putting something together. Sam, our videographer who has all the footage is also at CES and I know they are all on the stand all day today. I will continue to try and as soon as I Get something, we will get it posted. Hey Jamie. Regarding flying below the starting altitude. Yes, absolutely. The altitude bar on the right hand side of the app has a negative control too of about 40% of the positive. So you could fly off the edge of a cliff or bridge and look at a birds nest or whatever. Regarding dodging a football. 1. Zano runs obstacle avoidance depending on the situation between 100 and 1000 times a second. If it was ramped up with maximum gain, it could sense a football from 1.5m away. 2. Now depending on the speed of the football, anyone help here? 3. How long would Zano have to respond? I would think a football is limited to say 64kph/40mph? That is 17m/58ft a second. 4. Zano's maximum speed is for argument sake 40kph/25mph, so Zano would have less than a 1/10th of a second to move out the way. 5. Considering if a direct collision course was assumed, the size of a football from end to end is say 300mm

(1ft), taking half of this is 150mm, Zano's maximum ability would be to move 1m in that time. So technically yes this is possible assuming my assumptions are close enough. Would take a bit of fiddling with avoidance to get the worse case scenario working but technically, yes. Have a great morning everyone and as always, thank you for your support and enthusiasm. Kind Regards, Ivan @FlyZano

Jan 6 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Additional item for John Gorst. Sorry I filled to comments boxes and it clipped the final part of my response. Hey John. Regarding SD card management. I like your suggestions, as you say, we have not yet fleshed out the specifics but your suggestions seem ideal. We will provide a preview of videos from the SD card to the app after flight too so you can decide if you want to rerun the flight and video or photo. Much the same process as you do with modern SLR or smaller digital camera's. The video will be MJPEG from Zano as this allows us to perform all manner of higher compression level filters etc over the content but if you want the best quality video, this will be stored natively on the SD card. From there, the app will allow you to stream this content over WIFI from Zano and re-compress into any of the standard formats and save onto your phone, or upload to the HPC if you wish, its your choice. Does that help?

Jan 6 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone. As I write this we are just about to bump over the £1.9m mark, this is incredible and thank you to all of you for backing this project. By reaching the manufacturing volumes we are now reaching, we are really reducing the cost per unit and that allows us to pour the extra resources into functionality for you all, allowing us to build the really cool stuff that everyone wants sooner and get it in your hands sooner via an in app functional update download. Regarding merchandise. We have had a chat and absolutely will offer a Zano Kickstarter backer shirt and caps. We will publish this on the add-on list before the end of the campaign. You can pick your size etc and we will work on the artwork over the coming weeks and get all your votes on which artwork to run with for the shirts. You will be able to select the shirt on the survey at the end. You will need to adjust your pledges by the cost's or if you miss out, just let us know and we can sort out the specifics with you at a later date. How does that sound? The conversations going on here are fascinating and I almost get lost reading them and realise, oh yeah, I have to respond. I am stunned by the level of enthusiasm from this community. You have all helped form Zano and help give us the energy to really push the boundaries even more than we have. I'm sure I have missed some questions below, if so, please prompt me. I have looked but can't see what I

have missed. Hey Sinan, Hey Peter. Thank you, very much appreciated. Hey Peter. It is very exciting. I love creating technology especially robots. That is my personal passion and I have been working towards this sort of technology since I was 7 when I first started programming because I wanted to build a robot. Then at age 11, I wrote my first command line interpreter (the command line in DOS), then a multitasking GUI all in assembly before I was 12. All of this was me exploring robotics and embedded systems. To be at this point on Kickstarter after more than 4 years of blood, sweat and tears in the research and development of all our UAV prototypes before Zano, it is personally so amazing to me to see so many people as excited about this technology as myself. We (Torquing Group) have enormous task ahead to take Zano from where it is into full production and all the hurdles we will have to get passed but as a team we have proven to each other that we are in this for the long haul and we are so excited about the first shipment of Zano's leaving ready for dispatch followed very shortly thereafter by another batch, then another until all 10,000+ Zano's have been dispatched and delivered to the incredible Kickstarter community. Hey nanobot9000. The bebop is cool and I wish them all the best. I think Zano is my choice but I may be a little biased ;-)

Good post of the article, thank you. Hey Florian. Thank you for your support. Hey Thomas. Regarding functional updates for beta-testers, I would expect on average 1 to 2 a month. Somebody beat me to it, initially more as a guess but over 12 months I would expect an average of 1 to 2 a month. Regarding linking Zano too heavily to the internet. Fair point. The only requirement for internet access is to register so the app can download the encrypted firmware and encrypted functional updates. Without a user account, you wouldn't be able to download this information through the app. The linking of Zano the an account is only so we can track who has what updates and provide this information to developers so they can see their target market has a spread of 22% with x update, 13% with y etc. Does that make sense? I appreciate your comment and beyond that process, internet access is not required in anyway. Does that help? Hey Gedney. Regarding indoor flight, I think someone beat me to this one too, yes, very much. Zano relies on other sensors when GPS is not available to provide indoor flight with the same gesture control. Hey Jamie. Regarding beta-testers, the testing is for firmware not hardware so will be done using full production Zano's as of June. We are expecting to randomly select a few people to help test pre-production units but this has not been confirmed yet. You will need to be registered as a beta-tester to be considered for this. Does that help? Hey Nick. Regarding batteries etc. Every Zano has two batteries and two sets of props (one is fitted). Does that help? Though I am sure someone beat me to answering this one ;-)

Thanks everyone. Hey Stefan. Regarding the transaction, if it does fail, I would expect we would be notified too, if that happens we can always sort something out via paypal or amazon payments etc. We will always do what we can to be flexible. Thank you for your support too. Hey Special. Hey Mario. Regarding the question of flying off a cliff. Special, you are very close. Zano uses a voting system much like the neurons in your brain. Whatever the majority vote is wins. So if more than 50% of the sensors say one

thing, the other sensors are captured and tracking values are reset to follow this. So if you fly off a cliff the ground below Zano has dropped away and the voting system would say that Zano has not actually dropped in altitude so the sonar would be ignore and Zano would rely on the other sensors for altitude control. Hey John. Regarding you have pledged for LE Red but want a Black Zano instead of the red one? I don't see why not, please make sure you communicate this on the survey and we can sort that out for you. Hey Giampaolo. Regarding repairs? Zano is largely assembled without the use of tools so most parts can simply be unclipped and replaced. All spares, upgrades and add-ons will be available at www.flyzano.com. In the event of a motor failure, you remove the feet that hold the motor, the two motor wires are soldered under the foot, anyone with a soldering iron can replace these very easily. Everything else can be done by hand. Does that help? We will also make videos showing how to do various repairs and publish these on the www.flyzano.com site. Hey Peter. Zano stand is running until thursday. There is a big press event today so we should see some more publicity regarding Zano soon. :-) I believe the official 'public' opening of the show is tomorrow and its press only today. Please correct me if I am wrong, that is my understanding. Regarding the other drones we are releasing. Two (firecrest and sparrow) are 120gram platforms and are targeted towards special high reliability users such as police, fire, rescuer etc. Swift is the same size as Zano but will be a hardened and secure version really targeting portable police, rescue and military units. They are all based around the core Zano OS but with variations specific to each usage such as cryptographic enhancements for police communications etc. Imagine a hostile situation and you can send in 10 Swifts to survey the area before police risk their lives. That is our thinking but at the moment, the others will come but not yet, our priority is 100% Zano. That will come first. Regarding charging batteries, we will provide a small USB charger that plugs into the ZanoFuel for charging the spare battery. This was an after thought but necessary so we will provide one. Hey John. Great post, thank you. Hey Roger. Regarding filming behind a jet ski. I think someone answered this one too :-) but safe to say, you set a safe point on the shore line so when the battery is flat etc it will automatically return to that point and wait for you. Does that help? Hey Angus. Regarding Swift, Sparrow and Firecrest. These will all come after Zano, all of these are based on the Zano technology but the other UAV's are focused at different markets where they require hardening to withstand harsh usage such as police. They are much more expensive to make and are not available until after Zano has shipped. We will then start working on the production release of the other UAV's. We have done a great deal of work on these others too but they are not consumer UAV's. If you wouldn't mind seeing my comment earlier in this post about their application, I think it will make sense. Regarding a beta tester, no, we want every level of Zano user to be a beta tester. It is the best way for us to get feedback about the experience from everyone from young adults, parents, grand parents, outdoor enthusiasts, pub enthusiasts, etc etc. Hey Special. Regarding adjustable dampening of the virtual tether, that is a great idea. Really nice idea and

thank you for raising this. Hey John. Regarding SD card management. I like your suggestions, as you say, we have not yet fleshed out the specifics but your suggestions seem ideal. We will provide a preview of videos from the SD card to the app after flight too so you can decide if you want to rerun the flight and video or photo. Much the same process as you do with modern SLR or smaller digital camera's. The video will be MJPEG from Zano as this allows us

Jan 6 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey Larry. I will put together a price list of items and publish before the end of the campaign :-). Old lollies down the back of the sofa don't count ;-). Hey Michiel. Regarding your question about following path. I think Special answered it with a suggestion. If we allow an elasticity setting or almost a hysteresis setting so you have to move more than a certain amount before Zano follows, would this accommodate what your thinking? Zano would naturally turn to face you but would you want Zano holding its course and you Zig Zag in the field of view of the camera? We could apply the same hysteresis setting to direction if you like. Really good idea about different follow me settings, we could use this to provide default configuration to the follow me engine. You can customise these profiles to better suit your usage. Does that work for you? I know, very exciting, thank you for your support. Hey Larry. Regarding which phone/tablet has the greatest range, I don't know. I have tested a few but certain couldn't comment on the majority of devices. The range extender will certainly solve the problem. Perhaps some reviews of the various phones/tablets discuss the WIFI range of them. The best WIFI range is what your after. Hey Sheri. Regarding an outdoor party. Most objects would trigger avoidance if close enough, I would expect hanging cords etc would however if the lights are emitting Infra-red the tracking system inside Zano that tracks ambient levels may be overwhelmed and not be able to detect any reflection. I am working on an algorithm to deal with this so it should be ok even in that situation. Hey Holger. Regarding Qi charging, I will have a look, thank you. Hey CaffeineJunkie. Regarding swarming. Your Zano's will swarm together as you have suggested. Regarding the second part of your question, let me expand a little on this. Swarming is a feature Zano will have where ALL Zano's in range of each other will share information about speed, location, direction, battery life etc. This is so they can mesh together and swarm (if all yours) or avoid other Zanos or programmed paths of other Zano's. This also allows the bracelet follow me idea as discussed earlier. This functionality also supports places like schools having a Zano mesh transmitter that transmits NO ZANO commands and Zano's will not power up in the vicinity of the beacon. I believe this sort of functionality is important to protect privacy. These will be carefully controlled and cryptographically secured. Does that help? Hey Boris. Regarding wind speed, I like this idea. We had a similar suggestion a while back and it is something I am thinking about how to implement. Such as loss of horizontal

position could force a controlled land. Thank you for raising it. Hey Byron. Regarding glow in the dark during the day, I can try, we are short on time though. The GITD plastic during day is very slightly green off white. It mainly looks like an opaque white plastic with a tiny green hint. Do you mean landing lights being overwhelmed? The landing lights and the RGB display are bright, if at full brightness they are dazzling if you stare into them so I wouldn't worry about them being overwhelmed. :-) Good question though. Thank you for your comment, really appreciate it. The GoPro is pretty awesome and it depends on what your expecting really from Zano. If your phone camera does the job you want then Zano will do what your after. If your after QuadHD at huge FPS then you would be best with GoPro. I know the guys have put together a video of lots of footage from and of Zano, I haven't seen it yet but I believe it will be available soon. Hi Sinan. Regarding thermal imaging, we are going to provide a long wave thermal imaging add-on through www.flyzano.com. This won't be included as standard. Regarding thermal imaging export control. Check our the data on the FLIR LEPTON, I am not aware of any export control issues on this device but if it is subject to control, then we will restrict shipping to countries that the UK will allow. Thank you for raising this, good point. Hey Zoriel, Hey ksc1333. Regarding the standard carry case. We have a rendering of it, I will chase the guys to see if we can get this uploaded. I know they are flat out at the moment at CES so I can't make promises but we will do our best. Hey John. Thank you. Hey Piero. Regarding internet connection, no, this is not required for Zano to work. Once a Zano is bound to your phone, you would operate for years without an internet connection. Regarding lost/stolen. This would be reported by the app next time the phone was connected to the internet but it isn't required to operate Zano. Zano is very easy to operate in the middle of nowhere with no signal as it will create its own WIFI hotspot for you to connect too. Hey Usdisney. Regarding the £139 pledge. All Zano's even the LE will be shipped in a very nice white wrapped two piece slide apart cardboard box much like high end smart phones with formed foam insert. These will be vacuum wrapped. If you bought a bundle with a case, the case will shipped together with your Zano to you. We haven't skimped on anything so the Zano's by themselves are all packaged very carefully and will transport without any issues. Hey Peter. Thank you, that is such a nice post and comment. Much appreciated. Have a great evening everyone. Thank you so much for your support. We are now at £1,909,932 and over 10,000 backers. This is remarkable and I know I have said it before but thank you to each and every one of you. Kind Regards, Ivan @FlyZano

Jan 6 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, The video from CES looks fantastic. As Reece has asked, could we please ask you all to share and tweet about Zano and get the word out. Lets topple that final goal! Hey TimZ46. Regarding replaceable motors, absolutely and

quite easily too. Hey Mura. Zano has a built in charger circuit. All you need to do is plug in a standard micro USB cable (supplied) and Zano will start charging. Hey Thomas. Regarding motors, they are changeable and replaceable and quite easily. The main difference with LE is the case, correct apart from Camo and Glow in the dark which have different colour PCB's and special shells for Zano. Hey Bryan. Regarding the videos etc. I know the guys have put something together, I haven't seen it yet myself. As soon as I get it, we will publish it. Hey Matt. Regarding the price list for optional extra's. I will compile this shortly and double check it with my team. Once everyone is happy I will publish it. Sound good? Hey Doug. Really good idea about the video. We will do what we can do and your quite right, no competitor can answer that. Regarding the T shirt, we thought about it initially but didn't think many people would want one. We could make the same shirts with Zano Backer. This is well outside my remit so will have to defer to others in Torquing for this one. When I hear back, I'll post something. Hey Arnel. Regarding following Zano. Technically this is quite possible and easy to implement. Hey Sheri. Regarding the clam shell case for the super early bird, your quite right, it isn't included. That price was our break even point if we hit the £125,000 mark so it just wasn't possible. The Clam shell case is £25 normally, there is a bundle where it is included and we made a calculation error and only charged £15 for it but have honoured that price for the bundle. Hey Brent. Check out 123Catch by Autodesk. Is that what you are referring to? Hey Mark. The shirts do look good, I like the Christmas jumpers too :-)

Hey Jonathan. Thank you. Regarding follow me, absolutely. If you get a chance, read through everything here, so many cool functions and features. Hey Ryan. Regarding other uses than selfies. We choose selfies purely as a marketing angle. It is a very capable nano autonomous UAV so you can use it for whatever it is physically capable. It can fly in small places too. Regarding hiking etc, you could launch it above the tree line to have a look at where you are going. Be neat to show off to your friends. Hey Lim. Regarding relative altitude. Parrot has 8m sonar range finders so if you are within 8 meters of the ground, as the ground moves so does the altitude of Parrot. Zano has 6m range finders so will do the same. If you are above 6m, then altitude becomes absolute and is based on air pressure. So if your 10m up and fly over a 3m high object, Zano will stay at 10m. If your 4m up and fly over a 3m high object, Zano will follow the ground and will raise. Does that make sense? Thank you for your support. Hey SKing. Regarding link to different phones etc. You can create a single Zano user account when you receive your Zano's. You can link both phones to the same Zano account. When you power up Zano for the first time it will link to the Zano account on the phone. Therefore both Zano's will be linked to the same user account and any phone also linked to that account can control them. Does that make sense? So in answer to your question, absolutely yes. Hey Ramon. Thank you for your support. Hey Zoriel. Regarding a night shot. Unfortunately we have not taken any and the development Zano's here are in pieces as we are flat out working on getting the production version ready. The night photography will be remarkably similar to most smart phones at night as they all have fairly similar low light

performance. I hope that helps. Hey Sheri. Regarding the batteries, the larger battery is not twice the price of the regular and therefore it wouldn't be fair to offer you to swap two batteries for one big one. We will make available a trade up price of a few \$ once we have confirmed battery pricing if you like. Hey Bradley. Thank you :-)

Hey Mario. Thank you for your support. Hey Larry. Cheers and thank you for your support. Hey Garvani. Regarding tethering and waypoint mode. We will allow waypoint mode if a user specifically acknowledges the risk and their phone can communicate with us that they have accepted the risk, the function will then be enabled. Same sort of thing with enabling toss to launch. Does that make sense? By default Zano will be tightly controlled but to avoid people trying to hack Zano and making it unsafe, all the extra functions already exist and if someone wants to make use of them, then all they need to do is accept the risk of doing so. Hey David. I will publish this list soon. Just need to double check it with the team here. Hey TimZ46. Thank you for your support. Hey Ken. Thank you. Hey Jamie. Regarding waypoints. Zano flies constantly using waypoints but it is hidden from the user. It actually supports over 500 compound waypoints so the support for waypoint flying is substantial. Every waypoint also supports a POI (point of interest) which is a GPS location where Zano will aim the camera and keep the camera pointing at this location no matter how much Zano moves. Does that help? Hey Doug. Regarding toss to launch. There is a colour code sequence Zano goes through to show when it is ready. One long green flash followed by constant green flashing means good GPS lock and ready to toss to launch. So long as you have flashing green landing lights, Zano is good to toss. Does that make sense? Hey Jamie. Regarding Zano's and security, very definitely. As Mark has mentioned, something similar to your suggestion is the plan. Zano's will be bound to a user account, phones will be bound to a user account. So long as your settings don't allow any phone, only phones on the same user account can control a Zano from that user account. We will also support a notification to us if a Zano is reported stolen (through your Zano account) and is then powered up on a different account. Does that help? Hey Boris. Regarding post-processing. We are focusing on the HPC as that is a shared resource for all Zano users and post-processing software is already prolific on desktops there is little point us building something to compete in this space. The HPC also supports automated sharing based on your settings to your social networks if you so choose so it is more than just post-processing content. Does that make sense? The video formats will be standard and support by most software. Does that help? Hey Doug. Thank you. Reece came up with the name, it was his brain child and we all liked it. :-)

Hey John. Regarding cost per camera module. I would aim for a typical module to be £20-£30. I think that is a fair price depending on the level of functional improvement. The thermal camera is a great deal more simply due to the cost of the camera. Hey Mihai. Thank you. Hey Mark. Regarding the feet and a mounting hole. I have asked for this to be included in the next design review as I think it would be cool to be able to attach all manner of feet to the bottom of Zano. Hey Midhun. Regarding tillable from the app. This is only possible if we go down the fish eye route and use

camera windowing to support it. I am waiting on a response from our camera maker on the lens options. Hey Dennis. Regarding flight path, this will be available. Please see my comment earlier in this post about waypoint flying and the user accepting the risk of such. Hey Peter. Thank you. Hey Drew. Regarding maximum wind etc. For now we are saying 25mph Zano could hold its position. The production version is very different to the prototype and once we have the upgrade figures from that, we will publish revised data. Does that help? Hey Special. Regarding water usage, I was thinking some floaties too. Hey Ben. Regarding the world map, we (Zano engineering) are about to have a technical discussion about the architecture of data to support such things and this is definitely something we will make happen. I think I have covered everything but as always, I do miss things sometimes for which I apologise. Please bring anything I have missed to my attention and I will answer in my next post. Have a great morning and thank you so much for your support. Kind Regards, Ivan @FlyZano

[Jan 5 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Opps two halves back to front. :-)

[Jan 5 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey Mark T. Thank you for your comments and support. Really appreciate it. Hey Thomas. Regarding the orbit follow me, great name and yes that will be supported. Do you mind if we pinch that name? because I'm going too :-)

Regarding the personalised decals, I will look into this. Regarding a serial number. I think using the RGB display, we can display a QR code style serial number. Thoughts? Regarding a Zano world map. Love it. As I mentioned earlier in this post, I think this could be an awesome way of sharing photos and videos if you wish to share them, the location is there, you zoom in and see what photos and videos are available. Hey Frans. Regarding our shipping date. We can never make promises as things exist outside our control such as suppliers delivering on time. However, this isn't our first production run of something so we know what to expect, we know what lead times suppliers work too and will start ordering all the stuff to build your Zano's in January as soon as we confirm the production Zano design is finalised and working 100% perfectly. We also are working with a professional EMS who has a project timeline working back from shipping in January. This gives us milestones to hit and we will know very early on if there is going to be any issues, this allows us to address them well before they become a problem and anything that effects our delivery date. Does that help? Hey Doug. The update is a really good point and thank you for raising this. What do you think of the update I have done? You can buy me a beer, how does that sound? Hey Varun. Regarding customs and shipping, we are going to check if we can freight these as gift. Will keep

you posted. The actual capacity of ZanoFuel is 3000mAh. Hey Larry. Oh good question and your quite right, it hasn't been asked. Where does the name Zano come from. It is actually Nano with the N rotated. It just stuck and we have run with it. Hey Mark. Regarding CES, I am quietly confident about the final stretch goal :-). If we hit it, I may not be so quiet then :-). Hey Roger. Regarding FPV, absolutely. The video from Zano is presented in less than 100ms on the smart phone screen. Regarding videos from CES. I know the guys will be shooting some videos, when they will publish them, I don't know but they will be published. I haven't seen the photos of the stand myself yet. :-). Hey Mark. Regarding how long can Zano be out of sight, do you mean legally? Well I guess, behind a tree isn't technically out of sight. It comes down to some common sense on behalf of the legislators and considering I have flown a Zano into me as fast as it can travel and I barely felt it, I would expect very little resistance legally to Zano anywhere. Hey Chris. Thank you for your comment. We (Torquing Group) will actively work with legislators and those writing the legislation. We will even conduct independent tests regarding safety on Zano and our other UAV's to help governments establish a baseline of what is safe and what needs to be controlled. Hey TimZ46. Regarding a tracker for your RC hell. We have been looking at an add-on as a bracelet, dog collar or small module which would work for what you are referring. Would be cool to launch Zano and let it film your RC hell as your doing stunts. Hey Tobias. Regarding altitude. Yes in answer to your question. Everything Zano does is relative to your phone apart from GPS waypoint mode. So if you launch at 50ft, Zano will come back to you, if your off the ground when Zano tries to land it will return to home location then reduce altitude until it lands. Does that make sense? Hey Mark. Regarding weather measurements. Interesting idea. Zano has onboard temperature, air pressure and could probably calculate wind speed and direction. What a cool use. Hey Didier. Regarding longest flight time, I would think a 3 to 1 ratio. So one Zano to 3 batteries should allow continuous flight. So you would have 3 batteries on change during any flight should allow you to land, change battery and launch again. We have added gold charging pads to the flight frame and we are looking into building an automated land/launch platform to enable this. Regarding boot time, Zano boots instantly and the WIFI is up and available a few seconds later. Regarding how precise can the landing be, if on GPS only, you are limited to an accuracy of 1m or so, with our landing platform for charging, we are going to build in sensors to help Zano land very accurately within mm. Does that help? Hey Ken. Thank you for your support, the BBC article is brilliant too. We are so close to that final goal now. Im quietly confident :-). Hey Dooley. Regarding the camera, you will be able to record 1080p video and if we are able to improve the motors we will make an upgrade set available on www.flyzano.com. Every upgrade or add-on for Zano will be available at www.flyzano.com Hey Doug. Regarding LIPO batteries and aircraft, we take them as hand luggage in suitable carry equipment (not rattling around) so are protected and have never had any issues or been asked any questions by customs or airline officials about them. Hey Adrian. Thank you for your comment and support. I think Zano is

going to make a real difference partially because of the clever technology removing a large part of human error but also because we will actively engage with officials to keep Zano legal and safe. Hey Talvinder. Regarding the raw footage, very definitely. In fact the raw footage will be available before the compressed footage. Frame by frame compressed JPEG's with EXIF data encoded about position etc. I think that is everything but as always, if I have missed anything please let me know. Have a good evening everyone. Kind Regards, Ivan @FlyZano

Jan 5 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening all, Thank you to you all for your suggestions about an update to reflect the changes in specifications. I have posted this, I think Larry beat me in announcing it :-). Now be kind, I am an engineer not a marketing guy :-). Hey Grant. Regarding the fisheye lens discussion. I am still keen on the fisheye lens as it won't affect video recording as 1080p video only uses 2million pixels out of the 5million pixels of the sensor. However for photography enthusiasts this is an issue so the discussion is very much divided. I think the solution to this is the modular camera options we are going to be offering and perhaps in future production runs we can offer a standard lens or a fisheye lens model or we may be able to offer interchangeable lenses. The camera manufacturer we use has been on holiday since before Christmas so I am yet to have answers to my questions hence I have not been able to post a final answer here. As soon as I hear back regarding options, I will post them here for discussion. Thank you for your support and input, as a community forming Zano, this process is fantastic Hey James. Regarding 360 camera capability. Do you mean a spherical lens? Hey Matt. Regarding the case. The LE and standard cases with the plug less charging won't be automated landing platforms, that will come later but I am looking into ways of embedding the contacts into the case for ZanoFuel to use to charge Zano. I can't be more specific at this stage as it takes time to form an idea, design some examples, test them, work out pricing to determine over feasibility but if not as standard in the cases, this will be an cheap optional upgrade for the cases when it is ready. Hey Brendon. 10,000 Zano's flying at one time, imagine the Guinness world record :-). Hey TimZ46. Thank you. Hey Peter. Regarding VR, this would be awesome and another reason for developers to make use of the SDK for Zano. You can do virtually anything you can think of and VR or should I say AR (Augmented reality) would be Zanotastic :-). Sorry, I just had to get that in, cheesy I know (ducks and covers) Hey Szabolcs. Regarding the range extender, this is very much going to happen and it is something I thought about but didn't post in the update as it isn't standard equipment and won't be due to cost. I think a few other backers have answered the specifics for you but if you need additional information, please let me know. Hey Peter. Regarding beta-testers. I wouldn't worry, at last count less than 10% of places have been applied for. Hey Mihai. Thank you for your support and comments, thats really nice. Our goal is and

has always been exactly that, delivered on time working well with basic functionality. As our system supports functional updates, I would rather ship on time with basic functionality and then release a huge raft of updates to give you all the functions you want. We don't need to hold off shipping if some of the functions aren't quite ready. Make sense? Hey Mark. Really good point and a great one to answer. Zano has two firmware modules. The boot loader which will NEVER change and is your failsafe. If in the event a firmware update causes an issue, through the Zano app you can reset Zano to factory settings which will be the latest Zano OS and then re-apply your functional updates. Does that help? This will be automated via the app so very easy to perform. Hey Special. Regarding the SDK and Beta program, the SDK is for developers who will also have beta tester access as we need them to download every functional update to ensure their apps support it. The beta tester network is for everyone, developer or not. So in answer to your question, the developers will have their own beta testing stream. The boolean logic error is one that is so easy to do $x = y \ \&\& \ x$ compared with $x = y \ || \ x$ is so hard to spot when buried in code and you've been working at it all day. :-) Hey David. Regarding solar, this won't be a standard fitting to the cases as it will increase cost to everyone. We are looking into the costs, how to implement it etc as I like the idea but we need to find a clean production method to implement it. Does that make sense? Hey John. Regarding DHCP and Gateway, really good point and that is my understanding too. So long as no gateway is specified, most operating systems won't use that adapter for internet access. Thank you for mentioning this. Hey David. Regarding a new LE released before the end of the campaign, this isn't likely. Thank you for your support. Hey Brent. Zano's highest frame rate is 120fps at QVGA, 90fps at VGA, 60fps at 720p, 30fps at 1080p and 15fps at maximum resolution. Does that help? Thank you for your support. Hey Sinan. Regarding solar cells, it is a neat idea but with current solar cell technology even powering the WIFI, the solar cell would have to be the same size as Zano. I will have a play with a few find me options and test them myself before Zano ships to you all in June for all your feedback and suggestions. Hey Mark. Thanks for that spreadsheet, that is awesome and what a help. Much appreciated and thank you for your support. Hey all, regarding the Zano map. That is a great idea. It would have to be an opt in service and couldn't display specific location unless you authorised it too but would be neat to see regions where Zano's are. Great way if you zoomed in to see videos and photos that users are willing to share too of that region. Regarding a forum. We will have a Zano forum on www.flyzano.com very soon and I will publish the details as soon as it is available. Hey Bradley. Regarding wake boarding etc. We had a suggestion a while back of a safe landing zone idea for water sports. So if you are wake boarding, before you launch Zano you set a location on the shore where you want Zano to land and when any failsafe is executed, low battery, loss of signal, errors etc Zano will return to your safe location. Zano wouldn't like landing in water. Sorry. Think of Zano like your smart phone. Same safety principles apply. Hey Mihai. Regarding the update, you are all quite right and thank you for mentioning this. I have

done the update, what do you think? Be kind, I'm an engineer not a marketing dude.

Jan 5 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon everyone, Hey Thomas. Regarding the GITD, I can't post a photo as the production tooling is yet to be finalised. Once the tooling is finalised and we have sample Zano shells back, I will post photos of those but that is scheduled for March as the tooling has a 60 day lead time. For now the best we can do is the rendering. Hey Chris. Regarding current legislation. Most legislators even if it isn't clearly published have a weight limit as in anything over x weight must comply. One reason we have worked so hard to keep Zano below 60g as we have spoken at length with the UK government and they have a sub 60g rating which is treated like a toy and has been proven to have no real possibility of injury due to its small size and weight. We will continue working with legislators to ensure common sense is used and the initial knee jerk response of simply blanket banning things doesn't apply. I am confident that we will be able to ensure Zano will stay legal for use in virtually anywhere subject to public nuisance orders etc. Thank you for your support. Hey Zul. Regarding the extended flight time batteries, once I have a final price back, you could trade up both batteries to the largest flight time battery we have. I will only select and allow to be provided batteries that I feel do not too adversely effect the performance of Zano so no worries there. Regarding the camera module upgrade, I don't know precisely when this will be available and as such, can't comment as to whether you could trade up to this before the shipping of Zano's in June. Closer to the date I will let you know the progress of the cameras. Sound fair? Hey Mark T. Regarding the LE batteries, sorry, I must have missed it. It is a fair point. I'll have a chat with the team about this. Hey Todd. Regarding the LE Red, the photos you refer too are the hand painted Zano prototypes. They are 3D printed, primed with a special primer, sanded and painted. The production tooling will result in a matt/low sheen finish not the gloss finish of the prototype. Regarding the red colour itself, we will run through quite a few red colours and metalised plastics to get the final result as close as possible to the render. Does that help? Hey Sheri. Regarding your suggestion, certainly should be able too. It would work best outdoors or where a GPS signal could be detected, you could configure a flight path of a few waypoints and the point of interest being your husband. It could then fly around him whilst videoing. Great idea. Hey Abdul. Regarding storage, if the SD card is full, Zano can store photos etc on your phone too. Video could be stored on your phone too. Hey Dave. Regarding Zano for time lapse style photos. Sounds great. If your choose a GPS location and altitude, it should be very repeatable and you can always crop and align the photos to make them perfect fit. Great idea. Have a great day. Kind Regards, Ivan @FlyZano

Jan 4 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, Hey Doug. Regarding the white case, that was a 3D printed case we tried, wanted to have an idea as to how everything might fit. I have asked for the standard case rendering to be put up so should show in a day or so. Hey Shaun. Regarding the UV leds, your quite correct, they are 0603 packages. :-) Thank you for publishing the dimensions too. To most people, they will barely see the little bump on the arm unless looking for it, that is until they are turned on. :-) Hey Larry. Shaun is quite correct regarding the leds, super tiny :-) Hey Mura. 'I also expect to know the capabilities of the final battery if it is 350 or 800 mAh for these more than double the final flight duration will be 20 to 30 minutes instead of 10 to 15 minutes , no and how to order them and that price. On the other hand , I read some comments or proposals he told to get him back or avoid the trees , it already does ? For me it's a lot. I have a Parrot drone that does not have too perfect , so for me to take photos or videos fixed or what is the same super tracking mode go and I do not see how adding more , an idea that me comes to mind , it faudrat be careful not to follow up mode if we dive, if not, farewell Zano . A + ' The final standard battery will be 350mAh as this ensures we keep the official weight below 60 grams, however we will be providing 350, 650 and 800mAh batteries as well. I am waiting on prices on the larger two sizes. The 350mAh will be \$8 to buy, I would expect the 650 would be \$10-11 and the 800 would be \$12-13. Once I hear back on pricing, I will publish all of these. I will actually be publishing a price list of add-ons for everyone before the end of the campaign. Regarding obstacle avoidance, yes, it does that :-) If you were to dive in altitude Zano would try and follow but will not allow itself to go below the minimum sonar altitude (relative to ground) that you can configure. So if you say never closer then 3m to the ground, Zano will follow you up but not get closer to the ground than 3m. Does that make sense? Have I answered your questions? I know the translation engine doesn't translate perfectly. Hey adchesney. Thank you for your support. You certainly can do it that way and we will make available a list of all the add-ons soon, before the end of this campaign. Hey Werner. Regarding the glow in the dark decals, that is a good idea. I will see what we can do. I was thinking white racing strips for the red Zano too would look neat. Hey Dom. Regarding Zano taking a bird for a 'walk', what a great idea. I know parrots can get quite attached to things, might end up as buddies. Hey Lim. Regarding dimensions of ZanoFuel, I know we have this information but it is with one of the team in Las Vegas (CES) who is handling everything case related. I will send an email and ask for the dimension. Regarding the final battery for Kickstarter. I am hoping to provide one of each, a 350mAh for compliance with the less than 60 gram promise of Zano and one extended flight time battery. Now that may be 800 or 650mAh. It depends on the final version of Zano, its weight, payload capacity etc and which battery is actually the best performer as far as extending flight time and allowing fully acrobatic movement of Zano. Regarding the costs of the batteries, I posted my expected prices above. I will post an accurate price list of add-ons before the end of the campaign. Hey Mark. Regarding the comments, that is brilliant, thank you so much. Hey Dom. Regarding

ZanoFuel, it should charge the standard battery 8 times (give or take) and the extended battery 4-5 times. The original figure of 4-5 full charges of the standard battery was based on the previous ZanoFuel capacity, this has since been upgraded during discussions with our battery maker. So two batteries (standard) and a ZanoFuel you could get 9-10 flights or with extended batteries, 6-7 flights. The extended battery will take longer to charge too though. Hey Arnel. Thank you, much obliged. Hey Thomas. Regarding an email, once we close registration, we will run a statistical sampling process over the database with some weightings applied to give us the very best spread and mix of beta-testers. At that point, when we create the beta-tester active list, the system will email your address provided with a link to confirm sign up to the beta-tester network. When you registered and hit submit, you should have been taken to a page that said 'Thank you, your application has been submitted.' or something similar. Regarding 'return to home', I like your idea. The screen could show something like a QR code so Zano knows your phone is its master and using the video target tracking it could fly directly and precisely to you. Is that what you had in mind? I really like it, at release we won't have this but this is certainly something I will add to the list of functional updates that you will all get as back of backing this project (12 months free functional updates). Thank you for suggesting this, very neat.

Jan 4 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey Eric. The only silly question is the question that wasn't asked. You are quite correct, however only 1 shipping charge. Make sense? Hey Abdul. Regarding Zano internal storage. It uses a MicroSD card so whatever card you choose to use will determine Zano's local storage capacity. Make sense? Hey Larry. Regarding Zano's communicating, your quite right. They share information via WIFI if both connected to the same hotspot, they can also communicate directly with each other using their own mesh network designed for their swarming capability, they can also communicate using the IR sensors on board. I like your comment Larry, I think Zano will be resistant to boredom too as we will continue to release functional updates and third party developers will continue building and releasing cool apps and add-ons too. There should always be something free to play with. Thank you for your support too throughout this campaign. Hey Garvani, Hey Doug, Hey David. Regarding the camera. Doug is quite right. Originally we had limited the camera to a fixed angle. However due to the demand and requests from backers here, I have re-arrange the top PCB of Zano to make space for a tilting camera mechanism and we are working on a few ideas as to fitting such a mechanism in. So it will be tiltable, how, I don't know the specifics yet but it will happen. Hey Simon. Regarding water mode. I had not previously thought of this issue until it was mentioned a few days back. I think this is a really good idea and a very real problem. I quite like a water mode as you say. I will also look into ways of detecting water, not sure if we can but until we try, we won't

know. Hey Special. Regarding NHRP, are you referring too address resolution protocols? Dynamic routing of packets between disconnected nodes that move dynamically? Yes, we have a protocol we have designed for a patent of ours that solves communication issues regarding dynamically located nodes that are often disconnected from a node they wish to communicate with. It is an interesting issue as overhead is critical to keep as small as possible and the packets as specifically formed for Zano to keep things as lightweight as possible and to maintain maximum bandwidth. Regarding a configurable alarm and your lost Zano suggestion. Leave that one with me as you have made really great suggestions there. I'll integrate much of what you have suggested whilst keeping the WIFI active to keep the time to reconnect to a minimum. It should be able to maintain this mode for an hour or so on a flat battery or 5 to 6 hours on a charged one. Hey Simon. Regarding the lost Zano beacon. When Zano turns off most systems, even if the battery is flat, the voltage will recover and allow as you say quite some run time in this mode. The batteries have an undercharge protection circuit too so destroying the battery won't occur but will still support prolonged find me operations. Hey David. Regarding the camera. The video is digitally stabilised. The Zano OS uses onboard sensors to predict movement in the video stream to adjust the windowing before the next frame so you should find the video in native raw format is very good. You can then post-process the video on our HPC to get excellent results. Hey Garvani. Regarding a flat battery, when the load is turned off (motors, leds and most functions), the battery voltage will recover quite a bit and this will allow the speaker and other HELP ME Zano functions to stay active as long as possible. Really good to see ideas and problems like this being raised as this will allow us to build functionality and support for all these great find me ideas. Thank you for raising this. Hey Simon. Regarding waterproofing the electronics, this can certainly be done. There is a process called conformal coating that uses a water proof non electrically conductive laquer to protect the electronics. With a little bit of careful attention, you could certainly apply this yourself to Zano. Regarding a homing beacon. This was a suggestion sometime back and one I really like. If Zano loses signal and has landed, it will flash the leds and make a loud siren noise to attract our attention. Added with all the new suggestions here today, this feature should be pretty slick. Hey Special. Regarding a speaker, your quite correct. Zano does have a speaker and a 2w Class D audio amp that if put to maximum power would turn the speaker into a puff of smoke. Using a single speaker during development and the Zano audio amp, I drove everyone in the office nuts with the volume it could produce and a nice 4KHz sound really got on everyones nerves ;-)

Hey Ray. Regarding beta-testers, thank you firstly for your support and comments. Regarding being notified, once we close registration and have run the sample to select the beta-testers, you will receive an email containing a link to use to create your beta-tester account. Does that help? Hey Garvani. Regarding follow me, we have proven this works as is shown in some of the videos but we will continue to refine and polish this. As Matthew has suggested, if you could sign up as a beta-tester, your input and feedback will help us make this feature

super slick. You will all try things with Zano that we haven't thought of so by providing feedback about Zano's performance, we can improve and refine these capabilities. That is the beauty of Zano, and the closeness with the Zano team, we will take your feedback and ideas and improve the product. We can roll out functional updates and fixes daily if need be as we control all our own infrastructure. Does that help? Hey Shaun. Thank you, it is a well packed 6 layer board with some pretty tight production tolerances just to get everything to fit. Paint ball carrier, oh I like that :-)

Hi Sinan. Regarding extending range, yes the 15-30m is limited by the antenna on your phone or tablet. We are going to release a range extender with >500m range for Zano. We are hoping to do exactly as you say and see if we can fit the extender into the carry case. Thank you for your support. Hey Emmanuel. Regarding drone laws. We are building into the ZanoApp a region detection function that will apply the laws from the local region and location to Zano. Zano also will comply with the rules set by the app. For instance, flying over the white house grounds will not be permitted by law or by Zano. If you try it will simply hit virtual fence and not fly any further. Same with No 10 Downing St in the UK. So unlike other drones, Zano will force users to comply with local laws and legislation. If your away from people and from no fly zones, then depending on regional laws for the area your in, flight distance and altitude will adjust accordingly. If your up in the Brecon Beacons for example (rural Wales away from virtually everywhere) hiking, Zano will apply virtually no restrictions and allow you to do with it as you wish. Does that make sense? Your point is a very good one and something we have carefully considered during the entire Zano design process. Hey TimZ46. Thank you for your support. Really appreciate it. Hey CanadianCoffee. Regarding Kickstarter, its incredible to be in the top 20 projects of all time and in the top 6 technology projects of all time on Kickstarter and still 4 days left. It is due to the enormous support from the Kickstarter community that we have achieved this. The enthusiasm, comments, questions and suggestions have create a true Zano community. It is all very humbling for us (Zano team). Hey Doug. Regarding the BBC article, thank you for posting that. Very chuffed to see Zano taking pride of place in the drone section. Hey Special. Regarding your idea of mapping an indoor area. Really good idea and yes, I believe it is possible. I am not a 3D mapping expert so my understanding is moderately limited but Zano does provide detailed inertial navigation data and distance data for all sensors hundreds of times per second. If all this information was fed into a mapping system, building a 3D model with some clever mathematics should definitely be possible. This would be a great challenge for a University to take on. Our large UAV (I say large but to us it is, it weighs 120grams) has high resolution sonar on all faces so could provide much more accurate measurements for this purpose. Would be cool to see it happen. Thank you for the suggesting. I think I have answered all questions, as always, if I have missed anything, please let me know. Have a great sunday everyone. Kind Regards, Ivan @FlyZano

“ Hey Sheri, absolutely and great idea. I'll make sure this is included in the app. Thank you for suggesting it.

Jan 4 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey all, Thanks everyone for the support regarding UV LEDs. Really appreciate it. I'm so excited to get the next version of Zano back, I've got a few traces to lay on the PCB then off to have the PCB made and Camtronics will load them. Won't be long now until we can post video of the production version of Zano. Hey Mark T. Regarding Matthew C posts, thank you for your concern and for voicing it, genuinely great to know we have such fantastic support here but it's really is fine. Matthew has been a huge supporter of the Zano community and we (Torquing Group) will publically support all third party developers and engineers building things for the Zano community. In fact I encourage any developer who wants to run a Kickstarter campaign for Zano related support products if it helps all of you, the Zano enthusiast by giving you new and cool stuff. Does that make sense? And thank you again Mark T for voicing your concern. It's because of the vocal support from so many of you that this Zano community is growing fantastically. Have a great evening all and I'll be back in the morning. Kind Regards, Ivan @FlyZano .

Jan 4 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi All, I've juggled a few GPIO around and can now make the UV LEDs independent and can be turned on or off at will. Wasn't easy but by combing two power enable functions (no effect to Zano or to the power usage) I have made one spare line which can be used for UV LEDs. Sorted! The weight of the LEDs is about 0.5grams in total so the weight impact is negligible. Sound good? Kind Regards, Ivan @FlyZano

Jan 4 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone, I seemed to have created some debate. Let me explain, the UV LEDs are for charging the glow in the dark plastic and if I add them to Zano they are there for all Zano's. Zano already has RGB landing LEDs and 8*8 RGB led display. The UV LEDs were to be mounted on the top side of the board to illuminate the shell. I can simply leave them unpopulated for anything other than GITD Zano if people wish. I have had a look and every single GPIO on the processor is used as now I have SD card connections, additional power switching for camera and another line was required to fix an issue with the mesh radio link leaving absolutely nothing

spare. If no one is fussed about the UV LEDs then I can add the space in the circuit but simply not put any components in. Or I can link the UV LEDs to the blue landing light colour only so red and green will not turn the UV light on. As the blue landing light and the UV led are both in the blue and higher light spectrum, they wouldn't look out of place if those two are linked. Thoughts? Or does this make the entire situation more complex? Hey Larry. The limited edition are limited in that there is a fixed number as mentioned and will never be produced again. Sorry if this has caused some controversy. It is difficult to support such an enthusiastic community with the current model Kickstarter allows. We will find a way to ensure everyone gets what they are after and honour the limited edition nature of the LE ranges. As CanadianCoffee has shown as well that we should clearly be fine with the LE ranges and everyone should get exactly what they are after and I suspect that none of this will even present itself as an issue as there will be plenty LE editions left over. Does that help? Have a nice evening everyone. Kind Regards, Ivan @FlyZano

Jan 4 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey everyone, Looks like UV LEDs is what we will run with. I'll ensure they are barely human eye visible so should create a really cool effect for decals etc. Hey Doug. Regarding VAT, that is also my understanding and the assumption our accounts people are working on. We have contacted our accounting firm to speak with HMRC to get a taxation ruling on this. However in the absence of other information we are assuming VAT is payable on all Zano's being shipped to the UK and will set the price you are paying in the UK as the VAT inclusive price so we pick up the VAT bill. For UK companies as you have suggested, you are able to claim the VAT back. Have a great afternoon everyone and I just noticed we have passed 9000 backers. Absolutely brilliant, thank you. Kind Regards, Ivan @FlyZano

Jan 4 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey all, Your correct, UV was for charging the GITD shell. They are just visible, that UV purple but not bright to the human eye. I can see the issue with fixed leds for the other Zano's. I can make the RGB, the same as the landing LEDS if everyone wants that though the effect for charging the GITD would be substantially diminished. So the choice is RGB or UV as standard for all Zanos. This discussion is only about a set of leds near the outside of the Zano shell, one led on each arm. I can not find a UV led that supports other colours so it has to be either RGB like the landing leds and linked to the landing leds or a UV led. Thoughts? Cheers, Ivan

Jan 3 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey all, now is your chance for some immediate input. I am placing the UV leds on the PCB, the main flight frame. I am thinking putting them just outside the shell so they are visible and would light upward. They will turn on when ANY colour is chosen for the landing leds. For example, if you want red landing leds, the UV leds would show, if you want blue landing leds, the UV leds would show. Now alternatively, we could fit red leds to the red zano instead of the UV leds, fit blue to the black zano, fit white to the white zano, fit UV to the GITD zano and green to the camo Zano. Thoughts? You have about 90 minutes until I need to place the leds and finish drawing all the PCB traces. Kind Regards, Ivan @FlyZano

Jan 3 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey Larry. Cheers. Just to confirm, the LE will be Limited. The will produce only once and everyone will have a certificate too. Have a good afternoon. (nearly afternoon in the states?) Hey Midhun. Cheers and much obliged :-)

Jan 3 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey Larry. I think this is what will happen. Firstly I think we have enough LE for everyone. There is still 442 red, 544 Camo, 384 GITD limited editions left. In the event that people who have adjusted their pledge to get one of these but Kickstarter won't allow them to select it, we will contact these backers and we should be able to give them the LE of their choice. In the event that all the LE are gone including our buffer stock for marketing are exhausted, we should only be talking a small amount, we will contact everyone who has say a red if we are short on red and offer everyone a free swap to another special LE we will create. If people choose to swap to the new one, that frees up red LE that we can use to fulfil the requests. The same would go with GITD and Camo. This is going to be a logistics issue but we will work hard to fulfil everyones request. I honestly don't know of another way. In your example, people who pledge for one LE wouldn't simply get offered a different LE, we would offer everyone of that particular LE a new LE one and there will be some takers. I am confident that we can work with the backers to ensure everyone gets what they want. In the extremely unlikely event that we can't get a backer the LE of their choice we will have a chat with them about what they want to do? For instance, someone may want a LE red and lets say we have tried everything and simply don't have enough LE red, in that situation we would offer a GITD or Camo if they want it as a no charge swap. I really am confident we can get everyone what they want by being flexible and just talking with people. Does that make sense?

“ Hey everyone, I have a few updates for you. 1. The MicroSD card is in the new design and all connected up. It is in the back of Zano and the MicroSD card is easily accessible from the rear of Zano. 2. I am fitting the UV leds to the board to allow charging of the GITD shell. 3. I have allowed up to 13mm for the battery. The 350mAh battery is 5mm wide, the 800mAh is 12.5mm. This will allow us to offer all manner of Zano batteries for different purposes. Hey Doug. Thank you for your support. We will find a solution that fits everyone. I bet now I have mentioned a Chrome Zano people are going to ask for that now, can't do it, I'm holding that one back until the end of the campaign I think as a way of making sure regarding LE and backers get what they have asked for. I think Chrome would look incredible. Thoughts? Hey Larry. It will be odd when this campaign finishes, I will still be posting updates and answering questions but the community will need to largely move to the forums and wiki. If we can get support for those, people sharing cool photos they have taken with Zano, awesome videos etc I think the community will mature and grow into something really exceptional (it already is but imagine more people with more cool ideas sharing their content) Hey Midhun. Regarding your questions, sorry. I am sure I had answered them but will do so here. 1. All LE cases are fabric over rubber, thermoformed into shape. They use the very best zipper we can use and also the stitching on the case is colour co-ordinated with the shell case as it isn't the same colour. A really special case basically. The standard cases are still very good but are from a material I would have to ask the case maker what it is, they have good zipper and the stitching is the colour of the shell. Both really good quality cases but the LE cases are limited edition and a bit special. 2. You can easily access the ZanoFuel charging port whilst in the case so you can charge both when not in use. We have moved away from the charging port on the case as this is a point of water ingress and would compromise the case if your outdoors and it gets wet. Instead we have found an easy way to access the charging port whilst in the case. 3. ALL cases will hold at least 4 batteries, spare propellers and a charging cable. 4. ALL cases will support a shoulder strap. 5. The camera tilting mechanism will happen. I have allowed space on the revised PCB to provide room for the mechanism. Thank you for your support throughout this campaign and for your comments. Please let me know if I miss any questions, I always try to answer everything but I do miss some. Hey Doug. Regarding VAT, thank you for your message. We actually asked the question to our accounting firm today about VAT. Technically backers are backing a project and choosing a reward. They are not pre-ordering a product. Once I hear back I will update you. Hey Rina. Regarding swarming, not far off now. Very exciting. Regarding the LE cases etc. Your quite right. I think in the event we do deplete our internal buffer stock for the LE as well as all LE listed on the campaign, we will have to do a special LE version for backers, perhaps release 1000 items of a Chrome version and then contact backers to see who wants to

swap, for those who swap away from one LE, we can then fulfil another backers request, and see if we can find a happy medium where everyone gets what they want. Either way, this will be a problem for Torquing Group to solve and we will do everything possible to ensure backers get what they want and that this issue isn't one you have to deal with. The demand has been overwhelming and you are quite right, the logistics of this is going to be interesting. I'm glad someone else in Torquing Group has to deal with it and I'm just a humble engineer ;-)

Great advice though and thank you for mentioning this. Hey CL. Regarding flipping, we can do that, we can even fly upside down. Now that should be some fun. You could land on the ceiling ;-)

Hey Jeff. Regarding CES. Thank you so much for your support. Email hello@flyzano.com and that goes through to Reece. I know he has a few hundred to respond too but you should get a response. The guys are always up for meeting backers especially if a beer or two is involved :-)

Hey Lim. Regarding detecting water. At the moment no, but I hadn't thought of the problem that you have mentioned so leave it with me, with clever signal processing, I may well be able to detect water. If I can, this will be a functional update released to you all.

Hey Roger. Regarding shipping, the £10 fee for shipping applies worldwide. When you pledged, you have only one option for shipping which is the £10. The batteries should be around \$8USD each (£5.20 give or take)

Glad the site is working again for you.

Hey Joey. Regarding other developers, as some of our team are away at CES, when they get back on the 12th, I will see if we can do a group video including everyone to commemorate the completion of this campaign. How does that sound?

Hey Dooley. Regarding upgrading your pledge. Kickstarter only allows you to choose one reward. We will ask you on the survey at the end of the campaign what items you want and will fulfil your order. Only one shipping charge is required no matter how many Zano's you want :-)

Thank you for your support. Hey Cheryl.

Regarding ZanoFuel. The LE cases all come with one but we will offer a different ZanoFuel as an add-on to this campaign or to purchase separately through www.flyzano.com later. We will contact you with the survey and provide a list of all the add-ons if you want any of them.

Hey Doug. Regarding sub-aqua Zano. I believe Zano (if waterproof and the flight arms replaced with small water thrusters) would behave the same way under water as a quad flies in the air. You thinking of some photos when diving? Imaging flying a Zano through the coral to get awesome photos. The problem is communications. Through water typically requires sub 100KHz radio. We have done this but it isn't easy in something as small as Zano. Good fun though :-)

Regarding Zano-Pico (not sure on the name ;-)) If I can find a decent BGA package Flash chip small enough to fit with enough capacity then onboard recording is very doable. Be great fun flying it around the house buzzing the dog or cat :-)

Hey Roger. Regarding the pledge levels. Yes, we will contact you at the end of the campaign to find out exactly what you after. See my comment above regarding limited editions, in the event we do run out, we have a small internal buffer stock for marketing which we will use, and IF we run out of those, we will release a new LE edition perhaps Chrome and contact everyone to see who wants to swap to that one to free up a few of the

other LE versions. Either way, we will solve it so everyone is happy. Does that help? Hey Mihai. Thank you for your support. Extra exposure helps a great deal. Hey nanobot9000. Thank you for your support. Sure would be a neat drone, < 20grams and 40mm * 40mm (1.57 inches) Hey Kevin. Regarding flying indoors, Zano is very much designed for both indoor and outdoor flying. In both situations it is just as easy to fly and have fun. :-) Hey Sheri. Regarding a beta-tester section. Very good point and exactly what we will have to build. I am thinking a nice simply dashboard too so not only do you see ALL updates available, a green tick shows the ones you have downloaded and someway of showing those you have reported on. Then at the top a nice simple % to show if your on track as a beta-tester. Really good point and thank you for raising it. Hey Mark. I'll pass that along to Reece. Thank you for your support :-) Hey Peter. Cheers, thank you for your support. Have a great afternoon everyone. Kind Regards, Ivan @FlyZano

Jan 3 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone. Another good day with nearly 240 new backers of this campaign. Thank you. Beta-tester registration form. <http://www.torquinggroup.com/extensions/register.php> Hey Ben. Regarding a forum etc. We should have the Zano forum up and running by the 8th of January so all enthusiasts and the Zano team can start evolving some of the ideas suggested here. Thank you for your support. Hey Mark. Regarding postage for the UK, we have to charge VAT for items being dispatched to the UK so to avoid all the complexities of trying to support this within Kickstarter, we simply set the shipping charge to be the same as the rest of the world and we (Torquing Group) will absorb the rest of the VAT for your Zano's. So what you pledge here covers the VAT as well, so by using some of the shipping fee and Torquing Group absorbing the rest of the VAT charge, we felt it was the fairest way we could think of doing it. Make sense? Hey Brent. Regarding beta-testers. Correct, you need to download 80% of function updates and report on 80% of those which is 64% of the total number of updates released. I would expect we would release a one a month on average. Hey Peter, Hey Special. Flying on the moon, your correct the lack of atmosphere would stop the current configuration from flying. However flying on Mars is very possible as there is a gas atmosphere there. Imagine a Kickstarter campaign to get Zano to Mars. Hey Abdul. Regarding travelling overseas, Zano will work exactly the same everywhere around the world and it creates its own WIFI hotspot so even in the middle of the Amazon Jungle, you could fly your Zano. Hey Peter, thank you for answering those questions. Your 100% spot on. Thank you for your support too. I know the guys are going to be doing some filing whilst at CES and will certainly publish these whilst away. I am looking forward to seeing what the 20*20ft Zano stand at CES looks like. Hey Special. Regarding wine glass delivery, if we configured 8 Zano's on a special carbon fibre frame with an attachment for a

wine glass, we could indeed fly a glass of wine around quite easily. How cool would that look. Champagne is even less as the glasses are smaller as typically is the contents :-)

Hey Doug. Regarding a small UAV. I have actually looked into this and yes I could do this. By removing the RGB display and a few other items, removing the MicroSD card, but keep the USB charging, obstacle avoidance, remove the speaker but keep the microphone and keep the GPS, I believe I could get Zano-mini down to 35-40mm motor centre to motor centre. Still with a 5mp camera but the video would be streamed rather than stored locally. That would be an awesome drone. Especially as it would still run the Zano OS so all the same capabilities including mesh networking and swarming with its bigger brother Zano.

Hey Mark T. Reece is from Australia, as am I. My accent has worn off somewhat as I have been in the UK now for many years.

Regarding charging whilst in the case, Zano monitors the battery temperature and will adjust charging accordingly so charging whilst in the case is fine and also what we have designed Zano to support. Sounds like you will be able to get some awesome aerial footage and photos. When www.flyzano.com is accepting posts, if you wouldn't mind sharing some of your favourite photos from your Zano, that would be excellent. I would expect the case to hold 4 batteries in total with the ZanoFuel and Zano as well as spare propellers and charging cable.

Hey Larry. LOL. I think the chair adjustment was more for getting the framing right on the video. Reece used to be a professional football goalie but retired due to injuries. Thomas is ex-royal air force. He served for 12 years. He tends to hide away from the camera's.

Hey David. Regarding the extra battery and the RGB display, its a good idea however the RGB display is only 2mm thick in total so takes up very little space or weight. The battery slot in Zano is 70% wider than our standard battery to support extended flight time batteries which we are also planning to release. It is important with something as small as Zano to keep the weight down but also well balanced to ensure maximum performance in gusts and outdoors.

Hey Matthew. Regarding your battery charger. I had a look at the site today, looks really good. When your Kickstarter goes live, let me know as I'll definitely back it.

Hey Roger. Noted, thank you. Not sure what is happening with the site for you. I have issues from time to time with my home internet service. General rebooting the router helps as it stops forwarding DNS requests (resolves a web site name to an IP address).

Hey Bryan. Regarding beta-testers. Nothing is required, all we need is that any beta-tester downloads 80% of all functional updates we release and then reports on 80% of those. That is it. In exchange you get all the functional updates free of charge as well as the latest news and events etc. Does that help?

Hey Matt. Regarding the matt finish. Your quite right. The injection tools will be bead blasted and not polished so the resultant parts will be matt/low sheen as was asked for by everyone.

Hey Ben. Thank you Ben. The biggest advertising for Zano is word of mouth. If everyone could share and spread the word. That final goal will be hit easily.

Hey Peter. No worries, the red does look pretty cool. Have a good evening everyone and thank you as always for your support. Kind Regards, Ivan @FlyZano

“ One more thing, just as I posted that Matthew responded and his point is a really good one for those who didn't know. Thanks Matthew. Zano has a built in charger so whenever Zano isn't being flown, you can connect it to your ZanoFuel to keep it fully charged.

[Jan 2 2015](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon all, Hey John. Regarding the charger, a small USB charger is included for the spare battery. This could be plugged into the ZanoFuel to charge the spare battery whilst your flying Zano. Hey Mura. 'Hello, is it possible to fix zane to be filming in standalone mode while you are walking or doing a course or bike. Thank you .' Yes, this is called follow me mode. Zano will follow and track you autonomously. Does that help? Hey Bryan. Regarding beta-testers. Not to worry, loads of the space in the program. Hey Doug. Regarding fitting into the pocket, I would say to most outdoor jackets or cargo pants, probably, depending on the garment. We are looking to put shoulder strap loops on the sides of the cases so you can sling it over your shoulder easily as well. Hey Peter. Regarding the standard case, it will still be very good quality. We have done some renderings of it, not sure why they aren't being shown. I'll ask the guys about that. The difference is the LE cases use the very best fabric bonded with high density rubber we can use for this purpose, coloured stitching, top of line the zippers, that sort of the thing. The standard case is still very good quality but is from a different material to the LE, has good quality zipper and standard stitching to match the shell colour. So both very good, just the LE are that bit special to celebrate Kickstarter. They will both have as much storage room in them as we can fit, battery slots, pouches etc. Regarding the swapping from white/black to red. The £189 is a Limited Edition Red with limited edition case. The Red Zano due to demand will probably become a standard colour but the case and ZanoFuel is where the cost difference is, we have charged the same for white, black and red Zano's as the reward levels without the case and FuelStick. So if you want a Red Zano, you can swap your black or white at the time of the survey to the red. You can't select the LE red case and bundle unless your pledge is of that level or make up the difference. Does that make sense? Regarding another creating Zano. Yes, the next video will include footage of the first 10 production versions being put through the assembly process so that should be really cool and show you all the final version. The one after that will be with me launching it for the first time and tuning it for stable flight, then little snippets as I enable each of the internal functions for testing. Thank you for your support. Hey David. Regarding moving when following you. Sorry, I do recall and think I answered it but no worries, I'll answer it again. Absolutely yes :) How is that? To be more specific, you could ask Zano to circle you whilst your running along for example. Whilst doing

so Zano will keep you in the centre of the camera view. We can add all manner of pre-programmed movements like this. Does that help? Hey Special. Regarding WIFI, the single biggest issue generally is the quality of the LNA/PA (Low noise amp for receiving and Power amp for transmitting) coupled with the usually poor antennas on consumer equipment. We have a WIFI tower we erect at our office that provides blanket coverage out to a mile in any direction mainly due to the good quality and BIG antenna and the quality of the chipset itself. Hey Doug. Sorry, auto-correct missed up some of my response to you. I agree, the larger UAV's are now (I had not) fairly easy to build and there is a lot of decent open source hardware and software to get a basic UAV up and flying quite quickly. As you have so rightly said, making something as capable and as tiny as Zano is an engineering challenge in itself, let alone the software we have been able to squeeze in. Really appreciate the support and have a great weekend. Have a good afternoon everyone. Kind Regards, Ivan @FlyZano

Jan 2 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ One more thing. The beta tester form. I will post an update tomorrow with the link, for now, please just use; <http://www.torquinggroup.com/extensions/register.php> Only 178 people so far have put themselves forward, we have allocated 4,000 places for Kickstarter backers. Remember beta-testers get all the latest functions, updates, news and events before anyone else and all the functions/updates are free of charge for testers forever. Kind Regards, Ivan @FlyZano

Jan 2 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone on this the second day of 2015 and what an exciting year this should be. Happy new year everyone and thank you all so much for your support, enthusiasm, encouragement and engagement in this campaign. Your involvement has made this campaign and the process a great deal of fun for us all, the ideas, comments and suggestions have been brilliant. We have 6 days to go and I'm still quietly confident we will hit that final stretch goal which means come June, your Zano's will be swarming enabled. :-) Hey Robert. Regarding additional videos. I am looking through our archives of early prototypes where I know we took some decent footage of avoidance etc. When I find these, I will make these available. Hey Special. Regarding 802.11ac. This may get a bit geeky but I'll explain a little RF basics if that is ok. 802.11b from my experience has the best range but lowest bandwidth (still enough for Zano though just you get lower frame rate). 802.11b makes use of less phase angles for encoding data, more narrow channels and supports down to 1mbps. 802.11ac is specifically designed to increase data throughput and supports up to 433.33Mbit/s per spatial stream of which 8 streams are supported. It supports wider

channels and operates in the 5G spectrum. The longer the range, the lower the bandwidth, the higher the bandwidth the shorter the range. This is assuming a number of factors stay true, that is antenna design, power output, obstacles etc. Also 802.11b operates on 2.4G, vs 5G. Another rule of thumb (doesn't always hold true but generally) the higher the frequency, the lower the range (non line of sight) as higher frequencies are attenuated more by physical matter. Physical matter includes dust in the air, interference can also come from ionic and other forms of radiation from earth and from space. Material properties of the earth around you can also make a huge difference. RF works well over water as this works as a ground plane and also provides line of sight. So in answer to your question, yes, 802.11ac with a good setup could provide excellent range and bandwidth. However, for Zano, bandwidth isn't so critical as range might be and the range tests we have done at 2km where using 802.11b at 11mbps and >87% signal strength. Does that help or have I confused things? :-)

Hey Greg. Regarding raw footage, Sheri is quite correct, the guys are working on this and we will post something before the end of the campaign. Hey Simon, Hey CanadianCoffee, Hey Lim Kok Leong. Regarding the TED Quadcopters, they are really cool but as Simon has mentioned, they are actually a demonstration of mathematics not of quadcopter technology. They are all centrally controlled and once again as Simon has mentioned, high speed IR cameras positioned precisely all over the room collect positional information and feed it through a central computer that then sends out commands. Zano has all the native intelligence built in. Without a high resolution local positioning system those sorts of precise movements are not possible. However in saying that, Zano's have loads of sensors other UAV's don't and with a LPS (local positioning system) which could be supported by swapping out the local GPS, Zano could perform those functions entirely autonomously following nothing more than a script of desired movements like choreography for dancers.

Hey Roger. Regarding batteries, they are lithium polymer and yes if not treated properly they can be quite dangerous. However, as Matthew has mentioned, Zano has an onboard battery temperature sensor so even if the battery is warm, Zano will still charge but at tiny currents and as the battery cools, the current will adjust. This is totally automatic and has been designed to suit lithium polymer battery chemistry. Everything about Zano is more like your modern smart phone than an RC Quad. Zano is intelligent, monitors its own weight, air temp, compensates for the speed of sound based on air temp for calibration of the sonar etc etc. It also supports low power modes, sleep mode and hibernate all to conserve battery power. On top of that the electronics are different to that of other quads the same size as Zano. We have special characteristics built into the hardware to prolong motor life and flight time. Regarding Zano Red and Black. All Kickstarter Zano's will come with a certificate showing model, build date etc and to show you were part of the initial launch of Zano. We are even going to be providing nice clear Acrylic display cases for Zano through the www.flyzano.com store for those who want to display their Zano for all to see but to stop sticky fingers from meddling.

Hey Walter. Regarding our flight time vs that of others. There are two

reasons behind this. Firstly, not all batteries are created equal. As an R&D firm, we research everything first and that includes batteries. With our Military UAV's we did extensive testing on batteries from 15 different manufacturers and all but two consistently failed to deliver their stated capacity when used in a UAV with high discharge. The battery we have chosen for Zano comes from one of the two manufacturers that actually produce a battery that lives up to its claims. This battery is bigger than say the Hubsan x107c battery which is also rated at 350mAh except under load, our battery has consistently delivered at least its rating. We are also subject to final weight of Zano hoping to squeeze 500-650mAh batteries as standard if we can keep this below 60grams. Secondly, battery chemistry is a funny thing. If you draw twice as much current, you typically get less than half as much time. The more you draw, the less capacity the battery has. This is made even worse with low frequency switching electronics like the speed controllers on many cheap small UAV's. There bigger and more expensive UAV's and Zano, use filtering to even out the load on the battery which does have a noticeable albeit small impact of flight time. Zano does one thing more and switches motors out of phase to each other to further even out battery load and prolong the capacity of the battery to deliver. This means the battery voltage doesn't drop as quickly and we drain every last % out giving yet again a noticeable but small improvement. Putting these things together, makes a substantial difference to flight time and performance. Regarding motor life. Unlike other quads of the same size, the motors fail due to brush wear, now this is caused as much through arching as it is through friction. We sort a lot of the arching issues out with hardware design and as such have significantly longer motor life. Regarding Swift, production Swift is very different to Zano. Ceramic components, high temperature substrates, conformal coating, higher performance motors and much more expensive too, also cryptographic support beyond that of Zano as Swift has more military and law enforcement purposes. The Swift videos were made using the Zano prototype but the production Swift will be quite different. They both start from the same heritage. It is things like Swift that I was mentioning before. We, Torquing Group, have the technology to build all manner of advanced autonomous nano UAV's but Swift is expensive to make and outside the consumer price range as a result. We are doing Swift because of the interest in Zano and the police, fire, rescue etc want Zano capabilities which don't currently exist in any other UAV so Swift is a special hardened version for that market. So your getting in Zano all the coolest stuff we can do right now in a consumer UAV and Swift is a special version basically for law enforcement etc. Can't have them missing out on all the fun. Thank you for your support too throughout this campaign. Hey Esmonde. Thank you, really nice comment and much appreciated. Hey Larry. Are you being a softy and buying your wife a Zano? You could even have the case embroidered with the year and type of wedding anniversary, be it silver, golden etc :-)

Properly Geek out ;-)

“ Are you promising early delivery?!?! ;-) Do we need to have a quiet chat my friend? lol. Hey Alan. Thank you for your well wishes, I'll pass that along to the team. They have left Gatwick now and are mid flight to Las Vegas. Hey Byron, Hey Brent. Regarding the two blade propeller. Byron is right but there is a little more to it. The slower the propeller the higher efficiency you can achieve as the wind drag on the tip of the propeller becomes a lower % of overall load. If the motor is high speed motor (all these little ones tend to be) then a two blade propeller is better tuned to run at very high speed than a 3, 4, or 5 etc blade propeller. The more blades, the slower they are designed to run. Motors have a sweet spot, the spot at which power in and power out is at the closest point. If your propellers are creating too much drag and the motor is outside this point, your burning energy. Like Byron has said, it becomes less efficient. However if your motor is higher torque and lower speed, the more blades may well be better tuned. Choosing propellers and motors is an art and requires lots of research which is what we have done. You have to get the right propeller for your requirements and to match the motor. Hey Special. Regarding the SDK, we will have a comprehensive and well documented SDK available. Regarding running a controller on a desktop, server etc. Absolutely. We have a fully html5 and css3 user interface for one of our UAV's running on a PHP backend on a LAMP (Linux Apache, MySQL PHP) server. This uses the SDK to render an entire dynamic and smooth UI for your browser. Regarding range, being WIFI, range is easy to extend. The easiest way is a very good tuned antenna called a phased array antenna. This provides a directional high gain antenna so helps with sending out a stronger signal and helps by receiving tiny signals and making them useful. Regarding a glass of wine. How big is the glass and what is the total weight of the contents? I like your thinking though. ;-) Hey Brent. Regarding the lens. It is difficult as Zano is so space constrained as well as weight. We are going to be releasing different cameras for people to change out themselves (very easy process) and we may be able to do a lens more like the GoPro. Bear in mind GoPro is very fisheye and designed to capture a broad angle but it does distort the picture. Regarding 3D printing propellers. This was asked a week or so back as I recall. A few people corrected me when I commented that I didn't think it would be possible to 3D print something strong enough this small. Looks like a laser sintering nylon printer or similar has the resolution and strength to print the propellers. An ABS printer doesn't have the ability to create something balanced enough due to the way it fills in the outline. Any fraction of a gram imbalance in the blades would cause huge shudder. Thank you for your support. Hey Doug. Regarding Zano being proven technology, that is a fair point. It is brand new technology. The larger UAV's are not fairly easy to build as all the technology is proven and readily available. Zano has such huge levels of integration and miniaturisation all sorts of new issues have presented themselves. That is why we will do as many revisions as needed before the final production build gets underway in May to make sure we deliver a 1st class, world first product to you all that will simply get better with feedback from our Beta-testers and

from our internal testing. I thank you for your support too. Hey Special. Regarding a home sentry. Sorry if you read these comments but a while back, the discussion was about a automated landing and recharging platform. I have managed to get gold charging pads on the arms and assuming we can get this making contact on the landing pad, automated landing, launch and charging should be possible. We will also put in some additional stuff into the landing bay to help Zano locate it. Zano has endless possibilities because it is autonomous and you can through simply software launch it, task it, land it and repeat :-)

Hey Leon. Regarding bitcoin. Probably not. As a UK company, we have to comply with HMRC and they get a little upset regarding anything they can't tax. Good question though and thank you for your support.

Hey Larry. Regarding security. Have you see how big Reece is? I don't know if you know but I'm 6'3, I'm not little and I have to look up to chat with Reece. In the videos, he adjusts his seat down so we look about the same height. I think Reece is a one man Geek security force. Sam who is going too is taller again. Then poor Thomas who is of normal height (about 5'11) looks like a hobbit alongside those two.

Hey Ken. Thank you for your well wishes. I know the guys are going to be so busy but it should be a fun show for them.

Regarding the party. We are looking to help with transport, if you can fly to Heathrow or Gatwick, its an easy train ride to Newport where we can arrange a minibus to get people to the Celtic Manor (Its a stunning place), or you may be able to fly to Cardiff or Bristol. Either way, with a mini bus and the trains, we can do what we can to help everyone get there.

Hey Mark. Regarding super early bird red. I will speak with Reece about adding that reward level. At the moment, if you have white or black at any other level and want to swap to red, you can do this on the survey at the end.

Hey Lim Kok Leong. Regarding flight time etc. If you could read my response above about this and if you have additional questions, please let me know. Is that ok?

Regarding FPV. The video and control signals are one in the same so if you have control of Zano you also get FPV video from the camera. Both are fully encrypted using WPA2 so no-one can piggy back your video or take control of your Zano so long as you choose a good WPA2 password. :-)

Regarding the range extender. There is now significant demand for this so I will see if we can prioritise it and have it ready for June shipment. We are looking to do a universal attachment to your phone so you clip your phone into the extender but the extender is stand alone so you could simply leave it powered up and in your backpack or similar too.

Hey Yannick. Thank you for your wishes and I'll pass those along.

Kind Regards, Ivan @FlyZano

Jan 2 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone and Happy New Year!!! I was in the office with the team this morning doing a final check and making sure they have everything and I can now say they are on their way from Pembrokeshire in Wales to London to fly out to Las Vegas for the CES show. I am staying behind and my team and I are flat out working on

Zano, production revisions, bills of material revisions, apps and graphics etc. we are going to use the time with the marketing and mechanical guys away from the office and make use of the peace and quiet and get some serious volumes of work done. Don't tell them I said that :-). As it is New Year's Day, I'm just posting this one message today but I will be back tomorrow as usual with my substantial responses to any and all questions. Remember the beta tester pre-registration form is now live; <http://www.torquinggroup.com/extensions/register.php> We have allocated 4000 places to our Kickstarter backers and at the moment, most are still available. Anyway, I'm off to spend some time with my family on this, the first day of 2015. May you all have a happy, healthy and prosperous new year and as always, thank you each and everyone of you for your support in this campaign. Kind Regards, Ivan @FlyZano

Jan 1 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone, The Beta tester pre-registration form is live. Just a reminder for those who have not yet put themselves forward. <http://www.torquinggroup.com/extensions/register.php> Just shy of 8,000 backers, this is absolutely brilliant. As the volumes of Zano increase, the cost to make each one comes down and that allows us to push more resources into extra functionality and releasing new functions that much sooner. Thank you to each and every backer for getting involved. The level of technology in Zano is remarkable and getting Zano to the price point we have is only possible with volumes. You have all made this possible. Hey Larry. Wow, 2,000 comments. I think one of the guys in my office said I had written over 50,000 words in this comments section, its no wonder its hard to find anything historical here :-). Hey Matthew. Thank you. Hey Daethstar. Thank you, really nice comment and much appreciated. If you pledge the total of both but only ONE shipping charge, you can select only one reward but at the end of the campaign, we will ask you what the other item is that you want and fulfil your request. I hope that help. Hey ksc1333. Regarding ZanoFuel as an extra item, a version will be available, it is about £10 cheaper when bought as a bundle here, the actual separate item cost is not something I know, sorry. I will ask though and post a list of costs and items before the campaign ends. Is that ok? Regarding selecting both, are you happy with the responses? Hey Doug. Thank you, that final goal is well within reach. :-). Hey Robert. Regarding swift. I'll tell you all the history. Our background is military electronics, communications, cryptography, security etc and we have used all of this over the past 5 years to create some pretty cool autonomous UAV technology. Anyway, with the continuous demand for Military but with our desire to release a cool consumer UAV, we used the Zano prototype for the Swift videos but the production versions of both though based on a similar core OS are very very different. The Swift is not even close to production, nothing like the Zano and will be built using special high temp parts and the substrates used in the board themselves are special. The cases are not ABS, the

are fibre re-enforce nylon. Swift has a different motor and control system and also makes use of special restricted batteries for substantial flight time. The OS changes (the operating system within Zano) also include a series of cryptographic functions. The purpose of this campaign was to create a cool, fun and highly advanced consumer UAV of tiny dimensions that you could take everywhere. We have developed the technology for Zano but law enforcement, fire fighters, rescue and military all have huge uses for what Zano can do. As such Swift will follow quite some time after Zano and will be hardened and targeted at harsh environments, the price will also reflect the tiny volumes and high component costs. Does that make sense? Hey T Kap. Regarding your super early bird, let us know at the end on the survey. We can line this up with the backer report and help you out, no worries. Sound ok? Hey Ben. Regarding red, I always liked the red. Just glad we have been able to release it as I have put my name on one of the internal marketing ones. :-)

Hey matt. Regarding quality of photo and video. It is virtually the same 1080p video as you would record on most modern smart phones or tablets. The photos will be very similar too. The advantage is we are offering free of charge post processing using our HPC. The HPC will allow uploads of videos from your phone taken by Zano. It can correct, stabilise and correct the video then export it to any social media site of your choosing or back to your phone. Pretty cool function. There is video and photos edited into various videos on this campaign from Zano. I have some more I will be posting before the campaign ends. Does that help? Hey Ben. Regarding devices supported. iPad, iPod, iPhone and the usual Android devices are all supported. We will also be adding support for windows mobile. The phone or tablet is registered to your account and Zano is registered to your account. So if you had two phones and one Zano and both phones were registered to your Zano account, either phone could be used with Zano. Does that make sense? Hey Sheri. Regarding your comment, are you asking for Zano Red to be listed by itself like black and white? Regarding obstacle avoidance. I have a really good video taken years back of one of our early prototypes hovering quietly indoors then avoiding someone walking towards it. If I can find it, would that be of interest? We have run out of time to put any decent avoidance videos together of the Zano prototype, it has been a lighting quick time since we decided to build Zano. Regarding the super early bird for a black or white. Sure you could select a red. What are your thoughts if we add a reward level of red just like black and white. Hey Frans. Regarding this campaign. I'm not sure if you know this, so please accept my apologies if you do. If we only hit the £125k initial target, we would barely have broken even. Zano is expensive to make as it is completely loaded with technology and could easily justify a much higher price. The figures we are getting to now, really bring the unit cost down which allows us to use the difference in what is received through this campaign and what it costs to fulfil the pledges and our promises to you all will be used to add more and more cool functions, better apps, slicker interfaces, help produce the SDK for third party developers which in turn help grow the Zano community which in the end only benefits every Zano user as you all get the very best, coolest and latest

functions and capabilities from your Zano. If we add more value, all this does is reduce the funds available to us to grow the Zano community and slows the release of new functions for you all. Zano is honestly incredible value and we will work very very hard to make Zano the very best we can and to support all the third party developers who want to help grow the community. Does that make sense? Hey Nicholas. Regarding adding items, yes, at the end of the campaign, you can add items by asking for these on the survey. Hey Mandarax. Regarding beta-testers. No, it isn't a first come, first in basis. There is a small amount of demographic information we have asked for like age range, sex, country. This will help us ensure there is a decent spread of Zano beta testers in all countries so they can be tested in all environments by the best spread of users we can. Once we close the Kickstarter Beta tester pre-registration process, we will run a statistical analysis of the data and generate a true random sample with some weighting to get the best mix we can. Does that make sense? Hey dark-hawk. Regarding maximum altitude. This depends on air temperature as this affects air density. We have a few beta-testers who do a lot of high altitude climbing who will test Zano to the limit and give us a real figure. In the mean time, do you have a specific altitude in mind? The prototype and production Zano's are very different and as we will not have the production Zano back until mid to late January, I can't actually give a accurate figure on max altitude. We have flown the prototype up some pretty decent mountains in Wales with no issue. Now re-reading my response, did you mean altitude relative to you? This is limited by the signal range of your phone or tablet. Have a great evening everyone and thank you to all those who have already submitted the beta tester pre-registration form. Kind Regards, Ivan @FlyZano

Jan 1 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey everyone. Opps, my mistake. I thought I marked it as live, not development in our CMS. What a school boy error. The CMS configures the URLs for local server access when testing things. Can you try again and please let me know if you encounter any issues. Kind Regards and a somewhat embarrassed, Ivan @FlyZano

Jan 1 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon everyone. The beta tester pre-registration form is now up. <http://www.torquinggroup.com/extensions/register.php> Any issues, please let me know. It will put your details into a database as well as email us. Hey Abulkhair. Regarding Zano red, pick the colours in the survey at the end and we will do our best to accommodate. Hey Doug. I thought it was the ZanoVerse ;-). Hey Tom. Regarding extra footage, we have some we will be publishing shortly. Our biggest issue is time, the guys are flat out packing for their departure tomorrow but we will get some extras

up soon. Hey Serge. Noted :-) Hey CanadianCoffee. I thank you for your support. Hey Godard. Regarding the firmware, no sorry. Zano's core intelligence is the software and that is very carefully protected and guarded. Regarding Zano's native binary language, if you wish to communicate with Zano in another format, our SDK libraries will do all the translations for you but on your device, not on the Zano core CPU. That should do what you after. Regarding MIPS v ARM, If you're able to access the older comments, it is quite a long story but it's not just about the core, it's about the peripherals built into the uC, the development environment and quite a few other aspects. Also MIPS has a few super cool features buried in the core that only an assembly language programmer would look for and provide a BIG leap in performance over other processors. Regarding developer plug-ins. Absolutely. That is going to be key and something we will heavily support and back. Good set of questions though, thank you too for your support. Hey Walter. The surge I believe was Kickstarter sharing Zano on their email about weekly projects. Hey Eirikur. Regarding prices for extra items, yes, before KS ends. I can give you an indication now. The propellers will be \$1.5-\$2 a full set. The GITD will be more, quite how much I don't know yet. The batteries will be \$8ish and the extended flight time batteries will be \$9ish. The rest as soon as I know I will publish some guideline prices. Hey Jiri. Regarding networking, Zano uses a Lantronix xPico WIFI module. Neat little device. Zano also supports an integrated 868 or 915MHz lower bandwidth network for Zano's to mesh with other Zano's for swarming and communication. Yes, Zano will create its own hotspot for your phone/tablet to connect too. Zano can at the same time connect to an existing WIFI hotspot such as the one at your home if you so desire. The WIFI module can hot swap between the strongest AP. Does that help? Hey Jan. Noted. :-) Windows support won't be far behind iOS and Android. Hey Luc. Will do, please see my comment above. It won't be far behind. Hey Darkz0r. Regarding marking as a gift. I have raised this with our legal guys and am waiting a response. If we can without getting into trouble as I agree, it isn't technically a purchase it is technically a gift so it should be fine. Once I hear back, I will post the response if that is ok. Hey Jeff. Thank you. At the survey at the end, even if all 1000 of a limited edition are gone, we have a small stock of our own of each type and we can use these to fulfil your request. You won't miss out. Hey Ken. Thank you for your support. Regarding the party. All of Torquing Group will be there, loads of pre-production Zano's to play with, champagne, entertainment, drinks, food, more champagne and perhaps another drink ;-). The Zano team will hang around afterwards if anyone attending wants to wander to one of the many bars at the Celtic Manor with us for a chat. Please see <http://www.celtic-manor.com/hotels> the function will be at the main hotel, a stunning 5 star venue with everything laid on. Should be an absolute blast. We are all looking forward to meeting as many of you as we can to say thank you for your support. We have a stunning room for the function that holds 250 people. So 200 Kickstarter backers, all of us (Torquing Staff), some of the Camtronics team, some of the Lantronix team, some of the Origin team (all the guys who helped make Zano possible). This is an exclusive event for Kickstarter backers only. Hey

Dom. Noted, thank you. Hey Doug. Regarding the various limited editions. We have reserved a few extras for marketing purposes, so if we run out of the 1000 and you adjusted your pledge to receive one, we will use our internal buffer stock to ensure you get what you have requested. How does that sound? Hey Dawn. Regarding 3D work, that would be cool. I think that is another one third party developers will get involved in. Nice idea. Hey Peter. Thank you. Hey CD. Red was the next most popular behind camo so we had to release it :-)

Hey eitan: The ZanoFuel does exactly that, cool eh? Put your Zano back into its case and put it on charge ready for the next time it is needed :-)

Hey Ben. Thank you. Hey Richard. Thank you. Really nice to hear and glad your involved. The iOS and Android apps should be virtually identical barring any differences in the graphics engines and screen sizes. Hey Larry, Hey Doug. I think there is a hole in the Universe space time fabric and it has connected to the ZanoVerse :-)

Hey Mark. Regarding two Zano's, one phone. Sorry, my misunderstanding. When swarming function is released, yes, two or thirty Zano's if you felt the need on a single phone or tablet :-)

Once you have configured them, how you want them to interact and then move to flight control, they would show as a single UAV but would respond in a swarm to your tasking. A little bit neat? Have a great evening everyone. Kind Regards, Ivan @FlyZano

Jan 1 2015 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, Wow, what a 24 hours. Over 1000 new backers have joined the project in the past 24 hours, thank you to all our backers for your support and helping us really kickstart Zano as a product for 2015. Hey Roger. Regarding pre-registration, the page will be live today and I will publish when it is. In all honesty, I am focusing on getting the team ready for CES as they leave tomorrow morning. Once they are all sorted I will then do one final test of the page and push it live. I will also post on here when it is live and do an update too about it. Hey Pius. Regarding a range extender. The cost won't be unreasonable. Our target is \$100-\$150 USD for the RRP on the unit. Whether it will be available by ship date is something I can not answer just yet but in the next couple of months I can certainly let you know if that helps. Hey Serge. Regarding your comments about solar etc. I think some of the other members here have answer your questions. If you have any further queries, please let me know. Hey Arnel. I'm still quietly confident ;-) Hey Jason. Thank you for your support. The different colours are just a bit of fun. We want Zano to be fun and useful. Remember, the more funding we get, the more Zano's are built which reduces the price per unit and allows us to push more resources into building more cool functions into Zano for everyone of you. Hey Midhun. Regarding CG. The battery was previously mounted below the flight frame laying flat against the underside of the PCB. As the battery is now as large as I can fit, to make this work and keep Zano tiny, the battery sits on its side behind the RGB display and the RGB display is shifted slightly further

towards the back. All in all putting most of the weight directly below the dead centre of Zano. With the motors and propellers dropping slightly, we still have a fantastically low CG from the top of the propellers where the lift occurs to the centre of mass of the Zano. Does that make sense? Hey Daryl. Regarding Kicktraq, absolutely fantastic day, very exciting. Hey Lim. Regarding your question, Matthew has answered it for you but to clarify the part about avoidance, Zano from in front of an opening will know there is an opening because of the front sensor, it will only know the dimensions of the opening when it is just about to pass the edge of the opening as the top, bottom, left and right sensors will then get range information. I would be confident in saying a 300*300mm opening could easily be navigated. I haven't tried anything as small as 150mm as I suspect the wash from the propellers might cause issues. Regarding returning home, it will avoid obstacles on all flight paths. So ones you have planned or ones Zano is executing as a failsafe such as loss of signal or low battery. This doesn't mean Zano will navigate through really complex environments in its current state, it means it won't collide with anything. If you block it from the top, bottom, left, right and front it will hold position with the current firmware as it currently won't try and backtrack to find a new route. That more advanced problem solving is in our development pipeline but won't be available at shipping. Does that help? Hey CanadianCoffee. Regarding a new colour. We have a surprise today :-). No spoilers :-). Thank you for your support and I'll pass along your support to the team for CES. Hey nanobot9000. June will come sooner than you think. :-). Hey Mark. Regarding two Zano's, one phone. Yes, both Zano's can be registered to the same account and that account can be registered to one phone. Does that help? Hey Beezham. Regarding a GoPro. Sorry, the GoPro is almost as big as Zano and Zano just doesn't have the capacity to lift it. Hey Shaun. Regarding motors and a tether. Really good point, motor wear time would start to become an issue, however they are easily replaced. Regarding the power over fibre. did you see the tracking laser power station for UAV's I posted a little back? I can't remember the link but that was a cool solution. Hey Tri. Regarding the spare battery, we are trying to get photos of the batteries now from the suppliers. As soon as we get these, we will post them for everyone. Regarding marking Zano as a gift, I will have a chat with our legal people but I can't see an issue with that as your quite correct. Kickstarter is not a pre-order site, it is a crowd funding site for which you choose a reward for your support. Good thought, thank you. Hey Doug. Thank you for your support, we will be posting videos from CES too so some good stuff yet to come :-). Hey Mark. Did I bury anything this morning? ;-). Hey Roman. Regarding the alarm, an audible alarm is a good idea. I'll make sure that is included in the Zano app. Thank you for your support. Have a great morning everyone. Kind Regards, Ivan @FlyZano

[Dec 31 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

Hey everyone. Just about to close off for the night and thought I'd pop on first. Hey

“ Mark. Regarding my giant answer, yeah, I get a little excited talking about this technology. Sorry :-) good news is the forum will be up by the 8th of Jan. Hey Matthew. Regarding the tether, I'll work with you on the tether and send you some part specs. I've done quite a bit with high efficiency SMPS and am confident we can get at least 94%. We would need to switch probably 2-3MHz to keep the inductor small enough to be lightweight but this won't be an issue. Once you have your charger out the way, we can look at the tether. Sound fair? Have a great evening everyone and as always, thank you to all our backers for your continued support. We have one more day tomorrow of preparation to get the team ready for their trip to Las Vegas for CES, for me and my engineering team its full speed ahead on Zano. Anyway, goodnight. Kind Regards, Ivan @FlyZano

Dec 31 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone, Hey Simon. Regarding the tether, interesting idea, a problem if you send AC at a high enough frequency for switching conversion, you end up creating an antenna which would radiate this frequency. Another issue will be capacitance in the wire, it would waste a lot of energy. With a local switch mode you also have local regulation which is important to deal with the rapid load changes from Zano. Regarding lifting more weight, as mentioned below, production Zano with battery will fly at 50-55% power. Without battery you have substantial scope for payload depending on the weight of the tether and power conversion module. Hey John. Regarding the tether. Switch mode supplies are very efficient, typically much higher than 90%. So assuming a 12v 2a plug pack was used, at 4v this would deliver 5.5a continuously taking into account switching losses. You can typically buy 12v 2a plug packs for less than £10 on ebay. Hey Bo. Regarding the HPC, we certainly do have an HPC. We intend to make HPC processing functionality available for developers too to host apps for Zano users. Zano users would have to opt-in to any service and their privacy and system security are items for which there is no compromise from Torquing Group. Regarding what could be done with it, if there is a demand, I'm sure third party developers will jump at the chance to build something like what your suggestion and through our developer network we have field engineers too who can provide personal support for engineering and technical issues to assist third party developers with their projects. Regarding your doubt about the production mode being any different to the prototype model with regards to the changes I have mentioned, that is a fair point, if you don't mind I'll explain it in more detail and put some of the figures into context. The first and by far most important upgrade is the motors. A 30% increase in power isn't just a 30% increase in power. The prototype used 85% of power to Hover, the motors just were not powerful enough. At 85% only 15% is left for stabilising Zano is gusty and windy conditions. If you then compare 85% to the new power output compared with the prototype as at least 130%, Zano is then

hovering at 65% leaving 35% power for stabilisation. In reality, production Zano will hover at more like 50-55% with a full battery. Anyway, even at 65% that is circa 2.3 times as capable as the prototype at dealing with gusts. That is an enormous change in performance. On top of that, the production model is also 2mm wider and longer, has the battery mounted vertically instead of horizontally so the centre of gravity is much lower and much better centred so the load on the motors is more evenly distributed and the firmware is much more refined. I have a video I will be posting shortly that the guys have put together (they leave thursday morning so time is very tight at the moment) before they head to Las Vegas for CES. Regarding API's available for Zano, I have made mention of the two key types but it was some time ago and very much buried in these comments. Zano will support API's in most languages and platforms to make developers work easy. These libraries will handle the network communication, correction, error handling etc as well as processing the raw data from Zano into a format more recognisable to most developers. Zano also supports a direct API which is TCP 10000. Both type of interfaces will be heavily documented. The direct TCP port 10000 connection will be in Zano's native binary language and through it you have access to everything Zano does or can do and as we release functional updates, this language will evolve and expand. Does that help with your questions? Hey mark. Regarding your near IR comments earlier, I misunderstood your question slightly, sorry. I will have a chat with our camera supplier and see if lenses with your requirements are readily available. I would say the removal of IR blocking and addition of visible light blocking should be relatively routine. Would you mind leaving this one with me and I'll do some reason. Really good point about the Pi camera. I know the company who supplies the camera's so I have a direct contact to ask. Regarding different filters. I would think if there is clearance around the lens itself, a clip on filter may be an option. Would this work for you? We could always have a play with this idea later and 3D print an filter holder to try the idea. Regarding the tether. Looks like Matthew has stepped up for the challenge. I like the idea too and I am personally going to back his Kickstarter project when it goes live. Regarding cable length, it all depends on weight of cable. To make the cable lighter, means a higher voltage is required. It is a matter of finding a happy medium but certainly sounds feasible to me. Hey Ben. Regarding modular and tracking you. Mark is quite correct. Yes, you can swap the camera yourself and Zano will follow you if you put your phone in your pocket and start running around :-)

Hey Walter. Thank you for sharing on Facebook and you are more than welcome. Have a great evening everyone. Kind Regards, Ivan @FlyZano

[Dec 31 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon everyone. Hey Walter. Regarding the camera, Jose is quite correct, the camera is modular. The case is held together with clips formed into the injection

moulding and can be removed without tools, the camera is on a ZIF socket (special zero insertion force socket) that is designed to be operated by hand so you can remove the camera ribbon cable and swap it out. Did you see on update 8 the FLIR LEPTON module we have designed that can be used to give Zano thermal imaging capabilities? Hey Matthew. Regarding the tether, I'll back your Kickstarter project. Another item for www.flyzano.com :-) I'll pop back later, have a great afternoon. Kind Regards, Ivan @FlyZano

Dec 31 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon, morning, evening depending on your time zone. Well, I had a good night sleep and ready to get back into things. The team here is frantically preparing for departure on the 1st of January to Las Vegas for the show and we have so much to do before they leave so please bear with us. Thank you everyone for your support, this campaign had a great day yesterday, we have been averaging 100 backers per day for the past 10 days and yesterday we hit 171 so thank you for helping promote what we are doing. Hey Rocco. Regarding protecting the propellers. Zano flies itself and will avoid obstacles. I know you will be pleasantly surprised at just how easy Zano is to use and no flight training required :-) Hey ksc1333. Regarding charging, Zano can be connected to any USB power source from your laptop to smart phone charger to charge the internal battery. Yes, the charge time will be the same as this is governed by the onboard battery charger. Hey Edgar. Regarding your questions, Matthew is quite correct on both questions. Regarding delivery, our project plan is for delivery in June however we can not make promises as we are dependant on our key suppliers getting us materials on time. We are ordering all the materials in January (well before final production) to ensure we stay on track and we are very organised so we are confident about the June delivery. Hey nanobot9000. Thank you for your support and your most welcome. Hey Nicholas. Regarding noise to wake, I believe Jose has answered your question. It certainly can support that, the initial firmware probably won't but it is an easy functional add-on to release so will very likely follow very shortly after shipping. Hey Wouter. Regarding stills and videos from Zano, if you check the videos you will see some of the footage we have edited into the videos from Zano. The production Zano has a different camera to the prototype Zano so the footage we have now isn't going to do the production version justice. However, we will post some raw video shortly. Hey Barry, Hey Mark, Hey Matt. Regarding the youtube video and swarming Zano's, sure shows some possibilities of what developers will start doing with Zano if for no other reason than just because they can. Pretty awesome stuff. Someone suggested a while back about a swarming pack, so lower price per unit to encourage swarming and in a bundle of 8 or 16 Zano's. Something like this we could certainly do, maybe Universities etc would be interested. We could help get the cost down by not retail packaging them, bulk pricing discounts etc. Hey Arnel. Good post,

thank you. Hey Ken. Regarding the sharing and promoting what we are doing, thank you. After seeing yesterday almost double the last 10 days average of backers, shows that the scope is there to hit that final stretch goal. Is there a way for backers to say how they were referred? We could offer incentives to existing backers to refer a friend if there was? Anyone have thoughts on this? Hey Nicolas. Regarding flight distance from an iPhone, it depends on the version of iPhone. I found an iPhone 4 had quite a good WIFI antenna in it, in fact better range than that of an iPad mini 1. The iPhone5 isn't bad and we have had to to 30m or so. We are going to provide a compact range extender too at www.flyzano.com which will comfortably boost range to >500m. We have had control on a prototype at 2km LOS (line of sight) so >500m shouldn't be difficult to obtain in most situations. Hey mark. Regarding the camera's, great post and questions, let me answer them one at a time. Regarding camera's in general, they are quite modular and at the moment, Zano supports one camera at a time. I could update the firmware to allow the RGB display to be removed and to support natively the long wave thermal camera's as they are SPI and lower bandwidth than high pixel count visible cameras. This could be a latter functional update and would support both visible and long wave IR at the same time. That would allow swapping between them. Just remember, the single biggest issue is weight and size. Zano is tiny. Regarding near IR, that is a filter applied to the lens that makes the camera especially sensitive from 800-900nm if my memory serves me correctly, this is ideal for low light usage but not complete darkness. As the lenses are not changeable on these little camera's it would have to be a camera swap to provide this near IR capability. Your comment and wavelength specifics is very interesting, I will look more into that. In all honesty, I am not a photography expert so you may well know a great deal more about these filters and lenses than myself. I'll take your comments away if that is ok and do some research. Regarding a switchable filter, I suppose it would be. Are you aware of any smart phone, tablet camera's with that capability? We tend to use camera modules that the phone/tablet industry creates as they have proven themselves very good at making these things tiny. If your able to recommend any modules with those capabilities, I will be sure to have a good look to see if it is possible to integrate them. Regarding powering Zano from a tether, technically absolutely. The issue comes down to resistance on copper wire. If you were to run two thin copper wires with a source voltage of 3-4v to Zano to power it, the resistance would result in a voltage drop when Zano tried to fly so this wouldn't work. To get around this, you would ideally need >10v as the current can be quite high and then a high powered switch mode regulator locally to reduce that supply voltage to something Zano is happy with. So technically this is very possible and not that difficult. Specifications would be as such. Local lightweight power supply weighing no more than 10grams would need to deliver 6amp peaks and 3amp continuous current to Zano at 4v. This module would ideally switch at well over 1MHz to keep the inductor size small and reduce interference with Zano on board electronics. The source voltage to this device would ideally be 20v or higher as this would still result in a current of 1a at 20v when Zano is flying assuming 80-90%

switching efficiency. You may be able to find an off the shelf switch mode buck module (buck is a voltage dropping regulator) that would be suitable. Remember, it also has to be the same size or smaller than the Zano battery or attach to the underside of Zano. The total weight on your connecting wires, coupled with the weight of the switch mode module would need to be no more than a few grams more than the Zano battery. I know a group of electronic engineers I could recommend you contact if you wanted something like this, alternatively, we could look to build and stock something like this on www.flyzano.com if I can get enough demand for it. Thank you for your support mark. Hey Larry. Regarding the Hottest Kickstarter post, thank you for sharing that. Pretty cool and I know everyone here is chuffed. We are still stunned by the enormity of support from the community here. It has been a humbling exercise for us running this campaign and working closely with you all for the past 5 weeks. Hey Collin. Regarding Unity3D, please hassle away. My oversight for being confusing. Our SDK will support as many platforms and systems as we possibly can. Every major device, library, framework, platform will get supported. For us it is an issue about priority. I think support Unity3D is a great plus for the SDK and this will definitely happen, if we can get more software developers expressing their desire to use Zano with Unity3D graphics framework, we will definitely push the priority even higher to give the developers the support they need. Much of our business is supporting developers as they will help create the market for Zano, as such we need developers to tell us what they want from us. Does that make sense? Does it answer your question? Hey Yannick. Regarding selfie term. I know exactly what your saying. It was difficult when we started Zano to find a simple marketing way of communicating what Zano could be used for as you are 100% correct and there are thousands of uses. One of the guys here saw someone at a marathon for charity running with a selfie stick and a camera on top of that and we thought, well that doesn't look cool but running with your own robot filming you would look so much cooler if somewhat futuristic. It is for those sorts of reasons we kind of went with selfie drone, playing on the recent media about selfie drones and linking this publicity to that of people sharing pictures and videos of themselves with friends and family on social networking. You are quite right, Zano is so much more than a selfie drone but it was a starting point to get the word out. When this campaign completes, a new site will appear @ www.flyzano.com with a different angle. Kind Regards, Ivan @FlyZano

Dec 30 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone. Sorry I haven't responded earlier, I have been on the road all day and just got home just before midnight. I'm off for hopefully a goodnight sleep and I'll respond to the questions tomorrow. We have a video update this week for you before the team leaves for CES and we will also post some more videos as promised. Thank you to you all for your continued support and goodnight. Kind Regards, Ivan

“ Good morning everyone. Fantastic read this morning. The various conversations going on here. Thank you Matthew and Georg in putting my straight on the 3D printing of the propellers. I stand corrected. I think the only query here targeted at me is about dimensions. The prototype was 65mm from motor centre to motor centre. Now 65mm in imperial is 2.559 inches. The production unit will actually be 67mm motor centre to centre as we need slightly longer arms to allow some tolerance for the propeller to body distance. The propellers are a little bit close for my liking so we have added 1mm to each arm. 67mm is 2.637inches and 1mm is one 25th of an inch. The RGB display is 23mm square which is just less than an inch and the body is 14mm taller than that which makes the overall height about 37mm or 1.456inches. I usually work in microns which would really confuse everyone :-). If I missed any questions, please hassle me :-). for an answer. Have a great morning everyone. Kind Regards, Ivan @FlyZano

“ Hey Robert. Regarding 3D printing. The prototypes are all 3D printed and all the plastic parts weigh about 8-10grams including the paint. So long as parts don't weigh in at 30grams, I would suggest people should be fine. Hey Matthew. Regarding the propellers. I'm more thinking about the x/y bonding. Most ABS type printers draw an outline which is very precise but they fill in the gaps in a different matter. It's the filling in the gaps that would cause the imbalance issue. Also, our Dimension 1200ES is a pretty decent production unit but I suspect something as thin as a propeller would probably pull the layers apart with the centrifugal force at the kinds of speeds they spin. Out of interest, have you seen examples of 3D printed propellers? Honestly I don't know if it is possible, I'm just theorising based on our printer. I'll make the STL files available anyway, personally I don't know if it is possible to 3D print propellers this small to deal with the forces. Anyone have thoughts on this? Have a nice evening everyone. Kind Regards, Ivan @FlyZano

“ Good evening all, Hey everyone. Thank you for your support and I understand your comments about the technology and pricing. For us, we have priced aggressively as we aim to make Zano the de facto standard for Nano UAV's. There is a huge amount of R&D and technology in such a tiny package and your quite right, we could justify a

higher price but in all honesty, we want everyone to have one. Don't forget our core business will be in future functional updates so the more Zano's the more cool functions we can release and be a profitable business in for the long term. We also want to support developers and third parties using our technology and by pricing aggressively, we make sure third party developers have a bigger market too. Does that make sense? Hey Mark. Regarding the price of the battery. I would expect a retail price of about \$8ea. Our batteries have protection circuitry in them too to prevent over discharge of the battery. Hey Bas. Regarding the standard case, yes you can add this at the end of the campaign along with spares etc that you may want. Hey Walter. Regarding RRP of Zano when it hits the shelves, it will be £170-£180. The final price will reveal itself once we have done a decent production build as we will have a true cost per unit. Hey Frans. Regarding STL files for the propellers. Unfortunately these are something that you may be able to print but wouldn't be up to the job. Not with any printer I know of. The propellers are carefully balanced and spin between 50,000 and shy of 100,000rpm so any imperfection will cause really bad shudder. All the other parts can be 3D printed but I don't believe the props could be. If anyone is aware of a printer that would print something robust enough, please share it here as that would be super cool. Have a great evening everyone. Kind Regards Ivan @FlyZano

[Dec 29 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon all, Sorry I haven't done my usual morning responses. I'm currently travelling to the airport to drop family off. I will log on later and respond. Have a great Sunday. Kind Regards Ivan @FlyZano

[Dec 28 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Just an FYI, Wednesday the 31th December 2014, we will be making the Beta-Tester pre-registration available on www.flyzano.com. Remember, you will need to use your Kickstarter nickname and some other basic demographic information as well as email address, preferred contact method. We are still ironing out the specifics of the form but it will be simple so remember to check back here regularly and I will post the full address of the form the minute it is available. If you become a beta-tester, you get all the latest updates, news and events before anyone else. All we need you to do is download 80% of all upgrades we publish and report on 80% of the upgrades you download. You need to have pledged for a Zano so £139 and above as obviously you can't test a Zano without owning one :-)

Have a nice evening everyone. Kind Regards, Ivan @FlyZano

[Dec 28 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone. Hey Collin. Really sorry, not 100% sure but your referring to Unity3D? One of our developers is very comfortable with Unity3D so part of this remit will be SDK libraries to support this. Quite when it will be released depends on the demand. If you can get a lot of other game designers asking for it, I can bring the priority up on it. Hey Andrew. Regarding regulations, one reason we have kept Zano down to such a tiny weight is that our conversations with UK government officials has shown that below 60grams they really don't care. 60grams is just not going to hurt anyone even. We are also going to work with legislators worldwide to keep Zano legal. This is another reason we have built in so many software failsafes so Zano can restrict its altitude, distance in any direction from the operator, automated no fly zones like around Military installations, Number 10 Downing St etc. There are no guarantees, however Zano is tiny and we are making a commitment to work with legislators to keep Zano legal. Hey Doug. Regarding obstacle avoidance. The best way to see it is that Zano can sense the distance of the closest object to any face of Zano. So if Zano senses something in front and to the left, naturally it will fly to the right. If you box Zano in on the front, left and right, it will naturally try and maintain distance from each object so as you move, it will move with you. Do you remember the old computer game called Pong, the two paddles with a single ball bouncing around (now I'm showing my age), Zano is like the ball, you put something in front of any face and it can either hold or move away. Its all configurable. We have actually played Pong with a prototype to Zano. My brother and brother in law tried to box it into the corner of our warehouse. When one of them put a foot under it accidentally, it detected the foot as being closer than the ground so climbed about 600mm to compensate, it was then above them both and it flew back into the middle of the room. This was all without any human intervention. With latter improvements to the image processing engine onboard, we will be able to perform more complex movements and avoidance so if it senses an object in front, it could navigate its way through. These are all planned functional upgrades. Does that answer your question? Regarding a special case. I can see this as a cool add-on. A special outdoor Zano for those who want a hardened rescue ready Zano. I guess time will tell, if the demand is there, we will respond in kind and release a version to provide these capabilities. Hey Emmanuel. Nice to have you here and thank you for your support. Camera upgrades that are planned, OIS camera, near IR camera, long wave thermal imaging camera are all in the pipeline. Regarding external processing. We are providing free of charge our HPC (super computer) for post processing, image stabilisation, correction, filters etc. Regarding limiting speed of Zano, yes very much. Everything about Zano is configurable including ground speed, yaw speed (rotation) etc. Hey Larry. Regarding the delivery date. I think one thing that is interesting and different about Zano is that we can build the hardware before all the functions are ready. So long as Zano firmware works and provides all the basics and allows the full and latest updates to be downloaded and programmed upon powered up, we can ship Zano's in a base state and by the time people receive them, power it

up and connect for the first time, every single update can be downloaded automatically ensuring we can ship on time. We are also working with a professional manufacturer who has a project plan showing deliver in June. In our risks section, our single biggest risk is parts supply. If parts come in early, we may well end up starting the build before schedule. I am adamant that we won't be late, I have my personal pride involved in this :-) but time will tell if our suppliers deliver everything on time or before. Whatever happens, Myself and Reece will ensure backers are up to date all throughout the next 6 months on the build schedule. Even milestones as all the parts are received will be posted for everyone. It is great to have so much interest in Zano and the support to match. Thank you to you too for all your support. Regarding the OAP (old age pensioner) fall problem, I think my grandfather would have loved to launch a Zano. There are some real opportunities in tele health for Zano and its technology. I hope developers in this field get involved and make use of our SDK for such purposes. Hey Victor. Regarding shipping worldwide, anywhere we can send post, we will deliver too. Some areas I am sure will take longer but yes, we will ship to Brazil. Nice to have you here and thank you for your support. Hey Didier. Regarding swarming, everything will be in the SDK for Zano including the protocol used for both the WIFI connection, the IR connection as well as the 868 and 915MHz connections that Zano hardware natively supports. Once we release the swarming firmware, the latter two forms of communication will become active and provide endless possibilities for exactly what your suggestion. Hey Zul. Regarding the batteries, the larger the battery, the heavier Zano becomes which is one reason we are limiting the standard battery Zano ships with so we can always stay below 60grams. We will make upgraded batteries available but these will be carefully selected to provide either the same or an increase in energy density and still within the weight margins of Zano. Regarding adding at the end, whatever new add-ons we have available or will have available for June shipment will be offered to all backers after this campaign finishes in case you want to add things to your Zano. Regarding Android, yes, Zano will support iOS, Android and shortly thereafter Windows. Does that help? Hey Ken. Regarding iPad and Android. If they are both on your same Zano account then yes, they will both work. If you create two Zano accounts and register one device to each, you will encounter the lost/stolen Zano failsafe. Which you can disable if you chose but this would trigger it. I hope you are all having a nice weekend. Getting chilly here now, down to 3c which is still very mild for this time of year. Being Australian I am not complaining though as anything below 25c to me is cold. :-) Kind Regards, Ivan @FlyZano

Dec 28 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, I hope you have all had a good break and have a nice relaxing weekend ahead. Hey Nigel. Regarding May delivery, it is possible but I can't make any promises. Our plan shows delivery in June and this is reliant on suppliers

getting stock to us. If their lead times improve then we may start shipping in May. I will be keeping everyone updated on the progress of this project well after this campaign finishes. Hey Andrew. Regarding how loud is Zano. At 1m away it is about the same as typical human conversation. At 3m outdoors, you can barely hear it even if there is no wind and its perfectly quiet. Hey Larry. Almost January though :-)

Hey everyone. There are a few questions/queries about security. Really good questions and suggestions. How does this sound;

1. Each Zano will be registered to a users account as they all have unique serial numbers. If a Zano is lost, we will provide a lost/stolen link on www.flyzano.com. You can log on to your account, select one of your Zano devices and then mark it as lost/stolen. If that serial number then is attempted to be assigned or used by another Zano user, we can trigger a software failsafe and disable Zano if you select that option but also show you where your Zano was last powered up when someone else tried to register it.
2. Regarding re-flashing Zano with the safeties removed. Zano firmware is fully encrypted and is only decrypted once inside Zano. Also, once Zano is programmed for the first time in our factory, Zano can only every be reprogrammed by the Zano OS (On board Zano software) only, the Micro-controller has all the code protection settings enabled to prevent people trying to hack the OS or reprogramming it.
3. Regarding reseting Zano firmware. Only the Zano app can reset the Zano firmware and this can certainly be restricted to only allowing a Zano which is correctly registered to your account to be reset.

Hey Frans. Regarding more videos, we have these in the pipeline. With Christmas and now a weekend, we will look into this this coming week. Please bear in mind the team is also getting ready for the CES trip to Las Vegas so time is limited. We will get as much together as we can and post it for you to see. Hey Robert. Regarding your launch without handset. Its a really neat suggestion and all very possible. I will look to implement this idea along with the toss to launch automated functions that others have suggested. It certainly would make the whole process more smooth. Thank you for the suggestion. Hey Russell. Regarding the Zano's being marked for Kickstarter. Every Kickstarter Zano will have a certificate showing model, build number etc to commemorate this Kickstarter campaign. Marking the Zano's directly would substantially slow down production as the only method that would really work is laser etching and the process start to end could take minutes per unit. Consider how many Kickstarter Zano's need to be built, this would end up pushing the delivery dates backwards. Are you happy with the certificate? Hey Ben. Thank you for your support throughout this campaign, much appreciated. Hey Sheri. Zano v Parrot BEBOP. Firstly, Parrot do some brilliant work. Well done to the Parrot team. The BEBOP is 390g, Zano is 57g. Thats pretty much the thing. BEBOP is a really cool gadget, nicely built. I don't like drawing comparisons to competitors, because anything I say is going to sound bias. What I can do is highlight what Zano is;

1. Less than 60g
2. Fits in the palm of your hand
3. Loads of intelligent failsafes
4. Automatically adjusts distance and altitude limits to comply with local legislation.
5. Connects to our HPC for superb post processing.
6. Automatically links and uploads to your social networks.
7. Full obstacle avoidance designed to be flown in or out doors

8. Can fly upside down 9. Zano is only 67mm motor to motor. BEBOP is 280mm. 10. Interactive display 11. Autonomous (Flies itself, can launch, land, fly to location, return, carry out functions all without human intervention) BEBOP is cool, no two ways but it is four times the size and 5 times the weight of Zano. Regarding the tilt. We are making the camera manually tilt. However if you set an incline angle, Zano will fly the direction of the incline. So if it is following you, it will naturally tilt on the angle required to follow you. Hey Abdul. Regarding waterproof. No, it isn't water proof. Think of Zano like your smart phone. Light rain is ok but don't let it get too wet. Hey Ken. Thank you for your support. I'll ask the guys to render the standard case to show you all. Hey ksc1333. Regarding the standard case, I will ask the guys to sort this, see my message above. :-) Hey Roger. Regarding avoidance, yes Zano already has avoidance sensors on the front, back, left and right as well as top and bottom. Yes, the full long wave thermal imaging camera will be an option as well as a visible light near IR camera will be an option. Thank you for your support. Hey Collin. Regarding Unity3D, yes very much this is possible. It isn't something I personally have a great deal of experience in but some of our developers certainly do and can make the relevant libraries for Unity3D to communicate with Zano. Good question. Hey Minning. Regarding the GITD. I like Matthews idea of UV leds. I will check out the frequency of light used to charge the GITD plastic and see what I can do about incorporating additional leds not the flight frame. This way when you fly, Zano would glow. :-) Hey Simon. Regarding rescue me. Someone did mention Zano as a emergency beacon, what your suggesting is along the same lines? I really like this idea and its such a good one to build. Zano charged into the case, in event of emergency, launch Zano and SOS your way to assistance. Really cool feature. Definitely something I will look into. Thank you for your support. Have a great morning everyone. Kind Regards, Ivan @FlyZano

[Dec 27 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey everyone, I scrolled down to my last post and forgot about the questions before that. sorry. Here goes. Hey Peter. Thank you. We had a great day, really unwound and ready and raring to go now. £1m is a massive achievement and one that we are so proud to have reached. It is because of every single backer that we have got this far. Hey Bosco. Merry Christmas and thank you. Hey Jef. Regarding the HPC. Standard usage of the HPC is free of charge to all Zano owners. We will offer professional services which will be chargeable but free for all Zano users and it will always be free. A standard image depending on filters applied would take only milliseconds to possibly massive reprocessing such as reconstructive forensic resample might take a few seconds. Hey TKoh. Regarding swarming. Swarming WILL be released even if we don't hit the £2m goal, it will just take us a little longer but you will still get it within the free 12 months of upgrades. Thank you for your support too.

£1m, what a milestone. Hey Andrew. Merry Christmas and thank you. I am quietly confident about the £2m goal, still two weeks to go and the last 3 days of this campaign are the first 3 days of CES show in Las Vegas. Hey Roger. Regarding the 3D models, once we finalise the shapes for production, we will release the models on the www.flyzano.com website. Have fun! :-)

Hey Ben. Really appreciate all your support and for the acknowledgment. Thank you too for your FAQ page you put together. Have you checked the number of hits on it? Merry Christmas. Hey Stefan. Thank you, what a milestone. We are all so grateful for the support from this community. Hey Midhun. Merry Christmas and thank you for all your support over the duration of this campaign. Hey Matt. I just realised I have been wishing everyone Merry Christmas but that was yesterday so rather than retype all my Merry Christmas greetings. I'll change it here to Have a happy and healthy new year. Thank you for your support. Hey Brent. £1m is a massive milestone, thank you for your support. Have a happy and healthy new year. Hey Roger. Thank you. Have a happy and healthy new year. Hey Matthew. Thank you. Thank you for your support too. Hey Doug. 11.59pm GMT it ticked over and what a Christmas present. Santa came early. Thank you to everyone. Hey Mark. Thank you. Go Santa :-)

Hey Simon. Thank you. Have a happy and healthy new year. Hey Larry. Its now £27k passed £1m. The support is fantastic. Thank you. Hey Alwyn. Regarding obstacle avoidance, it is both proportional to the error (how much closer or further away than it should be) as well as velocity. Those two variables are filtered and fused carefully to provide a smooth avoidance response. So yes, if you fly slowly, you can get much closer. Hey adchesney. Thank you for your support. We are very proud to be British, to have all the designs done here, most of the manufacturing done here and creating jobs here. Very exciting times ahead. Thank you for your support. Hey Joerg. Have a happy and healthy new year and thank you for your support. Hey Tasio. Regarding the SDK, this will be very comprehensive as your are 100% correct, a good SDK is critical to it being adopted by the development community. Have a happy and healthy new year and thank you for your support and welcome. :-)

Hey Peter. Regarding going global, absolutely and thank you. I am pleased to have the backing of this fantastic community and together we made it happen. As you have said, everyone here is part of this and when you see Zano in the stores and on news helping rescue people etc to know this is where it all started is pretty neat. Hey Eirkur. Regarding the 3D models, as soon as we have the designs finalised, we will release the 3D models on www.flyzano.com site. Hey Peter. Individually matching numbers to Zano's would be a big logistics issue but providing a Kickstarter backer certificate to show all your Zano's are from the very first ever Zanos and to show the model type, number etc is doable. To everyone, if I have missed any questions, please prompt me. Either way, I hope you all have a happy and healthy new year, holiday, festive season and Christmas. :-)

I think I got it all covered. Kind Reards, Ivan @FlyZano

“ Good morning everyone and I hope you have all had a great Christmas (if you celebrate it, if not a great break). Surprises are still pending, so no spoilers today, sorry :-) Hey Larry. Merry Christmas to you and your family. It is now 10.12 and I was sitting reading the comments with a cup of coffee and thought it was definitely time to log on. Thank you for the nudge :-) Hey Anthony. Regarding the cold. LIPO batteries output voltage is greatly affected by the temperature. As such, it is very unwise to charge a battery to 100% in the cold then take it somewhere warmer as the voltage will climb rapidly and can damage the battery. When flying, Zano will make the batteries warm due to the rapid discharge so in the cold you should be fine when Zano is actually in the air. Regarding storage of the batteries, if your snowboarding and want to take some spare batteries with you, your best bet is to keep the spares on your person as your body heat will keep the batteries at a similar temperature to what Zano will keep them at when flying. Regarding testing in the cold, we certainly will. Does that help? Hey Tasio. Regarding the Gamepad. Good idea and absolutely. Not initially but as we are publishing a full software developers kit and no doubt, developers will build apps to use virtually every cool piece of hardware out there with Zano. It is just a matter of time. Hey Arik. Regarding waterproof. QuadH2O does look pretty cool. Not quite possible for Zano as every gram is so critical but good suggestion. Hey CanadianCoffee. Merry Christmas to you and your family. Thank you, fantastic news. It hit £1,000,040 at 11.59 Christmas Eve in the UK literally seconds before midnight. Regarding a small payload and a hook. Absolutely. We had a question about flying a small packet of crisps to a mates house across the road (Still one of my favourite questions emailed to us as it made us all chuckle), the new motors should comfortably lift a small payload. Hey Leon. Thank you and Merry Christmas. Thank you for your support and for being part of this fantastic community. Hey Will. Merry Christmas to you and your family. Hey Arnel. Thank you. Very exciting. Hey Nick. Really appreciate it Nick. We will see you in the new year. Hey Yannick. Merry Christmas to you and your family. Thank you. Hey Andrew. Merry Christmas and :-) Have a great day everyone and I'll pop back later. Kind Regards and seasons greetings. Ivan @FlyZano

[Dec 26 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Drat typo. Kind Regards Ivan

[Dec 25 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Merry Christmas everyone. Thank to you all from everyone at Torquing a Group for your incredible support and helping us meet and already exceed the £1m goal. I'll be back to answer questions tomorrow. From the entire team here, Merry Christmas and

thank you. Kin a Regards Ivan @FlyZano

Dec 25 2014 on ZANO - Autonomous . Intelligent. Swarming. Nano Drone.

“ Good afternoon everyone and Merry Christmas. Regarding flight time, we are going to release an extended flight time battery. This may push Zano over the 60g mark so beware, Zano will only allow you to use it where legislation permits. Zano will not fly if you try and use this battery in an area where it must be below 60g. However, if outdoor areas, down hill snowboard or skiing etc. This battery should be ideal. It should extend the flight time by 30-40% but as I don't yet know the final weight of the production Zano because we don't have them yet, I can't make any promises about actual flight time, just that it will improve it without too affecting the flight ability. Regarding the numbering idea, its a valid point. What does everyone think of a certificate for every limited edition model stating model, build number, the name of the person who built it and the build date? We can't etch or print the circuit board directly due to very little circuit board being free. We could use the MAC number of the WIFI module itself as the certificate number, that is unique and is bound to the specific Zano. Then every model is uniquely identifiable. How does that sound? Hey Thomas. Noted, thank you. Hey Blake. Regarding increasing volume and decreasing cost. What this allows us to do is add more functions for you all. If anyone is a distributor, retailer or wants a bulk order, they just need to contact us at hello@flyzano.com and start a discussion with Reece. He would be your best point of contact regarding larger volumes. Does that answer your question? Regarding the propellers, we will be releasing lots of different colours or do you mean a single propeller which is red, white and blue all in one? Regarding other parts, the feet certainly are changeable. The arms aren't unless coloured in the factory as these are actually circuit board. Hey JPH. Regarding the numbering, what do you think of my comment above? Does that meet your suggestion? Regarding the camera. Noted and thank you. We will find a solution, just haven't solved it completely yet. -) Hey Yannick. Regarding the cases, good question. The standard case with all the battery slots, space spare props and a general storage pouch etc is £25. The reward level that includes a Zano and a standard case is only £15 more which was a calculation error on our part but we will honour that, it was meant to be £25 more. Regarding the family pack, yes, we are pretty flexible. If you want various combination, we can certainly sort that. Hey Doug. Regarding Zano's working together. We have built in a special mesh network into ALL Zano's and though the firmware doesn't support it yet, it will do shortly after shipping even if we don't hit the final £2m stretch goal to enable swarming. This allows you to link Zano's and swarm them in whatever formation you wish, allows them to follow each other automatically etc. Does that help? Hey Roger. Regarding the GITD and pledge adjustment. Yes, if you adjust your pledge and want the GITD as well but have chosen a different pledge, we will ensure you get one. It may mean we use one of our

reserve models if we need too but at the moment with the time remaining, either way you will get a GITD if you want one. We are planning to hold onto a small % of each limited edition one ourselves for demo's but if needed, we will release these to our Kickstarter backers. We want to ensure you all get the rewards your after to say thank you for your support. Does that help? Hey P. Joey. Regarding the extra flight time, see my comment above. Does that help answer your question? Hey Doug. Regarding higher wind speed than Zano can handle. I really like that idea, I can build a new failsafe that if Zano is loosing position despite its best efforts then it lands. Thats a cool failsafe. Thank you for the suggestion. Hey Sheri. Regarding the video etc. I will get in contact with Sam, our videographer and see what raw content we have archived. I will get him to do a quick slice edit, so only stitch stuff together into a single video and we can post that. How does that sound? Hey Tuan. Regarding the glow in the dark plastic. It is a good quality plastic from a specialist supplier. I can ask for more technical details. I think Matthew suggestion UV leds to keep it charged. I will look into this too. Regarding orientation, the landing leds are all linked but can be absolutely any colour, you chose. If you want LEDS for orientation you can always turn on the RGB display, its brilliant for showing orientation. Just remember Zanos orientation doesn't matter as if you want Zano to fly forward, it will fly away from you no matter what direction it is pointing, if you want it to fly backwards, it will fly towards you, once again not matter what direction it is pointing so orientation is more about what the camera is pointing at, and has no real impact of your tasking of it. Does that make sense and help answer your question? Hey Bryon. Daryl and Matthews answers are correct. If you need additional information, please let me know. Zano is incredible capable for its size but physics gets in the way, limiting speed and flight time simply due to its size and electronic payload. Hey Creative. Regarding glow in the dark propellers. They will be available as spares for the GITD limited edition so you will be able to purchase them.

[Dec 24 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey Mandarax. Regarding adjusting the pledge and swapping rewards. You can manage your pledge and adjust it then select the new rewards. Or it may be the other way around but you can do it by managing your pledge. :-) Hey Florian. Regarding the fake site, thank you for mentioning this. Its crazy and the 4th time they have allowed these fake Zano sites. They are getting pretty quick at removing them now as I think the support we have here and the number of people who jump on it, gives them the kick to remove it. Thank you. Hey David. Regarding the videos, please see my earlier comment in this post. We will compile something and post it after Christmas. Should show what your after as some of the footage we took was in woeful weather especially at blue lagoon. That is where the guy jumped off the rock into the water, the wind was nuts. Hey Joakim. Regarding longer flight time, please see my comment at the top of

this post. Does that help answer your question? Anything else, please let me know.

Hey Doug, Hey John. Regarding FPV. Zano streams live digital video fully encrypted over the WIFI link, no need for a 5g video sender. Every Zano does, video, audio, telemetry is all live and all in the WIFI TCP stream. Zano is very definitely first person view and if you wish, you can fly it using video only from the onboard camera. The latency will be less than 100ms so pretty quick.

Hey Eirkur. Regarding the different colours. Yes, we will make various upgrades available but we are also making the 3D models available so if you or someone you know has a 3D printer, you can download the models and print your own in any colour you like.

Hey Alan. Regarding the GITD, sorry, the plastic is quite expensive and being a smaller run, the unit cost is higher. The spares for the GITD will be available and if you wish you can buy those spares and fit to your Zano. Regarding the LEDS at the end of the arms, you have full control. Any colour, red, green, blue or any combination including white if you wish. They are all linked to all arms glow the same colour. If you want orientation, the best bet is using the RGB display which is also 100% controllable by the operator. Remember, Zano is task, not flown so its orientation is only about the camera. Even if Zano is pointing towards you and you say forward, that is relative to you so Zano will move away, fly left is relative to you and Zano will always fly to your left irrespective of Zano's heading. Makes it very easy to task and control. Does that help?

Hey John. Regarding 5g, the current WIFI module is 2.4g only, our larger UAV's run 2.4g and 5g. Regarding FPV and video, you would need better than 2mbps to get decent FPV video. WIFI 802.11b has a minimum of 1mbps so you can push the range right out if you turn off the Zano distance failsafes.

Hey Ben. Regarding the red. It does look cool. The order from the survey was 44% GITD, the next one was the red. As such, red will probably be the next standard colour we release.

Hey Sheri. Regarding GITD propellers. They are the same but made with GITD plastic. Regarding the GITD plastic. The GITD properties should last years so long as they aren't bleached by huge amounts of UV. Such as being left in the sun for weeks on end in somewhere like Australia. This bleaches the plastic. Normal usage they should last years.

Regarding noise cancellation. We will work to improve noise cancellation but it is for these sorts of more complex issues we are giving all backers here 12 months of free updates. The Zano app will record audio from either the Zano or your phone or tablet so if we don't get the noise cancelling working perfectly before release, you can simply use your phone or tablet microphone and as soon as we release the update, you can use the Zano microphone. Does that help?

Regarding the standard case. I will check, I was sure we had posted a picture, if we haven't, I will get this rectified ASAP and sorry for the slip.

Regarding the ability to withstand impact. During early testing, I turned off the motors at 10m and let Zano fall. It hit a car then bounced onto a hard surface in the carpark, only damaging one propeller. The frame is FR4 fibre glass and is remarkably tough as it flexes. I am confident that unless someone steps on it or drives over it, you should feel pretty comfortable it is tough.

Hey Lei. Regarding picture quality in the dark. If you have a smart phone or tablet, the low light performance is very similar. All these small

cameras because of the small lens have similar performance. I don't have any low light footage to show you, sorry, we didn't think of capturing any when we were putting all the content together. There is footage from inside at night in the videos but nothing seriously dark. The RGB display does double as a torch or flash as well and puts out quite a bit of light. So much so that staring at the display at full brightness leaves you seeing stars. Does that help? Hey Matthew. Regarding the UV leds. I like that, leave that one with me. Have a great afternoon everyone and as always, thank you all so much for your support. That means every single backer, everyone who believes in what we are doing and how exciting this project is. It is because of the support from every single backer that this project is where it is and your support has honestly blown us away. If you celebrate Christmas, Merry Christmas. If you don't, have a great week and happy new year to all. Kind Regards, Ivan @FlyZano

[Dec 24 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey Ling. Regarding getting both black and glow in the dark limited edition Zanos. Kickstarter only allows one reward to be chosen. However, if you pledge the total for both but one shipping charge, at the end of the campaign when we send you the survey, you can tell us exactly which Zano's you want and we can ensure you get what you after. You can also at this point specify more batteries, propellers or other add-on's. Does that help?

[Dec 24 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey Thomas, if you wish to upgrade, you can modify your reward choice. Hey Jeff, Zano is expensive to make, the extra cost is representative of the true cost change to the unit mainly because it is limited edition. If we make it a mainstream model, the cost would be less as the volumes would go up. Hey Frans. Every single backer is important to us, please know that. I responded to your question in the main comments. Any questions, please let me know. Hey Mario. Thank you. It does look cool.

[Dec 24 2014](#) on #9: from the project ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone, Hey Frans. Kangaroo 1-Drone 0 :-)) Hey Lukas. Regarding the glow in the dark Zano. I'll mention to the team about a daylight rendering. Good point. Thank you. Regarding the black limited edition vs the new limited edition units, the new limited units are more expensive to make as the injection moulding run has to be cleaned and reprimed with the new material as the volume is limited, our cost per unit is substantially more. Also the glow in the dark plastic (it's not just a coating) is

quite a bit more expensive than the plastic used in white and black. The Camo Zano is going to be quite expensive for us to make, however as glow in the dark has special propellers too, the cost of both units is about the same to us. As a note for everyone, please understand that our margin on all the Zano's is basically the same, the extra cost to make them is the extra cost to buy them for you. We aren't using new limited editions to just generate revenue, we are using them to provide cool exciting Zano's for you and to boost volume. All the Zano's share the same electronics and that is a very large part of the cost of each Zano. We have to get the volumes up to get the cost down. Does that make sense? Hey John. Regarding the propellers, they would look good on other Zano's too especially flying in the dark. Hey Sheri. Regarding the noise from Zano. Zano is quite quiet when compared with other quad copters. However, we are working on noise cancelling to remove the propeller noise. Please remember Zano's will continue to evolve so as we perfect new ideas and functions such as noise cancelling, these will be released and allow your Zano to be upgraded to remove prop noise from sound recordings. Does that help? Hey Dom. Regarding glow in the dark. We are using glow in the dark plastic, it's not just a coating so it should glow well for quite some time. Hey Marshall. Regarding the limited edition black. Sorry you feel let down, it's not intended that way at all. Each of the new limited edition units are much more costly to make than the black or white Zano due to the plastics and appearance change, also the low volumes means much higher unit price. We genuinely believe in doing business fairly and we are genuinely trying to make Zano as much fun and as cool as we can. The in-app functionality updates are free to all Kickstarter backers for 12 months of registration of your Zano. If you sign up and are accepted as one of the 4000 beta testers reserved for Kickstarter backers, you will get all the latest functions, news and events well before anyone else. Does that make sense? Hey Frans. Regarding old backers, please know that every single backer is equally important to us. We also released new limited edition Zano's at the request of backers here suggesting we do something new to keep the numbers up. Zano is about getting the numbers up, more Zano electronics, the cheaper the build gets. Also, the new limited edition Zano's are a more expensive to make and therefore buy, the early bird and super early bird are crazy good value and if we had only just hit our target, we would barely break even. Zano is an expensive little gadget to make. Does that help explain things? Please let me know your thoughts. Hey Stevens, Hey Mark. Thank you. Merry Christmas :-)

Hey Midhun. Regarding the camera tilting. I have updated the Zano electronics to allow physical space for the tilting. This is something we are doing, just haven't finalised the design yet. Hey Brent. Regarding mapping. That's a cool idea and I'm sure with the information Zano is sending back, game developers could certainly implement your idea. Neat one. Hey Grant. Regarding the VR headset. That's cool. I'll get myself one. Thank you for showing up. Hey Yannick. Regarding CeBIT. If you are attending, the team will have some of the first production test batch there, let me know closer to the time and we can let you know all the details so you can visit the stand. Regarding 2.4 v 5g, Matthew is quite right. Outdoors 2.4 will penetrate trees and other

light objects much better than 5g, however in cluttered environments at the moment 5g is better but we have only really found that level of clutter to be an issue at trade shows. Have a great evening everyone. Kind Regards, Ivan @FlyZano

Dec 24 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, Regarding the photos, the first photo is actually modified, the second is as it came off the iPhone5. The first photo was an 8mp photo that we down sampled to 4mp using a standard resampling filter. The effect is almost identical to taking a 4mp photo as the pixels to be removed are averaged against corresponding pixels. Much the same as sampling with less pixels to begin with. We then used a similar resampling filter to take the photo back to 8mp. The result was that most people actually preferred the first picture which was a 4mp picture scaled to be an 8mp picture. No contrast, hue, exposure or edge detection filters were applied, just a good old fashioned resize. I think this shows that more megapixels doesn't always mean a better picture. The lens is paramount. If I had done this same process with a 24mp DSLR with a rated lens. You could easily see the difference but with a tiny smart phone camera, the lens simply isn't up to the job irrespective of the resolution of the sensor itself. So the 5mp camera in the Zano, can easily with software output a 10mp or even a 20mp photo that to anyone but a trained photo forensic specialist would struggle to tell wasn't a genuine 20mp photo. Hey eMtec. Regarding the testing, thank you but I haven't seen it, can you connect with me on linked in? Hey Doug. Regarding the photos. Interesting isn't it? I love a good old challenge :-). Regarding the £1m, thank you for your support. It is looking good to hit that goal within days as you say. Christmas day would be brilliant. Regarding your search and rescue idea. Very solid suggestion and one that we also see Zano and our technology could be extremely useful in. Really good questions. Regarding drifting sideways and sensor protection. The obstacle avoidance sensors project from every axis on both faces. So forward, backward, left, right, up and down. The only dead areas are diagonals from the propellers at about 400mm. Beyond that pretty much every direction is covered. So regarding drifting in a small space, lets say an air-conditioning duct or a narrow hallway, you would have virtually 100% protection as Zano would use the obstacle avoidance to help hold relative position to objects on all faces and yes, it would compensate for drift to hold that relative distance. Regarding moving through a small gap. The only real issue with gap size is the turbulence from the propellers. I would think anything down to 300mm (1ft) Zano could fly through without issue. You can also tune the avoidance systems to allow a smaller gap. We will be doing a series of live demonstrations throughout 2015 but in all honesty, our sole focus at the moment is getting all your Zano's built. As much as we would love to just show everyone how cool Zano, we have so many requests for demonstrations, being a small team, we don't want to get spread too thinly. Our commitment is firstly to our backers here and

Zano will happen on time, that is our focus and goal. Regarding CES, we had planned to have a full flight cage at CES and to show case everything Zano can do, the issue was time. Being a UK based company, we would have to have built the stand, finished all our testing and co-ordination of the demonstrations then packed the stand away and sea freighted it to get to CES. With all the customs processes and shipping delays, we would have to have shipped no later than late October to allow for delays. We just couldn't get the stand built, everything tested and signed off, packed and shipped in time. Also our insurance company didn't make things easy. We do have a cool stand at CES with exploded views of Zano, real versions of Zano there etc. With the limited time we had, its not ideally what we planned but it should be pretty good. We are planning our full flight cage for CEBiT though. Hey Mark. Regarding multiple views from Zano. At the moment, Zano supports a single user of the video and telemetry, however using the SDK we have built an entirely web based user interface for one of our UAV's that allows hundreds of people to view what is happening. Doing something like this would certainly allow exactly what you are suggesting. Hey Peter. Thank you for your support. Hey Holger. Noted :-)

Hey Jiri. Regarding propellers. Zano has obstacle avoidance so the chances of you hitting anything are extremely rare. They propellers will be sold on www.flyzano.com and be very reasonably priced. You can find other propellers from other small UAV's that may fit, the issue is they may affect the flight control as Zano is tuned for the motor/propeller combination it is designed for. Regarding a broken propeller. Have you had a chance to watch all the videos? Zano can reverse motors so in the event of a propeller failure. Zano will naturally try and land and can do so in a moderately controlled manner with three motors. Regarding the flight controller itself. We have designed a ZanoTech flight controller which allows a UAV of any size to be built with all of Zano's cool functions. If you check out www.torquingroup.com you will see three other UAV's. They share a common heritage with Zano, that is our flight controller. Its a pretty cool piece of tech if I do say so myself and your quite right, assuming another copter could interface to it, you could build some pretty cool stuff. Hey Bosco. Regarding the range extender, the key is really the antenna. Increasing output power only helps send data one direction. If you have something as small as Zano, output power is always limited as is the antenna. So to compensate, a good tuned phased array antenna pointed in the direction of Zano will pick up tiny signals and make them usable. Yes, the TX power from Zano stays the same, the range extender with the proper antenna becomes exceptionally sensitive and increases its output power by using the antenna. With a good PA and LNA (power amp and low noise amp, tx and rx) on the range extender, the range is limited only by latency as WIFI has latency checks and if acknowledgement doesn't occur within a certain time, a packet is considered lost and resent. You can also adjust the hardware in a good WIFI stack to allow longer latency which really deals with the distance and speed of light restraints. Doing so you can extend WIFI to over 40km without major issues. Much beyond that, curvature of the earth starts to play an issue along with other interface properties. Does that help? Hey

Kaimis. Regarding FPV. Zano streams live footage to your phone or tablet so you very much have FPV. I am looking forward to developers getting hold of various VR headsets etc and interfacing them to Zano so a tilt of your head and Zano follows. That would be so much fun. Regarding a Zano 2. We may well do. Once developers get hold of it and customers and developers send us feedback, letting us know what they want and need, we will continue to update our designs. The best thing is we can release physical upgrades so your core Zano stays up to date. Thank you for your support, it is a cool little drone. Hey Ken. Your most welcome. Hey John. Regarding the flat panel antenna, using something like that, you can remove it from its case and you have a PCB phase array antenna ready to be put into a new box. We used something very similar to that but from an OEM. Regarding the models and makes, I was looking for this yesterday for a client. Once I find in my archive all the details, I will post it on here. There is some really good commercial grade MIMO WIFI gear that doesn't cost the earth and provides brilliant features. Hey Eirkur. Regarding the range extender. Your quite right, any WIFI range extender will work. Just depends on robustness outdoors and what range your after. Hey Yannick. Regarding the pledges and batteries. Sorry for the misunderstanding. Thank you for your support though. Hey Vince. Noted, :-)

Have a great morning everyone and stay safe. Kind Regards, Ivan @FlyZano

Dec 23 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone. Regarding authentication, Zano as it uses standard 802.11b/g/n WIFI, the first time you log on you can set a WPA2 code so anyone wanting to use your Zano would need to know this. Basically the same security you have on good WIFI networks. The app will also register the serial number of the Zano against your account. If it is registered against someone else's account and the phone has signal and is able to check against our server, we could as Bosco is suggesting, notify the owner. I'm not 100% sure as to the logistics. Reassigning Zano's, letting mates use your Zano etc but the idea has some serious merit and something I will continue to look into. Hey Yannick. Regarding the batteries, Ben is 100% correct. If you have any other questions, please feel free to ask. Hey Bosco. Regarding the ideas. Yes, we are working on the forum and wiki ideas at the moment. Once these are up and moderators are in place. sorting and organising these ideas and letting them grow organically is the next step. Regarding authentication and notifying the owner if someone else tries to access it. That is an interesting idea, I'm not 100% sure of the logistics of the idea yet as per my comment above but I will continue to grow the idea. Leave that one with me. Hey Creative. Regarding the video. Thank you. I'll raise this with the team. Thank you for your support too. Hey John. Regarding the helium balloon. I like the idea. Free fall would be very power economical and you would only need to engage the motors fully probably at 10m above ground level to stop the

descent and then fly to base. Hey Andreas. Travel safely and I'll personally put your details into the registration form. Hey Grant. Regarding the range extender. It was a netgear hub running of 12v (small 12v SLA) and an OEM phased array antenna. The test hardware took about 30 minutes to assemble. Have a great evening everyone. Kind Regards, Ivan @FlyZano

Dec 23 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, Hey Jose. Regarding the microphone, yes, absolutely you can. The microphone is exceptionally sensitive and we could add into the firmware a wake on predefined volume. We could also release a firmware function to on wake, perform certain actions like launch, hold for 30 seconds then land or whatever you chose really. Neat idea. It is very cool, the £1m is within grasp now. Hey Doug. Regarding extending range, firstly you would have to disable Zano's range fail safes (not difficult) then by using a small battery powered WIFI hub with a phase array antenna, you could easily control Zano well past the 500m range. We have tasks our prototypes at 2km without issue, still better than 76% signal strength. Regarding image quality. As everything will be recorded locally on the SD card, the WIFI signal is not so critical however you should still be receiving 480p or better at 30fps on your phone. Alternatively, if your question is about camera's ability to show a person at 50m (I may have misread your question), at 1080p and with the ability to digitally zoom, you should have fairly good picture. Does that help? Hey CanadianCoffee. Regarding coffee, is Canada good for coffee? We like coffee in this office. Our graphic artist is a bit of a caffeine fanatic. :-) Thank you for your support and its always great to hear from people who are as inspired and excited by this project as we all are. Regarding loss of signal then coming back into range. This is a really good question. At the moment, when a Zano fail safe kicks in, it executes until Zano is safely landed. I did this in case of loss of signal or very patchy signal, Zano may get a signal then it gets dropped then back again and rather than Zano bouncing around, I wanted Zano to be safe and sensible so in the event of loss of signal, Zano carries out the failsafe and behaves in a known and predictable way. This predictable behaviour also helps with certification and legislation as one of the biggest issues with UAV safety is that untrained pilots are not predictable and the UAV's may behave in unpredictable way if someone loses control. Your question is very valid, in answer to it, at the moment for safety reasons, once a Zano failsafe engages it will execute. Now you could change the configuration of the failsafe to simply return to you but not land. In which case if it loses signal, it will come back to where you are then you have control again. Does that help? Hey Mark. Regarding Zano acting as a range extended. Yes, it could. If you configure one Zano to connect to the WIFI hotspot of another Zano and then connect your phone or tablet to the same Zano, you will have a flying range extended or you can land the range extending Zano and then you have a range extender landed and

waiting for command. In this mode, you could access or control either Zano through the app. Does that help? Hey Arnel. Regarding beta testers. Matthews answer is absolutely spot on. Sorry, no additional Zano but you do get early access to all the latest functions, latest news and latest events. Hey T Kap, Hey Carlson. Regarding your questions about WIFI and range. Matthew and Bosco are correct. If you need additional information, please let me know. Hey Larry, Hey Doug. Thank you and really nice to hear. We quite deliberately chose nano platforms and have continued over the last 4 years to build functionality into smaller and smaller devices and as such have set ourselves apart from the rest of the industry. Bigger UAV's in all honestly are so much easier, you have more room to work, a gram here or there doesn't matter and sourcing parts is much simpler. Also, there are some exceptional UAV's out there in the larger sizes but we found nothing really existed in the sub 60 gram mark that I would consider as anything other than an RC toy. Now there is nothing wrong with RC toys, I love toys myself but piloting some of these tiny UAV's is hard work especially for someone who hasn't had experience. We wanted to make something tiny that required no skill to use and would just be a great deal of fun, capture the moments that matter and become part of your life just like smart phones have become. Thank you to you both for your ongoing support throughout this campaign. Hey Creative. Regarding a video, just to clarify, are you thinking a bit like our Kickstarter campaign video but focusing on the new aspects and not selfies? Hey Simon. Regarding beta testers. No worries, if I forget just remind me but I will add you to the beta tester process. You won't miss out. Hey Joseph. Regarding the camera tilting. Yes very much. As part of the production revision work I am doing, I have relocated the front and top obstacle avoidance specially to allow space for a small tilting mechanism for the camera. We haven't finalised the design for the mechanism but we now have space for it. It was quite a squeeze and ever so slightly changed the shape of the top board. Hey Guiseppe. Regarding the SDK. You can create whatever you like so long as it is within the terms of the SDK and developer forum. We want developers to have fun and be as creative as they can be, push the limits. We will also make developer bundles available of Zano's. Cut down on the retail parts but focusing on what developers want. We are right behind the developer community so yes, please have fun. Hey Andreas. Regarding your email. I have seen it. Are you on Linked in? Can you connect with me there and send me a message. That will come directly to me and no risk of it being lost as a few people handle the hello@flyzano.com account due to the volume of emails. Hey Jean-Stefane. Regarding the SD card buffering, the best solution is as Matthew says, a really good SD card. Zano has very limited memory simply due to space when compared with burst mode on a 5mp camera and the data that generates. Our best option is a good SD card that can handle whatever Zano can push out. Thank you for your support and glad your excited. June isn't as far away as it may seem now, it will be here and your Zano will arrive before you know it :-). Have a great morning everyone. Thank you for your continued support, enthusiasm and passion about this project. We are now £60k away from the £1m stretch goal and the

worldwide publicity we are getting is thanks to you, our backers. The sharing, the tweeting and the general excitement about this project is what is causing the buzz. Please keep it up, we have 17 days to go and I am still quietly confident the £2m is within grasp. That means more features much sooner for you all. Remember, this project is all about volumes. The higher the volume, the lower the cost of manufacture, means the more people and resources we can pour into Zano and build newer and cooler features even faster for you. It is that simple. I'm not sure how many of you are off for the holiday's but travel safely and have fun. I'll be back later, can't keep me away :-)

Kind Regards, Ivan @FlyZano

Dec 22 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon all, Hey Marc. Regarding return to base, yes on loss of signal or low battery, Zano can be configured to return to home, hold position, land or travel to a configurable home location. Regarding your toss launch idea, yes, good point. The Zano app allows your default launch altitude so the toss launch would use this configuration to set its altitude and position. Would that do what your after? Hey Matthew. Regarding the dual camera. I need to get a SEEK camera and have a play. If it is as easy to interface too as the LEPTON then we will definitely look into adding this as an option both on its own and as a dual camera option. Regarding burst mode. Good point. I believe it would. If we are pulling 90+ MB a second from the camera, a u3 card can handle this. Hey Doug Conran. I received your email but the reply too address was rejected when I responded to you. Can you try again please. Hey Dom. Regarding early access to Zano's. Sorry, Beta testers have to wait until their Zano is shipped too. Hey Larry. Thank you for your comments. The groups feedback has been fantastic and very much part of the Zano project. Hey Marc. Regarding signal strength and distance. Zano app will show on screen it's distance from the operator. We may indeed include signal strength. The issue is that signal quality is very different to signal strength but we can look to add something to do what your suggesting. Does that help? Hey Peter. Regarding the SD card, so long as it is a MicroSD, absolutely. Regarding beta testers. I'll put a sign up form on www.flyzano.com this coming week and will post it in an update so you can register. Hey Mandarax. Regarding the beta tester sign up. Will you be able to sign up next week? I'm posting the sign up page this coming week. Hey Jose. Regarding SD card, before release I will test it with everything up to 128gb card. Sorry about not responding to the email, I haven't seen it myself and I know Reece has been away so some of the emails may not have been read. Have a great afternoon. Kind Regards, Ivan @FlyZano

Dec 21 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, Hey Jose. Regarding shake to wake up. It is a good question. I am looking to use the IR sensors to detect if it is still in the case, if so, it won't wake. Thank you for your support and its very cool. Nearly £1m, that is massive. Hey Georg. Regarding the laws, thats very interesting. So Zano is classified as a toy in Austria according to legislation. It is interesting that they have set 250gram, even our larger UAV's fit under that category. :-) Great news. Hey Matthew. Regarding the pictures. One is a raw image and one is post processed. :-) Hey Alan. Regarding the pictures. I'll give you a hint. One picture is a 4 megapixel image and the other is an 8 megapixel image. One has been digitally rescaled to 8 megapixel and what is interesting is unless you look at the pictures almost from a digital forensics point of view, they are virtually indistinguishable. The rescaling used was a very simple process, not even a proper reconstructive rescale like the one we can implement on the HPC in which case I doubt anyone without serious forensic examination would distinguish the difference. Interesting isn't it? Hey Pablo. Regarding the firmware being open source. Sorry but no, Torquing Group has spent years developing our firmware and that is our single biggest piece of IP. Our firmware is what other UAV manufacturers have struggled to do hence we can build something as small and as capable as Zano yet others have struggled. It isn't just the electronics, the firmware is the brains that make Zano possible. Hey Roger. Regarding snap on body parts. yes you certainly could. The difference with snap on body parts when compared with the limited edition models is that limited edition models also have the PCB's coloured to match. We will be making all kinds of cool add-ons, tops, bottoms etc available on www.flyzano.com. Anyone who signs up as a beta-tester or developer will get discounts too and as we have reserved 4000 places on the beta tester network for Kickstarter backers, its an extremely good chance for our backers to get involved at that level if they wish. How does that sound? Hey Mark. Regarding the typo. I noticed that one too, unfortunately Kickstarter won't allow any changes to the reward descriptions. Each time I scroll down the page I see it and I mutter to myself :-) Thank you for raising though. Hey Abulkhair. Regarding the 4 carry cases. Absolutely. At the end of the campaign when we send out the survey, you can add whatever add-ons we have available including the standard carry cases. Hey BrewStorm. Regarding the Kickstarter issue. I can see the original pledge back in November. If you raise this at the end of the campaign on the survey, I will personally see to your original reward being honoured. If you have subsequently chosen a different reward, we could refund the difference of you could use the difference for add-ons that will be available when we ship in June. Totally your choice. How does that sound? Hey Brent. Regarding the camera settings. Yes, every setting the camera supports will be configurable and saveable in Zano. So you will be able to configure the camera white balance, saturation, exposure etc to however you like then these can be saved in Zano so each time it powers up, the settings will be reloaded. Hey Matthew, Hey Andreas. Regarding the two camera discussion. We will be doing a module that includes a long

wave thermal camera and visible light camera on a single board that is a replacement for the Zano camera with built in DSP and configurable blending of the images so rather than just averaging or blending, it is selective and picks out the points of contrast from each image then combines the results. Hey Roger. Regarding changing from one limited edition to say the glow in the dark. The glow in the dark will also be limited edition with a special case, alien green or similar. So if you change to the glow in the dark if that is what we do, its still limited edition. Regarding being a beta tester, no skills required. We want a broad spectrum of Zano users to be involved. The broader the range the better the results will be from our beta-tester network. So long as you meet the requirements of downloading at least 80% of updates and report on at least 80% of the updates you download, that is all we ask. Hey Brent. Regarding a burst mode. Absolutely. The camera can do 15 fps at full resolution, the SD card will struggle with this but I suspect we can do 5-6 fps at 5mp. I think they are both great ideas and I will ensure that core functionality to support these is built into the firmware to make the updates later easier to do. Hey Larry. Regarding Facebook users. Thank you for this. I have forwarded your suggestion to the guys handling Facebook, twitter etc. Very good point. Not really knowing a great deal about Facebook myself, where the posts buried inside other comments? So when we post a comment or site or article, people commented inside these? Hey Matthew, Hey Andreas. Regarding the Seek camera. I have already looked into this. I will design an adapter for this camera much like the LEPTON camera adapter that we already designed. Thank you for mentioning the SEEK camera. Hey Matt, Hey John. Regarding a change in marketing strategy. Really good point and thank you for mentioning this. I agree, for me, my Zano will hardly take any photos of me. It will be more used to take photos at Go-Karting of my kids racing the track or of fantastic old buildings and scenery. I will mention your suggestions and see what we can do. Regarding image stabilisation, yes, it crops. However it is configurable. The more stabilised you want it, the more it crops. The wide angle lens allows the same video resolution as 1080p is only 2 million pixels from the 5million the camera handles. I will look up the specifics of the lens and post them here. The fish eye lens effect will be removed through post processing if we go with a fish eye lens. Hey Angus. Regarding testers, no, not just UK, worldwide. The better the spread of testers and the broader the range of age, technical proficiency, experience etc, the better our tester network will be. Hey Doug. Regarding updates to Zano, good point and here goes. 1. MicroSD card will be included and firmware to use this. 2. Toss the launch. 3. Charging pads on arms. 4. Camera upgrade modules will be available as we make them and available through www.flyzano.com 5. RGB display will act as display, icons, animations, pictures etc but also display battery status when powered up, act as a torch, flash, act as a beacon, display QR codes of sorts, work as SOS, support display of lives left for dog fighting Zano's etc etc. Total flexibility. 6. Ability to fly upside down and flip 7. We are looking into case as a landing pad/launching pad option for later add on. 8. We are looking into charging Zano whilst in the case without need to connect cable. 9. We are looking into solar booster for

case 10. we are looking into all manner of panoramic and inverse panoramic pictures.
11. All manner of firmware updates to support beacon mode, toss to launch and carry out auto photos without use of phone, plus many many more. There is more changes but some mainly for developers but the above are the major ones. Does that help?
Hey Guiseppe. Regarding face detection. This is something we will look to include as part of the tracking targets using the camera. As we enhance and refine these functions, we will continue to release updates for you all. Have a great morning everyone. Kind Regards, Ivan @FlyZano

Dec 21 2014 on ZANO - Autonomous . Intelligent. Swarming. Nano Drone.

“ Hey everyone and good afternoon. Just wanted to say thank you, 5000 backers is a massive achievement and all we can say is thank you to each and every one of you. We have also passed £900,000 so our next stretch goal is just around the corner. We will be opening up the registration for Kickstarter beta-testers this coming week too, please note you must be a backer of a Zano so £139 or above to apply to be a beta-tester. We need 5,000 beta testers in total and as promised 80% of these are reserved for our Kickstarter backers. We will run the registration for Kickstarter backers until the end of this campaign, at which point any remaining places will be made available to other Zano users once the Kickstarter Zano's have shipped. So be prepared and be ready to register. Remember, Beta testers get all the updates free of charge for so long as they are a registered beta-tester. Once you apply and this campaign finishes, we will send out the relevant information about being a beta-tester. Nothing too complex but you need to download 80% of all updates we release and then report back to us on 80% of the updates you download to stay a beta-tester. Can I ask that everyone keeps spreading the word, sharing and liking the posts. Find the articles being written and share those too. Remember this campaign is all about volumes. The more Zano's we make, the cheaper they are to make and the more cool functions we can build for you all and release much much sooner. Hey Andreas. Regarding 5000 backers, thank you, absolutely amazing and we still have 19 days left of the campaign. We have some new promotions coming up including the activity at CES so the final stretch goal is still within reach. Hey Bosco. Regarding your idea, thats really cool. I'll look into it. Hey Doug. Thank you for your support, I am still quietly confident about the final goal. :-) Hey John. Regarding the change in marketing, it is a very good point. I'll have a chat with the guys and see what we can do, be a good change for the CES stand too. Hey Joakim. Regarding the follow and circle mode. Absolutely possible and certainly something I will look to get included in the Zano app. Great idea. Thank you for your support. Hey Simon, Hey Grant. Regarding the RGB display, I'll put together some icons for the RGB display before the end of this campaign and post a short video of what it might look like. Sound good? Hey everyone, regarding the photos. I will tell you all on monday what is different and how this relates to the discussion about

megapixels and picture quality. It really is most interesting. Please keep the thoughts coming on this one. Regarding the toss launch. Great ideas and variations. Keep the ideas coming as we will build in as many as we can. Have a great afternoon everyone. Kind Regards, Ivan @FlyZano

Dec 20 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, Hey Grant. Regarding the RGB display and battery level. I could add to the wake up function that it shows battery level on the RGB display as a little battery with bars. How does that sound? Hey Simon. Regarding the led indication. It is a good point. At the moment, Zano will sit a blip the landings lights blue if battery is good, red if the battery is flat and this will stop Zano from waking until recharged. If the battery is fully charged such as Zano is connected to the ZanoFuel the landing lights will blip green. If you take Zano out of the case or pick it up and give it a quick shake, Zano will hold the landing lights green for 1 second before flashing red as it acquires Satellite. Once the first green for 1 second flash happens, Zano is awake and could be thrown but is lacking a GPS lock. If the landing lights are flashing blue this means Zano has a basic GPS lock and could locate and holds its position within a couple of metres. If Zano is flashing green before thrown, Zano has a full GPS lock and would locate itself within 1metre outdoors. So expanding on your suggestion, if you pick up Zano and give it a shake, the lights would go green to say I'm awake, then a quick flash red, quick flash blue then once they are flashing green you could give it a toss. I have had this process take 2 seconds when the GPS can do a hot lock. How does that sound? Hey Grant. Regarding the thrown and pano shot. Its quite doable, I like the idea. Hey Brent. Nice to have you here and thank you for your support. Regarding range, this is mainly limited by your phone or tablet and by legislation. A typical smart phone will allow a maximum of 30m. Regarding maximum FPS. If you want slow motion video, you can drop the resolution of video to increase the frame rate. Much the same process as all cameras. Regarding photos every x distance. Yes you certainly can. Zano supports over 500 compound waypoints so you could program in a flight path and configure an action at every waypoint such as take photo, land, hold position etc. I have no doubt that third party developers will build all manner of cool apps making use of Zano's GPS capabilities. Regarding swarming. The compound waypoints allow you to set a point of interest as well so even if Zano's get blown off course, they will keep their camera facing the POI. Does that help with your queries? Hey Dom. The FLIR camera fitting is a simple matter of unclipping the top and bottom, removing the existing camera, fitting the new camera and re-fitting the top and bottom. Honestly that simple, no tools required. Hey Larry. Regarding the photo location. Your spot on, the photo was taken out the back of the office. Interesting about how much you have to zoom in to see any real difference isn't it. You wondering what the difference is? Hey David. Regarding the photo. Yes, both photos are taken

from the same iPhones. Hey Matthew. Regarding the photo. Very interesting isn't it, it requires a great deal of careful examination to really see any difference. Regarding MJPEG as a compression standard, the MJPEG is a motion JPEG format and typically does have a JPEG preprocessor running to compress the changes. I often use MJPEG as the cameras have a JPEG compression engine on board and MJPEG is a very good standard but still uses the JPEG pre-processor. The other advantage to MJPEG is you can jump to anywhere in the file and display a frame where as other formats require you decompress quite a bit before hand to build the frame you want to see so MJPEG has lots of advantages. Hey Dom. Noted. :-) Have you voted? Hey Tan. Regarding the colour. When we release the next limited edition colour, you can amend your pledge to this one if that suits you. Hey Robert. Regarding the FLIR camera, due to the price of the camera and the adaptor it will have to be released as an add-on. I suspect this will be ready by the time Zano's ship in June but no promises. I can keep you posted on this if you like. Hey Sheri. Regarding the cost. Did Will's response answer your question? Hey Lee. Regarding the pictures. The first picture has indeed been modified and yes I am demonstrating that more megapixels doesn't always mean a better picture. Can you tell what we have done to the first picture? Hey Leon. If you zoom right in, to say >1000% and focus on one small part of the picture such as a branch on both images, can you see a slight difference in contrast, colour, pixels? Hey Chris. Regarding your suggestion. That is a good idea. I'll take that away and chat with the team about it. Hey Doug. Regarding the choices. Fair point. We can make different shells available as soon as we are able too. Hey Sheri. Regarding the shells. I think your question has been answered? Hey Matthew. Regarding the toss launch. Really neat functionality. I think it is voted on now, I'll enable that function with an opt-in capability. Hey Ken. Thank you for your support. Regarding free flight mode. Zano still has all its smarts enabled so free flight mode is very easy. Like playing a computer game, forward backward, left and right and it avoids hitting objects. Does that help? Hey Paul. Regarding windows phones. We are doing the app development to include Windows phones very shortly after Android. Windows phone users won't be left out, that's a promise. Hey Peter. Regarding toss launch. Noted, I think the opt-in is a good idea. I'll reenable the function and make it an opt-in so you have to turn it on through the app and that will configure Zano to allow the functionality. Hey Ben. Regarding toss launch. I agree. I will enable it in the firmware but leave it disabled by configuration and allow users to turn this on through the Zano app. Have a great morning everyone. Kind Regards, Ivan @FlyZano

[Dec 20 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening all, Hey Doug. Regarding the frosted clear. As the injection mould itself will be finished to provide a matt finish for the black and white Zano's, any other colour we do will be Matt as well. So by injecting a clear plastic it will be matt clear or frosted

it that makes sense. You will be able to make out the circuit boards etc but some of the detail may be obscured but it will allow the WIFI signal leds and light leakage from the RGB display to really show through and illuminate the case. If you pick a flickering yellow display for the RGB display, the whole case would flicker with it. Just like fireflies. :-) Hey Larry. Regarding the pictures. If you are able to zoom on one part of the image on both images and compare them. There are some subtle differences but very hard to spot. Hey Ben, Hey Peter, Hey Phil. Regarding the toss launch. It is a great idea and one we tossed (no pun) around when we first conceived Zano but came to a problem. What would happen if someone forgot to put the battery in (Yes Zano will keep itself powered) or if the battery is flat. Your Zano would spin like a frisbie then have a not so pleasant landing. Imagine if you threw it off a balcony then as that very moment you let go you remember 'Oh drat, I forgot to charge it' We can certainly enable the function and it would be super cool, If you all want it, I will enable the feature. :-) Hey Phil. Regarding match making. Imagine using the RGB display and show a little red heart if you like someone or a cross if you don't. The mind boggles. Regarding GPS data from the phone. This is a good idea, it is a mode the GPS module supports called assisted GPS where when it is powered up, Satellite data is downloaded into the device to assist its speed of satellite acquisition. Certainly is something we will look to build into the Zano APP and into the SDK. Hey Augusto. Regarding the renderings. We put up a Zano Red in update 7 so everyone could see what we had in mind. It does take a little bit of time to update the models to re-render the different options but it is a good point, hard to imagine what it might look like without the renderings. I will forward this comment to the team and see what we can do. Hey Matthew. Regarding the big stretch goal. Good point. We have a few surprises up our sleeve yet, I am also upgrading some of the sensors to the latest releases just because of better SNR performance. Hey everyone else. Regarding the photos, the results are very interesting. I won't tell you exactly how or what I am demonstrating here but please keep the comments coming. I'll wait until next week and reveal what the difference is. Have a good evening everyone. Kind Regards, Ivan @FlyZano

Dec 20 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon everyone, Sorry I wasn't on here this morning, I was tied up all morning in meetings. Regarding the camera conversations. Can I ask those of you who are interested, read the following;
<http://www.cambridgeincolour.com/tutorials/diffraction-photography.htm>
<http://snapsort.com/learn/sensor/true-resolution> http://www.northlight-images.co.uk/article_pages/guest/physical_limits.html The result of the above is that cameras this small and those in smart phones and tablets are refraction limited. You may have a 23mp camera but the actual effect of analysing the pixels will have 3 or 4

corresponding pixels will have effectively the same data because the width of wavelengths coming through the lens, the relatively poor quality of tiny lenses vs full size SLR. If you look at quality SLR lenses, they have a megapixel rating, this is because of imperfections in the lenses themselves, aberrations due to manufacturing do limit the true megapixel rating of images. I have a challenge for you, below is a link to two photos. Can you tell me which photo is better? This is really important, photo 1 or photo 2? <https://www.dropbox.com/sh/yr6lb3jghw4llh1/AABWneP-l4rTQFY-EdJdbQaMa?dl=0> Regarding the OV5640 5MP camera, I am looking into what options we can offer and what camera will be used on the production unit. The primary aspect considering lens size is not so much the actual megapixels but the frame rate. Please note the OV5670 is still a 5MP camera but can do QuadHD at 30fps and 1080p at 60fps as 5MP is still a lot more pixels than 1080p. Regarding photos, small lenses do reach a physical limit as they reduce the sensors ability to capture true pixels. However, we are going to be offering a number of camera upgrade options on www.flyzano.com after Zano's have shipped as we develop the various camera modules. Hey Andreas. Thank you for your comment and support. As you have said, it is a difficult juggling act as Zano really is very very small and resources onboard are limited, battery, weight, space for specialist processing chips etc. Hey Guiseppe. Thank you for your comment and noted about new cameras. This is very much the plan. Hey Leon. Thank you for your comment. Hey Peter. Thank you for answering the question William had. You are absolutely correct. Hey William. Regarding housings, colours, propellers, spare parts. These will all be available on www.flyzano.com once your Zano's have shipped. Glad your onboard and thank you for your support. Hey Doug. Regarding the number of Zano's. I think your right, thank you. It is great because volumes go up, price to make each unit comes down and we can put more goodies in the firmware and software. Hey Matthew. Thank you for your comment, your quite correct. We will put the best camera we can in for the cost restrictions, power restrictions, processing restrictions as well as supply restrictions. Hey Lee. Thank you for your comment. Much appreciated. Hey Thomas. Regarding charging the spare battery. Its a funny one as we originally launched this campaign without a spare battery, just the battery that was in Zano and using the onboard charger. The spare battery was something everyone asked for so we added it to all pledges £139 and above. We are looking into a small charger than connects to the ZanoFuel for charging the spare battery as your comment is very valid. Thank you. Hey Peter. Thank you for your comment and support. I think the quality of video and photo content from the production Zano will pleasantly surprise most if not all the sceptics. :-)

Hey Arnel. Regarding the 5MP camera. Good point about compression. One thing often forgotten is that video formats are all lossy, in that they remove colour definition and pixel count. So a 4k compressed video stream will not actually contain the same level of information as raw frames from a 1080p video stream. It is like JPG, they are very lossy but they compress in a way that the human eye doesn't notice the loss of real definition a great deal. Did anyone see the audio project on Kickstarter about

lossless audio playback? The Sono I think it was. By removing compression from all the audio files they ended up with huge files but the quality was superb. Hey Doug, Hey David, Hey John, Hey Dom. Thank you for your comments about the camera. It is remarkable how contentious this topic is. Good debate going on though, to me this shows a healthy and active community. I like people challenging me and my team, it makes us work harder to be better and to provide an even better product. Hey Simon. Regarding the HPC, you are quite correct. The raw footage will be quite good but post processing will provide a leap in quality of stability, colour correction etc. Any number of filters can be applied when the HPC re-renders your video. Regarding improvements over time, absolutely. This is very important to us. We have worked to provide an exceptional hardware platform that won't become obsolete in a year or two. We will continue to provide functionality updates through software for those who want them, free bug fixes and legal updates and we will be providing a range of cool physical add-ons through www.flyzano.com. Also working with people like Matthew to provide chargers etc from third parties to you all to help grow the community but also to help developers promote their products directly to the Zano user base. Hey Jim. Regarding video of Zano flying. There are some in the kickstarter footage. We have more raw footage and I will be posting some of those too. The issue is that the prototype and the production Zano are going to be very different as the production Zano has some very substantial upgrades, better motors, tiny changes to the frame, better weight distribution etc so will be even more stable and capable than the prototype. I will continue to post updates on here well after this campaign finishes and we are expecting the production Zano test batch back to us in mid to late January. At which point the minute it is tested and working, loads of videos will be posted. These will be raw and unedited documentary style videos of Zano flying, the video and photographs from Zano etc. As much raw information as we can reasonably post with our affecting the project timeline (Everything takes human resources to do). Have you checked all the Zano videos for the footage of it in flight? Hey Guiseppe. Regarding the camera not being stabilised. We will be using the windowing function to help stabilise videos on the fly within Zano itself so the raw content before post processing should be very good, after post processing, I think you will be surprised. Have you ever run a video stabilisation post process? The results are quite impressive. The end result will be stabilised footage done at the camera itself then additional post processing for stability. Hey Larry. Thank you for your comment and support. Could people also check the page that Ben from Kickstarter reviews has put together and is reference in our update 6. It covers a lot of the questions regarding the camera. The summary is we will ship with the best camera we can fit and that meets the requirements. We will also make camera upgrades possible by the user by making various camera modules available on the www.flyzano.com site after Zano's have shipped to you all. Hey Terry. Regarding the case a landing pad and WIFI booster. Very definitely something we are looking into. I think these would both be cool features. Hey Roger. Regarding obsolescence. Zano as a hardware platform is

designed and built using key parts that have ONLY just been released. This is to help future proof it. We have also put huge effort into make the platform itself future proof for a few years by making it accept new functions and feature by firmware updates. You will get 12 months free updates and then you only have to pay the nominal fee per update after that if you want that function. By updates we mean new functions like acrobatics, of flying upside down etc. All bug fixes and legal updates will ALWAYS be free of charge and our Zano app will ALWAYS be free of charge. Does that help? Regarding red zano. Please see Update 7 for the renderings of what we think Red could look like. Hey Angus. Regarding a big brother of Zano. Noted, thank you. Would be cool. We may have something in store for this. :-) Hey Joseph. Regarding the camera, if you wouldn't mind reading my comments above and also tell me your response to my challenge at the top of this post, I think we may clear up a lot of the discussion around cameras. Hey Matthew. LOL. As much as that sounds great, I think it may be a little bit ambitious with 20 days to go :-) Hey Hauvert. Thank you for your support and your quite right, its both my team and the Zano community here making this project really happen. Absolutely fantastic Hey Doug. Regarding Zano a Zano :-) The IR sensors from one Zano to another should be > 4m comf

[Dec 19 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey Anakin. Regarding the camera. If you wouldn't mind reading my comments above and telling me your answer to my challenge, I think we can clear up a lot of the discussion around the camera. Hey John. Regarding shells. Noted. I like that one too. Hey Ben. Regarding the long exposures. Should be very interesting to pre-program Zano to perform a flight path at night then take a long exposure. Great idea. Hey Simon. Regarding a Zano display team. That is definitely something we will have to prepare for any trade shows. Really show off their capabilities. Good idea. Have a great afternoon everyone and as always, thank you for your support. Kind Regards, Ivan

[Dec 19 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening one and all, Well I'm back, all shopped out. What a great response again here. I can see so many conversations going on and its all very exciting for us. We may have created Zano but you are creating something we are excited to be part of. A community of Zano enthusiasts and developers. Brilliant. Hey Doug. Regarding Zano battles, absolutely. You could program the arena dimensions as a virtual fence. Flying robot battles would no doubt attract a lot of attention. Hey Bob. Regarding multi angles. Thats very interesting. If the camera could be tilter downwards, so you get Zano out of frame by videoing what is below. Alternatively you would have to limit to

perhaps 150-170 degrees so that no Zano is in frame. Or I wonder if we could post process with the HPC to remove Zano from the footage. Now that would be some fun. Hey Simon, Hey Bob, Hey Andreas. Regarding the game mode. You could also display the number of lives on the RGB display and show an explosion along with explosion noise from the speaker. Hey Andreas. Regarding detecting a Zano in the feed. Zano could flash the RGB display in-between capturing frames, if the Zano it is facing sees this pulsing, theoretically the two could align their frame rates and also use this as a point of reference to another Zano being there, this could make tracking and removing the target easier for post processing of video. Thoughts? megamanxjac: Noted, thank you. Hey Feng Ying Hu. Regarding QR code, you have an 8*8 pixel display, you could certainly display something like a QR code on that. Would that do what your suggesting? Hey JP: Regarding your comment, thank you on behalf of the Zano team here at Torquing Group and on behalf of the Zano community. It is remarkable the enthusiasm shown here and the great ideas. It is so much more than just crowd funding, it is almost crowd development. Brilliant platform. Thank you for your support. Hey Andreas. Regarding your game comment. Sorry I am reading top down so my order is back to front. Great idea. I was thinking the SDK could be ideal for these sorts of games too. You could have battle apps of all kinds. I love the idea of using the RGB display, the speaker and the IR leds as part of a game. Using the the virtual fence and avoidance systems, you could setup complex arenas outdoor with all kinds of obstacles. Like some of the battle tank games on the PC. I'm not a game developer, but I'd love game developers to pick up the SDK and see what they can create. As always, we will provide the development support specific to their industry should game developers wish to get involved. Hey Simon. Regarding the lawn mower. Thats great, all I need is a very small lawn :-)

Hey John, Hey Steven. Regarding customs. Good question. We often travel with our UAV's as hand luggage all over the world. The worst issue we have is people in customs wanting to see it and their response is that is so cool, they chat to us for a bit about how cool it is then wish us a good trip. We are always very upfront about the UAV's and declare them and carry them as hand luggage and never an issue. Hey Ben. Regarding CES and ZanoWear. I like that idea. I'll mention it to the guys going to CES. Hey John. Regarding the party. I'll ask. We are outsourcing the logistics so a company picks up the Zano's from the EMS then breaks up the pallets and ships them according to orders. Depending on the number of people who wish to attend, it may be a logistics issue as we are not handling this ourselves. We believe in getting the best people (or company) for the job. I will ask though. Regarding location. We are not here because of the UAV centre. It is a happy accident. I founded the company in London, then met a lovely lady (my wife) who lived in West Wales and was born and bred here. The rest is history :-)

Regarding Zano's at the party, as many as I can pinch from the assembly line :-)

Hey Paul, Hey Holger. Regarding the VR for Zano, I am looking forward to developers tackling this as I want one too :-)

Hey Christopher: Regarding your post. Sorry for missing it, my oversight. That is a great idea about one click morse code. We could use all the lights

on Zano and the RGB display to communicate this. What a brilliant beacon. I'll add this to my list. Thank you for the suggestion. Hey Peter. Regarding the party, no worries at all, thank you for your enthusiasm. We are planning to host it in Cardiff, I've been told by the lady (my wife) in Torquing organising it to stop spoiling the surprise so if I say anymore I'll get in trouble :-). Hey Chris. Regarding swarming. Absolutely. That is one of the swarming formations we had in mind. Have a great evening everyone. We are working on the forum suggestion as well as the other suggestions. I also want to say thank you again, with your help we are now passed £867,000 and well on the way to our third stretch goal. We announce the options for the next special Zano limited edition tomorrow so please keep the ideas coming as we post this survey on Facebook tomorrow. I'll be back in the morning. Kind Regards, Ivan @FlyZano

Dec 19 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone. Hey Matthew. Good stuff :-). Hey Ben. Regarding ZanoGlass. What a neat idea. It is for he's sorts of things we see huge potential for the SDK. Hey Daniel. Thank you for your support. Regarding 3D, thank you, I'll pass your comments along. Hey Matt. Regarding IR. The lepton itself is quite expensive. I believe \$200 even in volumes. Our adaptor board is entirely flexible so it simply replaces the existing camera. I would expect the cost to be around the \$400 mark, most of which is the camera. Regarding GPS logging. It certainly do. Very detailed information including data from all the inertial sensors can be logged. Hey Nobunari. Regarding regional compliance. Yes, Zano WIFI is certified for use in Japan. It also has compliance for every major region, USA, EU, UK, Australia etc. Hey Tractor. Noted. Hey Ulrich. Regarding your suggestion. Some larger UAVs can do this with variable axis props. It's really cool to watch. Zano can't, sorry :-). Hey Dom. My apologies to your wife in advance for you using Zano to request things when you have man flu. Regarding red and black. That would look neat. Noted. Hey Shaun. Fantastic ideas and thank you for the support. We thrive on the enthusiasm, so keep it coming :-). Regarding internal location, yes very much. Beacons could send pulsed data via Infrared and the obstacle avoidance sensors could pick up the data and know roughly where it is based on this data. The protocols already exist in Zano for this. Great application of it though. Regarding a telepresence Zano. Great idea, I want one :-). yes, you should be able to do this. Zano supports Internet protocol (TCP/IP) and WIFI so it's easy to connect via a VPN. Regarding flight data. It can store it locally or on your phone. We try and make everything configurable. If this information was fed into a mapping system, you certainly could build and improve flight and mapping capabilities. Regarding loosing Zano. Good idea, if the app ran in the background, unless you click a cancel button it could warn you if Zano gets too far away. I'll add this to the list. Regarding kid mode. I like that. Zano by default will restrict its flight distance from the operator to whatever the legal maximum is or what the signal strength will allow,

whichever is shorter. We can make this more restrictive for kids. Leave that one with me. Not crazy ideas, people thought when we first suggested Zano that we were crazy and that it wasn't possible. Well we proved them wrong :-). Hey Brady. Zano chargers from USB so anything from your laptop to any USB charger works. Hey James. Regarding being on time. There are no guarantees. Our biggest risk is supply of parts as mentioned in the risks part of the campaign. We are however professional and well organised, we have a dedicated planner whose job is to run the project plan, she works with our EMS on delivery and shipping schedules. We are confident we will be on time and are working hard to that end. Hey Abulhair. Regarding family pack, if you check the description, it's basically a four pack of our early bird unit so exceptional value but doesn't include four cases. The margin simply isn't there to allow it, sorry, Hey Robert. Regarding a solar charger. It's a good idea and something we are looking into. Hey Guiseppe. Regarding verticals tilt, it can flip vertically but if it try's to hold a vertical angle, it will fly the opposite direction. Hey Ulrich. Regarding active noise cancelling, neat idea. Reduce the noise from the props, stealth mode. :-). I like that. Hey Peter. Thank you for your support. Regarding a launch party. Spoilers!!! We have something in mind but hadn't mentioned it yet, we are thinking a Zano party where we all get to have a party really. Any good excuse :-). Hey Manuel. Regarding the speaker. Yes, you can stream audio from your phone to Zano. Could be some great fun. Hey Paul. Regarding OSD. Absolutely. I'll find somewhere to put the display so it doesn't distract. Hey Luca. Regarding charging points. It's a good idea and yes, I'm working on including those in the production release. Hey Doug. Regarding motor failure. It could also reverse back and forth the opposing motor to keep Zano level. Be awesome to watch. Hey Ben. Thank you for putting that page together. Much appreciated. Red does look cool. :-). Thank you to everyone else too, lots of shows of support. I'm off to do some Christmas shopping with my family so won't be back here until this evening. Have a great morning everyone and as always, keep up the comments, continuously great ideas just keep coming. Great stuff. Kind Regards, Ivan @FlyZano

[Dec 18 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey all, the update is going to be posted today, very shortly with the video. It's a little longer than I wanted but is of real interest to the developers as well as enthusiasts. Sorry if it gets a bit techie, I try and avoid too much of that. The guys in the office call me 'the mouth' as once I get started talking about something I enjoy, you can't shut me up. Rude isn't it. :-). Anyway, stay tuned, Reece is posting the update soon. Hey Matthew. It did make me laugh, I though if anyone would catch me on that, I knew who it would be :-). a bit warmer here but still wet and windy. Have a nice evening all. Ivan @FlyZano

[Dec 18 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Thanks Matthew :-)

Dec 18 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone. Firstly I want to apologise, the video which I stated would be available today isn't going to be. I reviewed it this afternoon and it's not quite ready. We are all quite perfectionist and until we are happy, we won't release things. I hope it will be available after another edit in the next 24hrs. Anyway, sorry, it is coming, that's a promise. We are also going to publish a Zano red rendering so you can see what it might look like. Hey David. Thank you for the link. Hey Peter. 1. Regarding transferring of the data via wifi. Once we release an application for your Mac or pc, you could use that to download the video or photos over WIFI. 2. Regarding transferring then running out of room. Zano wouldn't delete data until instructed too so if a transfer is interrupted, you could just restart or resume it. 3. Regarding files saving to SD card, yes, the file formats will be standard. 4. Regarding indoor mode. What your suggesting is exactly the sort of things we envisaged for indoor flying. Yes, you can fly it around in free flight mode without issue. Regarding the wearable tech. We have a few ideas on this and one of our backers suggested ZanoWear. This is a great idea. Thank you for your support. Hey Manuel. Regarding the case as a landing pad. This is something we are looking into. Would be very cool. Hey Phil. Regarding CAA. Good information, thank you. I'll pass it along. We have spoken to members of the Uk Government specifically about legislation and a recurring exemption below 60g keeps arising now this is because sub 60g could not hurt anyone. I believe there are discussions about raising this to 100g. I'm sure eventually common sense will prevail :-)

Hey Shaun. Regarding FLIR lepton. We have an adaptor that will work directly with Zano, I'll post photos soon. Hey Simon. Regarding charging Zano whilst in flight on a blimp. Yes, you could do what your suggesting. It would be a small charger board interface but easy to do. Sounds like a fun project though. The developers on here I'm sure could lend a hand. Regarding Zano comms, sorry I missed your question. Zano mesh network is either 868MHz or 915MHz of a series of tuneable bands around those centres. I would expect to get a few hundred metres of range through these from one Zano to another. So that is swarming network, not your link to Zano through wifi. A base station could get many km with the right setup to either the wifi or the swarming network. Does that help? Have a nice evening everyone and as always, please keep sharing and tweeting what we are doing. The more shares and tweets of the articles being published too helps us strive for those stretch goals which means you all get extra cool stuff sooner. Have a ice evening. Kind Regards, Ivan @FlyZano

Dec 18 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon everyone. Just a quick update. I have completely reaid the top board for Zano. I am 95% completed with this board and it is then ready for the pre-production run. This allows more space for easier assembly, a new WIFI module and general rigidity to the board. Also better pin definition for those who want to interface to this aspect of Zano. The rework of the top board also makes more room for the camera so we are better able to offer camera upgrades. The next task after this is the rework of the flight frame to fit the SD card and a few other tweaks. We are on track for these to be completed early next week then off to production, then things get really exciting. Hey Stefan. Regarding Dutch law. That is extremely interesting. I think what your saying is probably going to be common in the EU and legislators will eventually catch up. Even though Zano is anything but a toy, if legislators class it as such, then we avoid so much red tape and by working with them, applying restrictions to Zano depending on locale and region, we hope to keep it this way. Hey Tom. Regarding flying indoor, you can still use gesture based control or swap to free flight mode which will be the closest thing to controlling it. Zano still flies itself but you get the feeling you have more control and this is a great way to zap it around in the house. Hey Ben: Regarding the rendering, the guys are posting it as part of the update today. Stay tuned :-)

It does look awesome. Hey Eirikur. Regarding a torch etc. You can use the RGB display for anything from display text, pictures, animations, as a flash or as a torch. Your Zano your way :-)

Hey Tjark: Noted. We will see what we can do. Hey Pietro: Regarding charging the Fuel stick whilst in the case. I believe the guys here are discussing that very thing with the case makers. I hope to have some news on that front soon. It is a great idea. Hey Rudy: Regarding laws in the Netherlands, I believe Stefan has provided quite a bit of information on this. Does it help answer your question? As Zano progresses, we will publish results of discussions with various legislators on the www.flyzano.com website to keep everyone up to date. At the moment, I don't have any additional information. Sorry. Hi Simon: Regarding not wasting battery with GPS lock. If you are outside walking and Zano is in your back pack, or if your at a bar/pub outside and Zano is with you etc. The GPS will be able to get a lock. Pretty much anytime your outside, the GPS will be able to lock. It locks within 30 seconds from cold whilst inside my home office. That is a full timber structure, glass windows, doors etc and this provides only a small encumbrance to the GPS. Regarding pontoons. I think expanded foam will be the best, very light, very durable and easy to attach. When we have finalised the production shape and dimensions for Zano, we will release the 3D models so the developers here can have a tinker. Sound good? Hey Christopher. Thank you and noted. :-)

Hey Bosco. Noted, thank you. Hey Grant. Regarding GPS lock, if you see my response to Simon above and to expand on that, Zano will stop the periodic GPS lock if the battery falls below 70%. You can also disable the GPS periodic lock if you wish to save power. Good ideas regarding detecting if it is in the case. I'll make a note of those. Thank you. Regarding the stretch goals, noted, will see what we can do. Hey Tom: Regarding Zano flying indoors. It detects that no GPS is present and will rely more heavily on the

other sensors as both Bosco and Cammiejunkie have mentioned. Zano is very much indoor/outdoor. Indoor it will rely heavily on sonar and IR, outdoors both sonar and IR apply but it will also work with air pressure and GPS sensors as well as all the self levelling data from gyroscope, accelerometer and magnetometer. It also supports two modes. Outdoor you need it to be more aggressive. Indoor you want it to be more gentle. There are two standard operating modes so you can select which one you want to use. Have a great afternoon everyone. Kind Regards, Ivan @FlyZano

Dec 17 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, Hey Andreas: Regarding EXIF headers, this is a good idea, something I had thought about but not yet implemented. I'll pop this on the list to be completed before production begins. Hey Phil. Regarding CAA regulations, very interesting, thank you for raising this. We do have legal people looking into each region, I'll forward your comments to them. We can always use a super light battery (short flight time) but one that would drop Zano's combined weight to 50g or less, we are only 5 gram off that so maybe for legislation, in certain parts of the US, you would need to use a 300mAh battery and drop Zano's weight to 50g. Whatever obstacles are presented, we are committed to working with the legislators to keep Zano legal. Hey Tsang, Hey Bosco. Regarding storing GPS data with photos. Yes, Zano can export the GPS data along with each photo, we can actually align the high speed telemetry feed (all inertial, actual, obstacle avoidance and GPS) with each video frame. As Zano can export this information as Bosco said, app developers will be able to do all kinds of neat stuff with the fused feeds. Hey Roger: Regarding the cases. Good idea, we wanted to do something special for the limited edition cases to make them truly different. Zano does have the RGB display on the front and RGB landing lights. All of which are configurable and programmable. Using these, at night, you are quite right, you could do some incredible effects and stunts. Hey Jonathan: Regarding the Iron man edition, that does look very cool. I can't get involved as we haven't yet spoken to Marvel about any tributes to their characters so we do not have a license in place. Hey David: Regarding the cable wake boarding. Excellent, we will continue to refine features and functions as time goes on, so the more feedback you can provide to us, the better we can make everything meet your requirements. Hey Dominic: Regarding the new colour and what it costs. If the colour is easier for us to produce than the camo-Zano then it will be cheaper than the camo-Zano. We always try and price fairly. Hey everyone: What about a stretch goal, we could provide an extra top, bottom and plastic feet in frosted clear? Would that be of interest? That would be financially feasible and wouldn't affect the project timeline. Hey John: Regarding the battery connector, the prototype used a Phoenix part but the production unit will use a Molex/JST part. I haven't yet fully specified this part as I am still finalising the production boards. The peak current of Zano with every running flat out is 6 amp,

typical current is between 1.9a and 4a depending on weather, speed, air density etc. I like the idea as a stretch goal. Before the end of december, I will check some good quality lithium cells (AAA) I have to see if they can deliver the current required and come back to you. Hey Larry: Well hello :-)

Hey David: Regarding the hosting, that is very kind, thank you. I'll speak with the team internally.

Hey Rick: Regarding Chroma. Brilliant and thank you. Ill pass that along to our plastics company. Chrome Zano would look neat.

Hey Stefan: No worries, I think I didn't accurately convey what I was thinking. Sorry for the misunderstanding. We will be recruiting people for our legal department too in the future so if your interested in commercial law in areas where most legislators really haven't got any laws, let us know.

Hey Christian: Regarding the special antenna. As Matthew mentioned, this is part of a range extender. This range extended will work with ANY WIFI enabled device including iPhones, iPads, iPods, Android tablets and phones etc. Yes, with this extender (mainly the special antenna) we have easily achieved over 1km line of sight. We have actually achieved 2km without major issues.

Hey Matthew: Regarding the super cap. I have looked at some of the pouch cell caps and obviously they can deliver the current, it is the energy storage that is more of a problem. During full throttle, Zano can pull 6amps and the cap would need to supply the difference between the lithium cells and what is required. Now I haven't actually tried it with a super cap, just haven't had the time but it is a really good idea. I am thinking the lithium cell battery chemistry may well deliver the current if given a few hundred ms to do so, obviously without the cap there would be a brown out from the battery.

Ok, I'm back to work on the production PCB's. We have two to complete and hope to have the first one completed for review today. Stay tuned for the update later today and the new video. Have fun. Kind Regards Ivan @FlyZano

[Dec 17 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

- “ Good evening everyone. Hey Ben. That is awesome, thank you. Hey John. Regarding then AAA batteries, I have looked a little into this, the peak current is the issue but they are lighter for the same power. Thoughts were a hybrid. Small lipo for peaks and average currents from disposable. I haven't progressed further on that front. Zano is happy on anything from 2.5-4.5v so feel free to have a play :-)
- Good idea about a stretch goal. I'll look a little more into it. Regarding stopping people trying to charge the batteries, good question, I could ask them nicely? :-)
- seriously though, good question. Perhaps a custom disposable battery with protection if we can get enough demand.
- Hey Simon. Regarding moderators etc. Thank you for your support. Once we have the forum up and running, we will definitely invite people to apply as moderators. I like some of the suggestions today and we will do what we can to provide server space, official links to the developer side of flyzano.com etc. We are very focused on the primary task, that is delivering your Zano's :-)
- Hey Matthew: You were just the man I

was thinking of for a moderator, knowledgeable and friendly. Thank you for volunteering. You'd also get all the latest info well before being made public :-)

Hey Doug: Regarding my earlier comment and your note of support, thank you. As an assembly language and electronics engineer, I am used to working away quietly in the dark so to speak. The community here, shown by your comments and subsequent comments is remarkable and very exciting for us too. We are crazy busy but our focus is very much delivering Zano's. We will allocate space in our new environment to get the forum, the wiki and rest of the developer community up and running asap. If any of you can suggest a good forum and wiki web tool to use, we can look to getting those setup sooner than the rest of the developer section.

Hey Stefan. Regarding the legal documents, they are agreements for developers. Basically anything we disclose that isn't public, they need to keep to themselves. Usual SDK documents. Are you interested in being a developer for Zano?

Hey Roger. Regarding the differences in the cases. The limited edition case are smaller runs so naturally more expensive, they also have every premium part we can find, so premium zips, fabrics etc. The standard case is still very good quality but not limited edition so larger run which means cheaper to make and with good quality zip and fabric. Sounds like fun with the neighbours. Does that help? Have a great evening everyone. Kind Regards, Ivan @FlyZano

[Dec 17 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon all, An update is being published by us tomorrow along with chapter 3 of our in the lab videos.

Hey Georg: Regarding the 1m goal. That is a really good idea, bridges to external content. Thank you.

Hey The Art Factory: Thank you.

Hey Michael: Noted, thank you. I agree and also think the interchangeable shells will lead to all kinds of neat things.

Hey Matt: Regarding swarming. You are quite correct, we will release swarming and all the functions as updates even if we don't hit the stretch goal. The stretch goal simply helps us release it sooner. If we don't hit the goal, I'd expect swarming to be released within 6 months of Zano's being shipped so by Christmas approx 2015.

Hey Andreas: Regarding the wifi module. I'll look up the specifications and post those shortly. Regarding emails, I know Reece has some from you, he has forwarded these to me. We will get back, I promise, must swamped at the moment and my focus is getting the production revisions of the boards done. Once that is done and sent away, I'll have some time to respond to emails. Sorry for the delay but I will respond.

Hi Simon: Regarding the pledge rate, it has slowed. That is a good idea. I'll raise it with the team.

Regarding distilled specifications. This is something we are working on, sorry, just don't have it just yet.

Hey Midhun: Regarding the final goal. I believe most campaigns slow in the middle the spike at the end. Based on this, coupled with other publicity we have, I think we are still on track :-)

Hey Matt: Regarding swarming, your idea is exactly how it will work. Phone or tablet and let Zano's work out the rest.

Hey Matthew, Hey Andreas. There is a document our legal

guys are working on, once this is done I can send it to you. If you agree (Tadaa and privacy etc), I'll be able to release early tech data. The same goes for other developers. Once the legal guys get this completed, I'll let you all know. Hey Simon: Regarding developers. You can sign up soon. We have various portals to build to support this, as soon as the beta environment is ready, you can sign up. Regarding a developer community. What a fantastic idea, I can provide a secure hosting space in our environment for this. Obviously need a few moderators to sign up. Any takers? Regarding comms distance. We have tested at over 1km and it worked perfectly. We have tested to 2km and still worked well. This was done with a special antenna. Regarding plug ins. The camera and RGB module port will both support what your talking about. Regarding untethered. Yes. Zano supports over 500 compound waypoints that include instructions for action. You can turn off loss of signal fail safe and do exactly what your saying and let Zano go on a mission. Regarding your own code. By replacing the RGB display with a processing module, you could certainly do what your after. Regarding HPC: Yes, we can provide access to the SOAP batch engine and web services. This would be under agreement. Regarding beta testing, sounds ideal. You certainly do have a great spot to it through its paces. Thank you for your support. Hey Bob: Regarding the landing pad, I think your quite right about price and design. Hey Doug: Regarding legislation, you can see why we are so focused on sub 60 gram. Zano without battery is circa 35grams. With standard battery is 55-57 grams and we are looking into an extended battery of 650mAh which should increase flight time by 30%. Hey Leon: Thank you, I have seen the email. Hey Scott: Regarding the BBC article, it's interesting but I'm confident we are ahead on platforms of this size. We are into production, not just research. I wish them the best, some cool stuff they are working on. We have had quite a few universities especially the robotics departments contact us asking to use Zano as a teaching tool for which I am very supportive. Hey Matthew: Regarding selecting a landing platform, I like the idea, not sure how to actually make it work in unknown environments but certainly something that should be achievable maybe in v2 or v3 of Zano firmware. Have a great afternoon all. Kind Regards Ivan @FlyZano

[Dec 17 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

- “ Hey Bob: Regarding 3D parts, we use a series of Autodesk products on the Mac. Maya is a good example, I think Autocad may be available now as well on the Mac. Our renderings are all done in Maya on the Mac. Regarding your previous question, thank you for the clarification. 1. Basic setup. When you receive your Zano, you do the usual and unpack it, connect the battery. Zano will flash the lights, if you give Zano a good shake it will wake up and a steady flashing of the lights will show it is powered up and trying to lock onto GPS. I would suggest whilst doing this you plug the charger lead (Micro USB) lead from Zano into your PC to keep Zano fully powered whilst you

set it up. Download the Zano app from your relevant app store then find the Zano via a hotspot from your phone or tablet, once connected, load the Zano app and the app will take you through the initial setup. 2. The limits within the software are ; - Range from operator (based on region) - Altitude relative to operator (based on region) - Low battery threshold - Low signal threshold - Obstacle avoidance threshold and strength - Launch altitude (default altitude when you hit launch) Then loads of others for flight control, waypoint control, general behaviour etc. 3. Regarding what can be removed etc. Zano is three pieces. The flight frame, the RGB display and the sensor board. All simply plug together and can equally be unplugged without issue (apart from you stop it working :-)) If we release upgraded modules for any of these, you can in the field upgrade them. The camera is also a separate module that is just as easily upgradable. The plastic parts are, one inside, the top and bottom, the camera mounts and the plastic feet. The feet hold the motors in place. Does this help with your question? We are working on a wiki to condense all the information in the comments into a readable format. I read that one backer read all the comments, that is good going. Hey Leon: Regarding shell, noted. Hey Andrew: Regarding the shell, noted. That would look neat. Hey Melanie: Regarding your comments, wow, that is good going, read all the comments. Thank you for your support too. Regarding the shell. Noted. Regarding taking pictures and video at the same time, No and yes. If in video mode of 1080p the best photo you would get is a 2mp pixel which is the number of pixels in a 1080p image. So technically Zano could save frames off individually without interrupting the video feed but the resolution of the photos would be limited. Regarding sleep mode. Most of the power for Zano is used by the motors, about 75% in fact and when flying everything apart from the landing leds and RGB display are required for flight. The power saving mode is when your not using Zano. So rather than having to remove the battery, Zano will power everything down like a smart phone to draw very little power and be ready in an instant. This includes periodically waking the GPS to get a GPS lock then putting it back to sleep. Does that make sense? Regarding the LED display. Absolutely. It is these sorts of suggestions that I hoped people would come up with. We have had some great ones (forgive me anyone if I forget to mention yours here as there have been so many, I'll mention only a few) such as a risk indication, Zano shows the risk level of its current flying, GPS signal, position, obstacle risk etc. Temperature, arrows, flash, torch, beacon (launch to 5 m and start rotating flashing the display to attract help). Regarding the countdown. We only went from 5 to 1 for the sake of the video, we wanted to keep the video moving well but you could count from 20 of whatever if you chose. Regarding the speaker. Glad you asked. Yes, Zano has a good quality digital microphone and digital audio amplifier. You could speak to your phone and realtime this is said via Zano. You could play tunes through Zano if you wanted. Noises from gaming mode Zano's. Absolutely and what great fun too. Regarding the docking station. Yes, the thoughts we are having is automated, so it lands, charges and can then launch itself whenever needed. With some of the neat things developers are suggesting here, I think the docking station will be well used.

Regarding distance from Zano to object. Yes, absolutely. You can dynamically change flight modes of Zano all whilst the camera is filming. You could change from follow me mode to gesture mode, or simply change the follow me distance all without affecting the camera. Regarding beta tester, great, I'll be posting on here when the registration is open. Hey John: Regarding 60g comment, perhaps we should. We are keen to work with legislators to ensure Zano always stay legal. Hey Matt: Regarding the shell, Stefan is quite correct. They are easy to remove and yes, so long as the paint you use doesn't have a solvent for the plastic we use and that you don't block any of the apertures in the case and that the paint doesn't get too heavy (It is surprising how much paint can weigh), you can definitely hand paint your Zano to further customise it. Hey Didier: Regarding the shell. Yes, we will release 3D models of the shell and dimensions so you can design your own and 3D print them. Regarding electronic customisation. Thank you for your comment. You can remove the RGB display. This exposes +3v3, GND and a 85mbps SPI port directly from the Zano OS. This would be the ideal place to add your attachments. Regarding software customisation. The first place is through the SDK, this requires you communicate with Zano over WIFI. You could do this from PHP, ASP, any C variant, Visual basic etc etc. If you wanted to run small programs locally, the WIFI module itself supports PERL. You could code in PERL and run your programs directly on there to provide new autonomous functions for Zano. Regarding acrobatic flight, yes, Zano will be able to fly upside down. The prototype wasn't able too but the production unit will be able too. Regarding obstacle avoidance, yes, you can configure the system completely. This is all documented in the SDK. Regarding being waterproof. You could if you wanted too completely conformal coat Zano, this is a clear enamel waterproofing lacquer to cover all the electronics. It will add weight and to do it properly will take some time but that would be your best best to make Zano water proof. Regarding a helium balloon. The only silly question is the question you didn't ask. Yes it certainly could be. We are releasing a video tomorrow to show how Zano in the lab. Part of this video shows how Zano could do exactly what your asking without modification, just a cradle to hold Zano to your balloon. Regarding swarming: Yes, we plan to either if we hit the final stretch goal or when time permits, finish the firmware swarming functions. Zano already has separate hardware for communicating privately between Zano's. Can I ask you watch the mess networking swarming video. It should answer your questions in more detail. Hey Doug: Regarding the case charging, I would definitely envisage this as a case insert replacement. I want one too :-)

Hey Blake: Regarding the shell. Noted. Good list.

Hey Ben: Regarding the Red render. I'll get the guys to put it up somewhere and I'll post a link. How does that sound?

Hey Joe: Regarding your idea, that is certainly doable. A great app idea for the developers out there. My Party Zano series of apps. I like it :-)

Thank you for your support and enthusiasm. Regarding find my Zano. We have had a few discussions on here about it and the result was two things. The first one is in the event of Zano no longer responding to your phone or tablet, the Zano app will swap to a map and show a pin as to where Zano was reported last. Zano will in the

event or loss of connection with your phone, or in the event of a crash etc will flash the landing lights, the RGB display and make noise through the speaker. That should help you find it. Does that help? Hey Guiseppe: Regarding stretch goals. Yes, I am looking into it :-)

Have a great morning everyone. I'll pop back later. Kind Regards, Ivan @FlyZano

Dec 16 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, Hey John: Regarding UK legislation. I am confident that <60g avoids almost all the worldwide legislation, coupled with the software restrictions we can enable depending on where you're using Zano, I believe we will be able to keep Zano legal where most UAV's will not be. I have had detailed conversations with people inside the UK government about Nano UAV's and I'm confident we are doing everything right to deal with even emerging laws. Hey Bret: Noted :-)

Hey David: Noted :-)

Hey Abulkhair: Regarding batteries, all the answers given are actually the same, just worded differently. Zano has one battery as standard and we are providing a second battery with every Zano. That means you get two batteries. Does that make sense?

Hey Georgia: I'll pass your message along to Reece, fluoro pink zebra print would be quite something to behold :-)

Hey Bosco: Regarding unedited video, I'll dig out what I can but as I mentioned, the prototype has a different camera to the production version so it isn't really indicative of the production version of Zano.

Hey Nagamendo: Regarding legislation, I'm not an expert in this field but our research to date has shown that below 60g worldwide seems to mean Zano is pretty much unregulated. This is mainly due to the fact the sub 60g really can not do anyone any kind of injury. A small hummingbird hitting you would hurt a great deal more than Zano. We will also continue to work with legislators worldwide to keep Zano legal. Does that help with your question?

Regarding your colour suggestions, noted. I like the white too.

Hey Larry: Regarding speech recognition, interesting idea. Zano has the processing power to handle speech recognition. I'll add that to my list of future updates.

Hey Andy: Regarding tops and bottoms, a Skeleton would look cool. Noted.

Hey Roger: Regarding pledging for both the black and the camo limited editions, that is correct and is my understanding. We will contact you and find out exactly what you want including any additional batteries, propellers etc. Yes, you can fly them both at the same time and when we release the firmware for swarming, they will be able to co-ordinate cool stunts together too. :-)

Does that help? I suspect by June we will have interchangeable shells, the only issue is that the PCB's are also colour for all the Zano's so if you want to change a Camo zano to a red Zano, the PCB is still green for the Camo Zano. The black Zano has a black PCB, the white Zano has a white PCB etc.

Hey Blake: Regarding recording a route, good question. Zano sends continuous information about its position to your phone or tablet, the app on your phone or tablet could indeed record detailed information and align this with the frames in the video

with a little bit of work, this could provide some really cool results. I like your idea, get big time boarders to run a route, record this information and share it. We are planning a series of sharing items on the www.flyzano.com site and plotting your own cool run down a slope would allow other boarders to pick that route and select the speed they want to go and let Zano show them the route. That is a really cool idea, thank you.

Hey Sheri: Regarding stretch goals, good points, leave those with me. We are trying to come up with some and these are good ideas, thank you. Hey Mike: Regarding shell choice, looks good. Noted. :-)

Hey eMitec: Regarding your questions from a climbers perspective. The production Zano has 30% more power motors, more refined stability and a better camera. The first batch of production units for us to validate and test are due back to us around 15-20th of January. So regarding quantifying actual gust tolerance and maximum altitude etc, I can give good figures once we have these back. If your interested in getting involved in really early testing of the production units, can you send an email to hello@flyzano.com asking for it to be sent to me please, would you be interested in very early testing well before production? Those sorts of extreme environments would really help feedback so we can give the very best Zano on version 1 of the firmware. Any other extreme environment enthusiast, please do the same and if you want to get involved, send me your details. We are genuine about making a rock solid product and whilst all the production engineering is being undertaken, we will be continuing on the firmware and flight tuning.

Hey Arnel: Regarding shells, I like the idea. Maybe we would do a series of hand painted Zano's. Would anyone here be interested in hand painted seriously limited edition Zano's. These could be abstract art, British racing green and white stripes, graffiti etc. Any thoughts? Sir Ivan?? LOL, I don't think the Queen would appreciate my humour :-)

Regarding feet. I tell you what, we could include a mounting hole in the bottom of the feet. This would allow enthusiast to make all kinds of feet attachments. How does that sound?

Hey Scott: Regarding wake boarding, Zano's top speed is roughly 25mph. That is dependant on weather. Regarding following you, it can do both, it could hold position and just adjust its heading to follow you, or it can fly and follow you at a fixed distance and adjust its heading to keep you in the focal point of the FOV.

Hey Doug: Regarding shell choice. Noted. Regarding a rendezvous point, thats a good idea. I'll make sure that the home location is adjustable so rather than just last position of your phone or tablet, you can configure a point perhaps on the shoreline if your on the water etc.

Hey Hauvert: Regarding investing, the primary company Torquing Group and its current divisions are fully private and held amongst three families. Yes, we are a family business. We are going to be creating a new division to cover some cool new Zano ideas that are a little off main stream and we have had quite a bit of interest for people investing into that division. If your interested, send an email to hello@flyzano.com and when the opportunity arises, we will notify you. How does that sound?

Hey Blake: Regarding recording from in front, both ideas could work. Zano updates position using GPS 5 times per second and does fine control 1,000 times per second. Assuming your phone or tablet is able to even get close to this level of

accuracy, Zano could effectively follow you from in front or you recording backwards. Your other idea of plotting a GPS route for a snowboard is a cool one too. Might make for some awesome action shots as you jump through the field of view of the Zano. Both are possible, good suggestion. Hey Larry: Regarding spare blades. If we do a glow in the dark which seems to be gaining popularity then spare props in glow in the dark are a great idea. Hey Dominic: Regarding shells, sky camo. Do you mean sky blue with white camo like clouds? That could look really cool. I'm looking forward to seeing the footage. Thank you. Regarding beta tester, you sound ideal and thank you for your support. Regarding a squash ball, WOW, that would be interesting. Honestly, I have absolutely no idea, The speed at which they can move, the shape and size as well as material would be very interesting. I'm going to try that. :-)

Hey David: Regarding cable wake boarding. Larry is correct, it is water resistant but not water proof. A new suggestion today is a programable home position so Zano follows you and when the batteries start getting low it automatically goes back to the shore to land. That should work ok for you? Thoughts? Hey Mark: Regarding the case, yes, that is the suggestion, the Fuel stick never has to be removed to charge or to charge Zano. I like this idea and we will try and implement it. Regarding shells. Noted: Nice suggestions, national flags :-)

Might be good ones for my hand painted range suggestion? Hey zero2sixty: Good nick name. Car fan? Regarding shell design, thats really cool. I'll through that challenge at our mechanical guys in the office, good challenge for them. Hey Mr James: Regarding shell, noted :-)

[Dec 16 2014](#) on ZANO - Autonomous . Intelligent. Swarming. Nano Drone.

“ Ahh, I misse a few as I was typing the response below when the questions were asked. Hey Roger: Regarding extra pledges etc. Good question, I would expect retail pricing as in pricing for the units when not through Kickstarter will be 15-20% more but the limited edition once gone are gone. So if you wanted a limited edition Camo and a limited edition Black, and you already have pledged for the black, if you increase your pledge to cover the cost of the Camo as well, at the end of the campaign we will contact everyone to find out what rewards you want if your pledge is more than the selected pledge that you have chosen. Does that help? Hey Sheri: Regarding stretch goals, we are thinking long and hard about what to do, we believe we need them but want to ensure whatever the goal is, is something that every backer will get. We could add goals that cover Add on products like follow me bracelets but people would have to pledge or buy those. If you have some suggestions or feel stretch goals like what I suggested above are ok, please let me know. To everyone, this is out first campaign so we aren't particularly sure if adding stretch goals that mean new add on products that you would have to pledge extra for is fair. You tell us. Hey Will: Noted :-)

[Dec 16 2014](#) on ZANO - Autonomous . Intelligent. Swarming. Nano Drone.

“ Good evening everyone, Hey Bob: Regarding operation and functional details. Can you expand on what your after? I'll provide whatever information I can without compromising IPR. Regarding soft feet, that is a good idea and very easy to do. How does a nice rubber foot sound as this would wear fairly well? Hey Patrick: Regarding the battery's. There are few pledges that mention the spare battery, Mathis is because no one had pledged for them when we decided to give a second battery with every Zano. Please know that every Zano comes with two batteries and two sets of propellers. Hey Dennis: Regarding the cost difference, that covers the case that the £154 pledge come with. Hey Kenneth, Hey David: Regarding raw footage. This question has arisen a few times. There is quite a few examples in the Zano in Action video of the output and I'm happy to post some from the prototype but I'm not sure how useful it is to you because the camera is different to the one in production, the firmware was prototype and the production version is substantially more refined and the prototype has less powerful motors than the production version so what you would be viewing is almost from a different UAV. If you would like to see some of the old unedited footage, I can see what we can dig out. Alternatively if your happy to wait, I am receiving the new production version of Zano back in mid January and will post new footage of it and from the camera of it performing in a number of situations. This footage will be much more accurate and show you footage from what you will receive when we ship. Hey David: We could make your Zano play jingle bells :-)) if that would help? Hey Simon: Thank you and really appreciate your comments. 'airable' is a great name. Regarding your questions. A few people have mentioned a landing platform, I think this is definitely something we will start work on. It could be extremely cool. Regarding neutral buoyancy. Absolutely and great idea. Zano can drive itself towards the ground using its reversible motors. Have a look at the next in the lab video and your change in flight dynamics is something Zano could deal with right now. Hey JP: Regarding a stretch goal for a case. Unfortunately not, however, we are looking into what items we could do for everyone to say thank you when we hit a new goal. The reason we can't is that it just isn't financially feasible, and many backers have chosen to pledge extra to cover the case. Hey Thomas: Thank you for your support. Regarding add-on, by removing the RGB display which is a separate plug in module, you have an expansion port there. Hey Doug: Thank you. Regarding the case, neat idea. We will add that to the list. Hey JP: Thank you for your comment and support, really good to get so much support and feedback that we are doing the campaign the right way. Noted regarding the suggestions, thank you. Hey Alwyn: Regarding legislation, the UK laws around small UAVs cover from 60g to 20kg, as we are below 60g, Zano is exempt from the restrictions applied to virtually every other UAV. Does that help? Regarding a thermal camera. Good idea, we are going to offer this as an add on available at www.flyzano.com once Zano's ship. Hey Alan: Noted, the coolest thing is that I doubt anyone would even hear or see Zano unless it's within a 5m of them. Hey Leon: Chrome, noted, that would look cool. Hey Ben: Regarding dark red, we have a

rendering of that, do you want to see it? Hey Tammick: Thank you, it's a great fun project too. Hey David: Noted :-)

Hey Dominic: Regarding batteries, sorry for the confusion, every Zano will have its main battery and a spare, so two batteries. The same thing applies to propellers. Glad your excited and thank you for your support. Please send us some of the footage you capture, be great to see.

Hey Eirikur: Noted, thank you.

Hey Rina,: Thank you for clarifying this.

Hey Abulkhair: Regarding batteries, you will receive two in total. Thank you for your support and what a great place to test. :-)

Hey David: Regarding tagging and following, what a cool idea. Be great to help find your child if they go missing at a park so something. I think I covered all the questions but as always, let me know if I have missed anything. Have a great evening and thank you for your continued support and enthusiam. Kind Regards, Ivan @FlyZano

Dec 16 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon everyone, As always, if I miss any questions, please let me know.

Hey Szabolcs: Regarding free flight mode, that is correct. Most quads you control the power to the motors, Zano you task and it implements your request. Even in free flight mode.

Hey CaffineJunkie. Regarding the backer number, looks like his isn't available. My mistake, sorry. What you can use instead is you Kickstarter username. We can cross reference that with the backer list internally. Does that help?

Hey Matthew: Certainly will.

Hey Doug: Regarding the case charger etc. I really like this idea, I am looking into what it would cost to do what you have suggested.

Hey Holger: Thank you. :-)

Hey Blake: regarding the 3D models, they aren't finalised yet as we are making a few changes to the production Zano to better fit things. Once finalised, this will be available on the www.flyzano.com site. I hope that helps.

Hey Amog: regarding reversible motors, that is a neat idea.

Hey Bosco: Regarding reversible motors, that is a really good point. The acrobat manoeuvres Zano could perform would be remarkable.

Hey Everyone: Thank you for your support as beta testers, as soon as the registration is open, I'll post it here.

Hey Larry: Regarding additional Zano's. If your ok to watch the video and update we are releasing today, Reece and I cover how you can do what you are asking.

Hey Abulkhair: Regarding the family pack, absolutey. Each Zano has a spare battery so four Zano's will give you 4 spare batteries. The same applies to full sets of spare propellers. Every Zano gets a full spare set.

Hey Roger: Regarding adding another Zano, if you are ok to watch the video and update we are posting today, this should answer your question.

Hey Andreas: Regarding the backer number, sorry everyone, this was my mistake. First time Kickstarter campaign opps. Just use your Kickstarter username that shows up here in the comments as we can match it internally as this shows up on our backer report along with backer number etc.

Hey Larry: Your message made me chuckle, thank you, great way to start a Monday.

Hey Jose: Thank you and as soon as it is ready, I'll let you know.

Hey Paul:

Thank you for your comments, I feel strongly about good communication, how else would you know that we are listening and trying to take your ideas on board. On top of that, it's great to have so much enthusiasm. All the team here read the comments and I know the enthusiasm from you all, helps spur the team into doing what they do. Stay tuned everyone for the pending video release and our new 'In the lab' video. The guys here are planning a bloopers video too, probably to be released in January, this generally involves me getting hurt, nice eh? Thank you for all your support and I'll be back later. Kind Regards, Ivan @FlyZano

Dec 15 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening all, On the comment about doing an update to cover all the suggestions that we are implementing and what we are going to release as add-ons after Zano's ship etc, this is a really good point. Every comment I have made here is recorded internally and we will run through all these and do exactly as you suggestion, I agree and think it will help answer a lot of questions. Thank you. Hey sparsons: Regarding the choice of uC. That is a very good question and thank you for asking. As an assembly language developer, the platform to me is irrelevant, they all do basically the same thing and its just a matter of learning the instructions specific to each platform, I have developed pure assembly operating systems on the original 8080, through current Intel platforms, also on z80, Microchip 8 and 16 bit platforms and their 32 bit MIPS cores, I have also worked on Atmel, ST and many other manufacturers devices based on ARM cores. The ARM core is very powerful but equally is the MIPS, especially if you can code specifically to take advantage of certain less noticeable architectural differences. For me, the decision comes down to a number of factors, low power mode, instructions per watt of power, the backing of a company who specialise in Micro-controllers not just CPU's (Microchip) and a device that has all the relevant timers, high speed analogue, DMA architecture, and other peripherals along with all the relevant documentation and whatever part I chose had to be at the right cost point. I investigated a number of ARM devices, their performance per watt, their development IDE, suppliers capacity etc as well as the various Microchip parts. Also, with my reading and research before I chose the Microchip part, I reviewed the MIPS core performance that the PIC32MZ is based around with equivalent ARM based parts as well as the instruction set. For me, the Microchip PIC32MZ met most of my requirements and therefore it was a decision based on those criteria. Does that help explain why I chose the PIC32MZ? Regarding the solar question: Excellent, thank you. Based on 1KW average throughout the world (I believe the solar constant for each is 1.3, in Wales its probably 0.3 :-) due to cloud cover), with a 40% efficient panel we may peak at 500mW which is quite substantial if it was for recharge purposes only. Hey Paul: Regarding flying instead of tasking. Absolutely a developer could do that, you would first disable some of the internal tasking systems that actually fly the system

and then you have much greater manual control over throttle, pitch, roll and yaw. Hence you could 'fly' the unit rather than task it if you so wished. Hey Larry: Regarding beta tester, I certainly have you lined up already :-). With your profession, I think you could provide invaluable insight. Hey Will: I thought many would. For a beta tester, we don't want certain skills or qualifications, we want the broadest range of Zano users possible. The broader the range from the youngest tech savvy kids to grand parents who love their gadgets, everyone can provide a completely different view on certain functions. To become a beta tester, its a simple process, we just want all beta testers to download a certain number of functions per year and then use them. In exchange for getting all these cool functions, we need you to provide feedback. So after you download the functions, we will request feedback through the website, suggestions, faults or other comments. You would need to provide this feedback on a certain number of functions each calendar year. It is a typical beta tester relationship. The specific numbers related to downloads and feedback aren't yet finalised. Now there will be a limited number of beta testers, we haven't decided quite how many yet. How the process will work is we will pre-allocate a 80% of the total number of beta testers that we need exclusively to our Kickstarter backers who have pledged for any of our Zano packages and then provide a link on the www.flyzano.com site to allow you to sign up for beta testing. You will have to provide your backer number as part of the sign up process, this is to ensure only Kickstarter backers get priority on the beta-tester pre-release program. This pre-release program will be ready for sign-up before the end of this campaign which ends on January 8th. How does that sound to everyone? Hey Doug: Regarding tracking one phone whilst being tasked by another. We have something in store to perform this kind of function. Stay tuned and I think you'll be excited. Hey Jose: Regarding your question about being a beta tester. Does my explanation above cover your concerns? Hey Matthew: Regarding charging. I'm looking into the option of gold pads on the arms. I'm still working on the final revision of the board and I think I can fit them quite easily. Good idea, thank you. Hey Larry: Regarding the "In-App" purchases, what are your thoughts about the beta-tester pre-release program? I think it is fair and offers our Kickstarter backers a real opportunity to continue to make a contribution to how Zano evolves. Hey Nicolas: Regarding a bracelet, we have something in store, stay tuned. :-). Regarding range, this can be extended and we are looking into a range extender as an add-on through the www.flyzano.com site once we have shipped the Zano's. We are looking to make it fit into all the Zano branded cases. Have a great evening everyone and this week we have a few things for you, stay tuned. :-). Kind Regards, Ivan @FlyZano

Dec 15 2014 on ZANO - Autonomous . Intelligent. Swarming. Nano Drone.

“ Good afternoon everyone, Hey Patrick: Regarding the SD card. Yes, Zano has a MicroSD cradle on the main flight frame and yes indeed you can put your own SD card

in there. Depending on what you want to do with your Zano, if you just want occasional photos, then any MicroSD card should be fine, if you want 1080p video recording then you would want a minimum of a class 6 MicroSD card. Does that help? Hey TKoh: Regarding the updates. Let me explain what we are doing if that is ok. The Zano app will always be free. Bug fixes will always be free. Firmware fixes (bugs, critical issues, safety updates, legislation updates) will always be free. Zano has a great deal of technology in it and it is a bit like modern smart phones, we don't have a huge margin on them even when we reach full production volumes. A large part of our business is going to be creating new cool functions for Zano through updates to the firmware, these will be downloaded using the Zano app and will expand the API available to developers. These updates is what will generate most of the revenue regarding Zano and will allow us to continue building cool functions. If we give away this aspect free of charge, we simply won't be able to allocate resources to build the coolest new functions, so in the end, users would miss out. However for all our Kickstarter backers, we are offering 12 months of free "In App Purchases" of these new functions from the time you first register your Zano and if you register for being a beta-tester through our developer network or sign up as a developer, you do indeed get LIFETIME free updates. How does that sound? Hey Midhun: Regarding prop guards. I'll make a deal with you :-)

Mid to late January when we get the first 10 production Zano's back with all the updates and I have them back up in the air with everything tuned and working, we will shoot some video of the obstacle avoidance and show how responsive it is as well as me trying to crash it. If you believe after seeing that video that it needs prop guards, I'll personally make the Dimension 1200ES we have (<http://www.stratasys.com/3d-printers/design-series/dimension-1200es>) available for people to send in bumper ideas for trial. How does that sound? Hey Hauvert: Your welcome and thank you. Hey Doug: Regarding ZanoFUEL and the Zano cases. Leave that idea with me, we may well be able to do a case insert replacement that covers all of this, inductive charging, solar panel on the case itself, socket for charging as well as plug free charging of Zano. I need to have a think on this one. Thats for the idea though. Hey Matthew: Regarding one time use batteries, I agree, I have a few different batteries to try, this hasn't been a priority yet but once we get closer to Zano's shipping, I will be able to further investigate some of these cool things :-)

Hey John: Regarding flipping. That is my thoughts too, Zano is hugely capable but there is nothing wrong with having a little fun with it too. It is like the RGB display, it may be more of a novelty when I first conceived it but there are more and more really good uses for it being suggested. I suspect the flying upside down as you say would provide the ability to look up, the camera itself can invert the image so what your seeing is still right way up and who knows, someone may think of a really useful purpose for it. Hey everyone: What we have tried to do is make a future proof platform as much as we can. We have used absolutely brand new design parts, latest digital audio amplifiers, microphones, speed control and IMS chips, GPS etc so that these parts aren't made obsolete in 12 months time and that when you get your Zano, it is current for years to

come with functional updates through firmware. So though some of the hardware may not be useful right now, the microphone for instance right now will pick up a lot of propeller noise but we will release a functional update that has noise cancelling to make the microphone really useful during all flying conditions. But to not include hardware at this stage would simply mean updates required later, hence the ability to fly upside down. Also, I have to admit, at heart I'm a huge kid and I love playing with gadgets. :-) Hey Matthew: Regarding software pan and tilt with a fish eye. For me it depends on the FOV (field of view) of the camera. If it is 180 degrees for example and pan and tilt function would almost be required to make whatever your filming actually the focal point of the video. Otherwise the FOV is so large even if your right on top of the camera, your fairly small with respect to the captured image. With a standard aspect lens, your quite right, it wouldn't be hugely beneficial. We are looking for the best compromise in lenses, I'm still working on this, making progress but nothing to report back yet. Hey Doug: Regarding the display of charge in the case itself. Really good idea, I don't have an answer to this one yet but leave it with me. We may be able to put a clear window in the case itself and a display on the Fuel stick. No promises but if you could leave it with me, I'll ponder this one. Great suggestion. Regarding flying upside down, I agree, initially it doesn't seem to have any benefit apart from just fun (I'm a big fan of just fun :-)), I do believe like the RGB display that once developers have access to a UAV that can do this that ideas will start to form and something really useful will come out of it. Also bear in mind you could fly towards a wall, then flip to 90 degrees and reverse the motors to push the Zano's feet against a wall, effectively landing on a 90 degree surface. It allows Zano to behave more like an insect than other UAV's. Regarding software pan and tilt. I agree, it is possible to get very good results, it is much harder in something as small as Zano but that is only a challenge we haven't yet conquered but we will :-) Hey Larry: Regarding anti-gravity. LOL, Now that would be cool :-) Sorry to hear you have been at a funeral, my condolences. Regarding the flying upside down, I'll give you an insight into how I like to design things, for every UAV we produce including our much larger units, we want them to be platforms not be limited by what we see them for. By that I mean we will make them work and work well but we want developers and third parties to come up with ideas and expand on the capability, think of things we didn't and help make Zano the defacto nano personal UAV. This technology is so much fun to work with and I know so many developers will already have ideas for this technology to take it to the next level. Have a great afternoon everyone. Kind Regards, Ivan @FlyZano

[Dec 15 2014](#) on ZANO - Autonomous . Intelligent. Swarming. Nano Drone.

“ Good morning everyone, Hey David, Hey Simon: Regarding the RGB landing leds, not at the moment, sorry. The LEDS are controlled by three FETs (electronic switches) so they are VERY bright, if they were to be individually controllable, I would need 12

LEDs and the board space is already very tight, I just couldn't fit the extra components. You can however display whatever you want, in what ever colours on the RGB display, if you had it on as a flashing beacon, at night you could clearly see what direction it was heading. The other thing is they Zano isn't really flown, you task it. You point your phone somewhere and Zano will go there no matter what direction Zano is actually pointing. All those conversions and calculations are done in the Zano OS. Hey Luke: Thank you, really nice comment. Hey Matthew: Regarding super-capacitors. I have for sometime been doing investigation into disposable lithium batteries, they typically have 3-4 times the energy density of rechargeable. The issue is they aren't exactly environmentally friendly and they struggle to product the currents required for flight. The super capacitors are a good idea, once they become commercially available and cost effective, we could certainly offer a special Zano battery based on the technology. Hey Midhun: Regarding motor reversal. Your quite right, we can perform a proper flip. Some UAV's have a similar function but they gain altitude and then flip but rotate around a axis that is some distance from the UAV. With reversible motors we could flip front-back or left-right or even diagonals with the axis around the dead centre of Zano. Hey Matthew: Regarding the giga pixel images. I found a website once that had a 360 degree multi giga pixel photo that you could pan, tilt and zoom on any part of it with incredible resolution. Something similar to what you were saying. The result was fantastic. Hey AngusCNH: Regarding the tillable camera. One issue we had was the length of the flex connecting the camera to the processor on Zano. We have a new camera model with a longer flex. This should allow greater tilt options, the actual mechanism for doing the tilt is something we are working on. I hope that helps. Hey Aitor: Firstly, thank you, I really appreciate your comment and support. Regarding a risk level. That is a great idea. We could fuse data from internal algorithms showing how hard they are working to hold position, how close obstacles are to the sensors, what battery life is, air temperature etc and provide a risk level. I really like that, thank you for the great suggestion. I'll see what I can do to incorporate that. Hey Daryl: Thank you for your question. Regarding the RGB display and the surface finish of Zano. The answers Will gave you are absolutely correct. I hope they answer your questions. Hey Will: I can't give away any spoilers about the new item coming soon :-)

Hey Roger: Vertical panoramic. What a neat idea, I hadn't thought of that. Hey Joakim: Regarding display of data on the smart watches. I'm not an expert in this field but using the SDK, if the watches support any sort of video feed from the connected phone, then I would say that yes, developers could certainly make the work relatively easily. Any android developers have any thoughts on this? Hey Roger, Hey Matthew: Regarding the reversible motors. You both hit the nail on the head. I envisaged Zano flying upside down, the prototype wasn't able to do this due to less powerful motors and the propellers running backwards are less efficient than running the correct direction. The production unit certainly should be able too. Imaging landing on the ceiling?? If we built some kind of landing pad for the ceiling, it would sit and hang like a bat. :-) I think I covered all the questions and comments, as always if I did miss

anything, please let me know. Sometimes I am not sure if a question is for me or part of a conversation happening here, if you ever want my thoughts on something, just mention my name and I'll add whatever value I can to the conversation. Have a great morning everyone and I'll be back later. Kind Regards Ivan @FlyZano

Dec 14 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone. Wow, I just logged on and saw that we have now reached and passed our second stretch goal. I am quite astonished at the support we have received. We are now onto our 19th day out of 45 days so not even half way and the growing this campaign rapidly. Thank you for all the congratulations, it is thanks to you all that we have reached where we have as quickly as we have. We have a few videos and other updates for you this week and want to say a thank you to everyone for helping support this campaign and for not only helping us get Zano into production but to get the volumes up enough to allow the cost of manufacture to come down which then allows us to continue to add features and functions for you all. Hey Grant: NFC, neat idea for app startup. Hey Stevens: Regarding a lower price camo unit: Sorry, the camo unit itself is not easy to produce and we will likely end up with quite a few rejects during the plastic fabrication process. It is because of this higher cost that we had to put a higher cost on the item. We try very much to make our pricing fair and to fairly reflect our costs of fabrication and manufacture. We have another design coming out soon which I hope you like. Hey Bosco: Thank you. Hey everyone: Regarding the discussions about extending flight time, unfortunately as many of you have mentioned, solar cells just don't generate enough power to outweigh their weight for something like Zano. There are methods I have seen using high power lasers to send energy to UAV's and keeping them in the air indefinitely. Check out www.lasermotive.com if your interested. I spoke with these guys a couple of years back at an AUVSI conference and trade show. Really neat technology. Hey Hauvert: Thank you for your support and ideas. There is real potential in this area for battery powered UAV's, I haven't personally done the calculations but if someone here feels like doing it, what is the total joules of energy that a strong sunny day would permit to be captured assuming 100% efficiency if captured on a 30mm square solar cell. I think I covered all the questions, so many great conversations going on in here, I do have a habit of just piping in with my thoughts. Let me know if I have missed anything. By the way, any thoughts on what else Zano can do with the ability to reverse its motors? Have a good evening. Kind Regards Ivan @FlyZano

Dec 14 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

Good afternoon all, Hey Andeeas: Regarding the wiki. Very good point. I'll look into

“ this next week as there is so much information here on the comments and answers to most questions not only from myself but so many of you have helped other backers it's been brilliant. Hey Hauvert: Regarding temperature, sorry it should have said Celsius. 80c is 176f so nowhere on earth should ever be above the operating temperature of Zano so long as you keep the batteries out of direct sunlight. Hey Doug: Thank you. Regarding latency, typically on local WIFI such as Zano, you should get less than 10ms, maybe 50ms if there is lots of congestion in the spectrum. If your out and about, especially out in nature, I'd assume more like 5-10ms. Ok so the command from your phone or tablet will reach Zano in less than 10ms, the local WIFI then processes the data and passes it to Zano OS within another 10ms at the outside. Therefore response time for taking a photo should be within 50ms of when you click the button on your phone. The video coming back will never be more than 2 frames behind the live feed so at 30fps, your seeing video never more than 80ms behind what's happening. Zano can accept multiple users on the local WIFI however can only provide communications to one user at a time. The app may well be able to share video. Our larger UAVs do support multiple users on the same video stream but we are more limited with Zano because of size and cost. Does that help? Hey Hauvert: Regarding solar cells. It's a good idea, the issue is that current silicon solar cells lack the energy density to power something like the Zano. However, they could certainly be use to keep Zano powered if it had landed somewhere to video something if they were built into the top of Zano. Hey Joakim: Regarding a forum and a wiki. I agree. We are going to need to find people to work as moderators on these. Regarding upgrades etc. We can release a thermal imaging module shortly after Zano's ship, we are also going to provide other camera upgrades, higher mp etc. Also lens options so people can pick what suits them. Yes, everything Zano related will be on www.flyzano.com including parts built by third parties and ourmdeveloper community. Regarding the camera. I'm actively investigating options on this. Nothing specific to report back yet, as soon as a I do, I'll let you know. Regarding examples photos and videos. Absolutely. I'll take and post videos and photos indoor under Fluro lighting, halogen light, outdoor in full sun assuming the sun comes out soon, cloudy conditions etc. I have to complete the PCB revisions first to keep to our schedule. I can then capture this content for you all. Thank you for your kind comments too. It has taken a great deal of work to future proof the design as much as possible whilst keeping the cost under control? Hey John: regarding the fuel stick and the standard case. Yes, there will be a slot for it to fit and there will be a version of ZanoFuel available to buy. Good question about charging whilst being charged. Yes, I believe it does. Regarding a wiki and forums. Really good idea. I was thinking about this as part of the developer network but a public ally available wiki could be very useful. Thank you for this suggestion. Hey h5n1: Regarding a Bluetooth joystick. I hadn't thought of that, good idea. Our Zano app initially probably won't support that but if we don't release that capability shortly after Zano's ship, I suspect one of the developers here probably will :-)

Have a good afternoon everyone and I'll pop back later. Kind Regards, Ivan @FlyZano

“ Hey everyone, One more thing I forgot to ask a while back. No one has picked up, of if you have, haven't commented on this. Zano can reverse its motors Apart from stability etc. What else could this be used for? I'll leave it with you. Kind Regards, Ivan
@FlyZano

Dec 13 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, It was morning when I started typing. We went out and had a few drinks last night and this resulted in a fairly slow and fragile start to the morning hence my delay in responding. I shall say no more and get to the comments. Hey Matthew: Your absolutely right. The data sheet for the part number I sent you for that charger chip pretty much covers exactly what you have said. Thank you. Hey John: Regarding the charging of Zano when away from the mains. As Zano has a MicroUSB socket on the side designed for charging the onboard battery and we have designed the case insert to allow Zano to be plugged into the ZanoFUEL stick to keep Zano 100% ready to go. We envisage that on return home, you would then plug in the Zano Fuel stick into the mains adapter USB charger and keep that charged too. This can all be done with everything still securely held in the various Zano cases (standard and the various limited edition cases) Regarding flight time once Zano has been in sleep for sometime, Zano will stop powering up the GPS if the battery drops below 30%. This is so there should always be useful charge in the battery for flying :-) To keep all these systems running and to keep Zano 100% ready is why we are making the ZanoFUEL stick. I hope that helps. Regarding the battery charger and the spare. The onboard charger is a dedicated LIPO charger and a very capable device. It maintains not just charges the battery. Yes, there is a charger for the spare battery too. Hey Doug: Regarding propeller guards. Fair point. I suspect many developers will make these available through www.flyzano.com. I'm sure some will be pretty neat additions. It is to support ideas like this that we are making 3D models available for developers to use to create new parts. Does that help? Regarding your other comment, Very well put. It is because of untrained operators using larger UAV's and the potential and quite serious risk of injury that UAV laws are coming and are likely to be quite strict, especially once someone actually gets seriously injured. For these reasons we are keeping Zano to sub 60g and will work with the legislators to keep Zano legal and that may mean implement various range, altitude, location restrictions if a various region requires it. To give you an idea, No 10 Downing St in the UK and the White House in Washington are two places to name just two, where Zano will restrict itself flying over the perimeter fences. Hey Sheri: Regarding the case with a battery and allowing Zano to be pre-charged. It is a good idea, basically what we are trying to do with the

ZANO GLE. You can connect ZANO GLE to your ZANO and then put it in the case so ZANO stays 100% ready for action. Regarding the autopilot options, good point and yes those configuration are available. You will be able to set the threshold at which a safety engages and ZANO comes back to you, or holds it position etc. Hey Joey: Regarding periodic GPS lock, thank you, it does work very well too. The GPS draws 50ma when acquiring, if this happens every 30 minutes for 1 minute, after 30 hours, it will have used 50ma hours or about 10% of the battery. However, the GPS lock will generally occur within a few seconds if outdoors so 10% of the battery will last more like 3 days as a guess under usual conditions. This will continue until the battery reaches 70% of charge at which point the GPS auto lock will be disabled to conserve power. Does that help? Hey Bosco: Regarding flying over water: What a neat and intricate idea. Would something simple like laser cut polystyrene foam pontoons like water planes use do the same job for you? The weight wouldn't be an issue. Hey John: Regarding windowing in the camera. Good question. Firstly its only useful for video because the camera is sub-sampling (reducing actual resolution) to output video. For example we use a 5mp camera (2592 * 1944 pixels), 1080p video is 1920 * 1080 pixels, this means using native pixels the field of view for video is smaller than for photographs. Of course you can sub-sample and make use of the entire array. However, back to my example. This means we have 300 pixels all the way around the video picture that aren't being used. So by using camera windowing, you can pan and tilt anywhere in this region which is about 20% FOV in any direction so it does give you a degree of movement. Now we are looking into a fisheye lens then using processing to remove the fish eye artefacts but this would make that 20% movable FOV cover a MUCH larger visible space and make the tilt and pan more like 40-50% in any direction. It is quite useful and doesn't decrease video quality at all. Does that help? Hey Doug: Thank you for your post and comment. Interesting isn't it. Hey Bosco: Regarding the SDK. Sorry, I don't quite understand your question or was it more of a general comment? Your quite right, the SDK will be available in lots of different languages and the WIFI module does support code in PERL as well as others. Hey jasse: Regarding flying in low temperatures. Absolutely. The electronics are designed to operate from -45 degrees to 80 degrees. Unless there is an ice build up on the motors, propellers or shell of ZANO, flying in -20 should be fine. I think I answered all the comments, if I missed any, please let me know. To the developers here, great comments, really looking forward to working with you. We will have to kick off the ZANO developer forum with a small developer conference. Would London or Cardiff work for any of you? Have a great morning everyone (afternoon now, sorry, I started typing in the morning) and I'll pop back later. Kind Regards Ivan @FlyZANO

[Dec 13 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

Hey Andreas: You just caught me, I was just about to close my laptop :-). Sorry if I

“ missed those questions. 1. I did post the link to the GPRS module. Did you get a chance to read it? I do not believe it is GLONASS, it is however a remarkable device with very good tracking at very low signal levels. If you haven't read the specifications on it, they are well worth the read. It is called the Origin NANO Hornet. Zano keeps a GPS lock too, it keeps the GPS powered up and keeps waking it up every 30-60 minutes to update the satellite data. Your phone through the APP can also send data to Zano so Zano can use assisted GPS to quickly lock on even if Zano is powered up from cold. 2. A Zano simulator for developers, yes. This would be an application you would run in your development environment and would answer the TCP socket connection directly so all the SDK libraries would work and not know they aren't talking to a real Zano. You would be able to configure all aspects of it so you can test your app. The simulator would also simulate a Zano by showing a graphic of Zano responding to your commands. I have an assembly language version that runs on a special development board that we built for the Zano project. It is as much for app development as for refining and building the firmware. We will port this functionality to a portable app to allow developers the similar functionality. Does that help? Thank you for showing such support for the SDK. As a fellow developer and engineer, I could talk ALL day about this. Just ask anyone in the office. :-) Have a great evening. Ivan @FlyZano

Dec 13 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone, Hey Andreas: Have you sent an email to hello@flyzano.com? Just asking because that would give me your email address. There are some documents that need agreeing before I can release certain interface specifications. If I have your email address, as soon as these documents are ready I could send them to both you and Matthew and any other interested developer. Once I received agreements back, I could start releasing early interface documents. Sound interesting? Hey Georg: Regarding motor RPM. Our larger UAV's with 5 inch propellers run at up to 12,000rpm. For Zano, we use coreless motors and they are typically rated to run the propellers at 3.0v at over 42,000RPM, our tests when we recorded nearly 100,000rpm, not actually quite 100,000rpm were done using a bench top supply with a supply voltage directly at the motor controller of 4.5v. We used a photo interrupter connected to a digital oscilloscope to display the frequency of interruption of the propeller through the IR beam. Obviously a two bladed propeller was interrupting the IR beam twice per revolution. The value we captured on the oscilloscope was around 3.2KHz. Divided by 2 gives 1.6KHz which is 96,000rpm. Does that help? Hey CMD: Regarding what to buy. My opinion is going to be biased :-) You are correct in that Zano will track his phone and also keep his phone as the point of interest whilst flying so it keeps the camera pointing in the direction of his phone. Regarding flight time, that very much depends on how hard and fast your friend is riding. It could be as little as 5 minutes or as long as 10-15 minutes. Regarding

following your friend on a Welsh road, up hill very likely it could keep up, down hill, I know friends who clock 50mph and Zano just couldn't do those speeds. Sorry I can not be more specific. Regarding seeing a wire, most objects that are even very small will create enough of a signature within 300mm of Zano. So depending on how fast Zano is travelling, it may well be fine even with something as small as a thin washing line thickness wire. Once again, sorry not a specific answer, more just an answer with information. I hope it helps. Hey Leon: Regarding a high speed UAV. Our Sparrow can lift 1.8 times its own weight has huge power to weight ratio. We aren't sure of its top speed yet but it is very very fast. Once we have the new version ready, I'll post some video as I am sure we could look to do a consumer version of this using ZanoTech :-)
Is ZanoTech too cheesy? :-) What you'd like to do with it, sounds awesome. Hey Larry, Hey Rudy: What about the voice from Knight-rider. We could always make the display flash like that in the car when it spoke? Have a great evening guys. Kind Regards, Ivan @FlyZano

Dec 13 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon everyone, Just logged on and noticed we are now less than £30,000 from our second stretch goal. Thank you so much to you all for helping us get here so quickly. We have some cool stuff in store and some more surprises coming. We are releasing a new 'In the Lab' video next week, I was hoping we could release it this week but it still needs some content, we want do things properly and make the video as interesting as the topic we are discussing. This next video is all about Zano and the technology behind it so I hope you find it interesting. Hey Mark: Regarding panoramic pictures. Honestly I had not thought of what you just suggested. If rotate Zano quickly and use the yaw gyro to determine what picture to take and when we could actually lean Zano forwards and backwards to increase the vertical height of the picture. Really neat idea, thank you. I can't say it will have that ability initially but that is definitely going into the planned upgrades which you will all receive. Hey Paul: Regarding the manually adjustable camera angle. Glad to hear it will work for it. We have been investigating using a fish eye lens and coupling this with the windowing function too to allow a fair degree of pan and tilt from the camera itself and using post processing to remove the fish eye effect from the video. I will certainly look into a later add-on for remote tilting the physical camera. I have a few ideas but weight is the issue, with a bit of time, I am sure we can overcome that hurdle. :-) Hey Rudy: Regarding a swarm of Zano's. That is great. Sounds like something out of Robocop. (Now I'm showing my age :-)) Hey Matthew: Regarding PCB layout, thank you for your suggestion. The motor controllers are located close to the motors to reduce radiated EM from power tracks. This is done by capacitively de-coupling the power rails at either end of the arm so the pulsed current being fed to the motors is smoothed out and not radiated across the entire board and through all power planes. There is always a reason to my

madness :-) You're quite right about how strong FR4 is, the flight frame is FR4 fibre glass and is incredible strong. Coupled with Zano's tiny weight, it simply doesn't have enough inertia to break the frame even if it slams into a solid object. I have tested this accidentally :-) Hey Andreas: Regarding the thermal camera. Excellent and thank you for the heads up. I'll look into it. Hey Paul: Regarding the motors being attached to the frame and about its strength. Fair question and let me assure you Zano is very robust. Because it is so light. Let me give you an example. Try and throw a bird's feather, it quickly slows down and when it does land even though it is quite fragile, it isn't damaged. Now Zano isn't quite the same but a similar principle. For the strength of the FR4 fibre glass frame (PCB material) and the weight of Zano, there isn't enough inertia for Zano to get badly damaged. I had one tumble from over 10m (30ft) up during early testing, it smacked into a car in the car park then landed on the tarmac. All that happened was one propeller was damaged. I replaced the propeller and launched it again without issue. Does that help? Hey Simon: Regarding the red version. Have you been in our office listening? :-) I'm not giving away spoilers. :-) Love the idea though. Italian job :-) Hey Andreas: Regarding Zano's response time to obstacle avoidance. Good question, to answer I'll give you some information as I haven't tested your scenario. The obstacle avoidance sensors run at 1,000 times per second as does the motor update and stability routines. Consider Zano can reverse a motor in less than 200ms (a fifth of a second), Zano should be able to get out of the way of virtually anything assuming we tune the avoidance systems to allow such rapid responses. Does that help? Hey CaffineJunkie: First off, what a great name. A kindred spirit :-) Regarding following a dog using image processing. Quite likely depending on how quickly the dog darts and weaves. We have a few hardware add-ons coming in the new year that will assist with dog tracking or seriously rapid movement and tracking of targets. Does that help? Hey Jose: Regarding Sparrow and our other UAV's. Firstly thank you for your support. We have always been a typical commercial research firm, clients come to us with problems and we try and solve them, we re-invest profits back into developing our own projects. As a business we have grown continuously and steadily and got ourselves into a position where we could take a risk on Zano and put a great deal of our own resources behind it and get it to what you see before you now. Beyond that, this is our first ever project on any form of crowd funding platform so we really didn't know what to expect or whether people would even like the idea of Zano. Wow, we got an answer to that one and have been blown away by the support, thank you all so much. Will we do another project on Kickstarter? I would say yes, we have so many great ideas ourselves and suggestions from you all that have gelled into what we believe could be awesome add-ons and standalone products including special requirements, heavy lift or super fast (seriously fast down hill skiers or motocross races) UAV's that we could apply the Zano technology too. Knowing that you want to be notified of any future such projects, absolutely, it would be our pleasure to ask for your involvement along with all our backers. Thank you to everyone of you. Hey Joerg: Regarding a WLAN bridge and controlling Zano via VPN etc. I think others

have already answered this for you but to confirm, yes absolutely. Zano uses TCP/IP (The internet protocol) for communication and this allows any manner and any distance of communication using everything from high speed satellite to cable and DSL modems. Does that help? Hey Rudy: Regarding the docking station and remote charging. Your correct, remotely inserting a micro USB would be very difficult but a small device that clips under Zano and connects to the micro USB could allow inductive charging or we could use direct electrical connection to small magnets on the feet to provide the power to the onboard battery charger. I am looking forward to the docking station project. I think that will be fun. Hey Oliver: Regarding automated flying, photos, charging etc. It is a great idea and one that has attracted a huge support base here amongst the Zano backers. I can see so many possibilities. I think it is safe to say we will definitely build such a charging platform after your Zano's have shipped. Hey dzikri: Regarding the tiltable camera. Yes, you would need to adjust it before launch. Regarding what the maximum angle will be, I don't know at this stage. We are working on it but have not yet finalised a design. It was requests from this kickstarter campaign for that function that prompted us to look for a way to build it. Stay tune and as soon as we have a working version of the camera gimbal, I'll let you know and show you a video of it too. Thats all for now folks. Have a great afternoon and I'll pop back later. Kind Regards, Ivan @FlyZano

[Dec 12 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey there everyone, I can't stay away from a good question. Hey livio: Regarding holding position then snapping a shot. That sort of result is from taking stills rapidly then choosing which still you want. Using motion detection is a great idea as an additional function we can release through firmware updates. Hey Paul: Regarding the angle of some of the videos. The prototype didn't really have the camera fixed, it was held in place by the top and bottom plastics and as such we were able to re angle it. We are aiming to have a manually adjustable camera angle in the production version so you can achieve the same result. Does that help? Hey arnel: Thank you. Me too. Hey Yannick: thank you for your message. We have another product called Sparrow which is larger and which has been under development for sometime. However not being a huge company we choose to focus on Zano first then release the larger UAV as tooling and production etc for that is going to be substantial. We may well do a consumer version of this too and knowing that some of our Zano backers might back that too is a really good option. Much appreciated. Have a great morning, I'm heading out for a coffee :-) Kind Regards Ivan @FlyZano

[Dec 12 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, This is your friendly AI computer logging back on. Geesh Larry :-). My wife has likened me to an AI computer before but I assure you I do sleep and eat. I love those petabytes. :-) Hey Ramco: Regarding the family pack. Yes, every Zano will have two batteries, so packs of Zano's will be the same and each Zano will have two batteries. Hey Sheri: Regarding the camera add-on etc. I'll explain our thinking if that is ok. One of the issues is that if we add extra pledges, you can still only back one pledge. The other issue is that we will only promise to deliver what we know we can and the camera is something we will work on but can complicate things very quickly if not managed carefully. We have a detailed project plan that we are working too, working backwards from our ship date in June and can make adjustments such as changes to boards if that fits within the allocated time. Anything outside of that, has to be carefully managed to ensure we still hit our date. We certainly will offer some neat camera upgrades but once Zano has been shipped. We also have an Thermal imaging camera (LEPTON

http://www.flir.com/uploadedFiles/CVS_Americas/Cores_and_Components_NEW/Products/Uncooled_Cores/Lepton/FLIR-Lepton-DataBrief.pdf) that will be made available very shortly after Zano has been launched. Hey T Kap: Regarding promising stuff to keep people happy. We have had declined a few requests simply due to financial feasibility. Some like camera upgrades we have agreed to do but at a later date as to not disrupt the Zano project timeline or affect costs and some that we can adjust and build in now we have agreed to do. We are a passionate group of people but pride ourselves on always being professional. We have only promised to deliver what we know we can. :-) Hey Leon: Regarding an intern to remember all the items, I like Larry's response. No in all seriousness, every comment I have made here has been copied and documented internally and the key points extracted. Also, before I promise anything here, we (Torquing Group) have a detailed meeting to discuss the request, the implications, cost to project timelines etc. If we can genuinely deliver it and agree to it, I then respond back as such, if that helps, or just go with Larry's suggestion and I'm sure my wife agrees that I'm actually an AI computer :-) Hey David: Regarding controlling Zano using an iPad. Absolutely, you can control Zano from any iOS (iPad , iPhone, iPod touch) device. Hey Arnel: Regarding controlling Zano by touching a location on the screen and Zano flies there, absolutely. I suspect many developers will build all kinds of cool mapping apps for Zano. You could do exactly that, tap a location on the map and Zano will fly there and hold until you tap somewhere else. Does that help? Hey Lukas: Regarding the case and WIFI extender. Good thoughts, I'll feed those to the guys working on the case. Thank you. Hey David: Regarding a higher resolution camera at this stage, if you wouldn't mind, I'll paste a response in here that I provided a few days back. I hope it helps make sense. If I may, I'll take a few moments of your time and explain why we have chosen the 5mp camera and what options exist to change this. If this gets a bit technical, please bear with me as I think overall it will make sense. Zano is very small and the main flight frame PCB has barely enough

room for a single processor and an SD card. SD cards are very slow in comparison to the high speed bus that modern digital camera modules use and therefore whatever data the camera sends has to first be buffered in the Zano main CPU whilst being written to the much slower SD card. Now this isn't a huge issue but it does require a great deal of careful coding to make the Zano operating system as efficient as possible to get the frame rate as high as possible from the camera. Now onto the camera, there are two types of mobile phone camera busses, DVP is the first and MIPI is what most phone are using now. DVP is a parallel bus standard which means it transfers an entire byte (8 bits) at a time and a lower clock rate where as MIPI (used in most mobile phones), supports cameras up to 23mp but is a serial interface and as such runs at a hugely fast clock rate. So for a MIPI camera to have the same frame rate as a DVP camera, the MIPI camera might use 2 MIPI channels, combined they are 1/4 the speed of a DVP bus so require 4 times the clock frequency. Bear with me. Why don't we just use MIPI I hear you ask? Zano is a massively dense and complex board and handles a great deal of power (electrical current) when flying. This electrical current effects digital signals such as those from high speed serial camera's. Have you ever heard that click click noise that happens when you put your mobile phone close to a radio? It isn't the same but similar effect, the power going to the motors affects the digital signals. The slower the digital signal (lower clock rate as per my DVP and MIPI comparison above), the less susceptible the digital signal is to this noise from the motors. We use DVP because it is less susceptible to electrical noise but this does mean our choice of native camera's for Zano is more limited. MIPI can solve this problem too because it is what is called a differential logic bus. However, DVP vs 8 channel MIPI, this would equate to both transferring 8 bits at a time, MIPI requires 17 digital lines where as DVP requires 8. We simply don't have the room to support an additional 9 data lines. There are ways around this but it gets very complicated very quickly to explain and there are reliability reasons why we can't implement these changes. However, we have an adaptor board that we use in another one of our UAV's that connects to the same Camera port that Zano uses. This adaptor board provides thermal imaging to one of our other UAV's and is a direct replacement for the camera that UAV is fitted with. The current camera we are using also meets the tight cost constraints we have for Zano, if we change the default camera to a much higher spec camera, that cost will have to be reflected in the sale price of Zano. So where does this leave photography enthusiast? We will design and build a camera adaptor that allows Zano to use all the latest MIPI camera's up to 23mp and make it available as an add-on through the www.flyzano.com store once we have shipped the Zano's. If you want superb photos from such a camera, you can buy the upgrade and easily fit it yourself. This upgrade would be a simple matter of unclipping the top and bottom of Zano (the two main plastic parts), unplugging the camera, plugging in the new camera and putting Zano back together. The firmware update would then automatically be applied to make use of the new camera and associated adaptor board. These larger camera's will weigh a little more but should still be within a few % of the total weight of

Zano so the shoot to night time will be minimal. Now I'm not saying we are only going to use the 5mp camera OV5640, if I can find another suitable camera (which I am looking for) that meets the size, weight, price and interface standard yet offers higher resolution, I will definitely look to making it the defacto standard and still make the upgrade above an optional item for those who want it. Does that help and make sense with regards to the camera? Hey Doug: LOL, that made me chuckle. I allocate time three times a day to respond to these messages. I have to stop myself logging on more as I still have a great deal of work to do. My schedule means I need to have the production revisions of the Zano PCB done in the next 8 days, then I'm off for a bit then back into firmware early January whilst a large part of the Zano team is in Las Vegas at the CES show. Hey David: Regarding file formats, I'll explain with some additional information. To reduce processor load and keep frame rate as high as possible, Zano will store a less compressed video format on the SD card, when you download the video from Zano over the WIFI, the Zano app will convert this into a standard compressed file format. We will build as many formats in here as possible. Have a great morning everyone and thank you as always for your support. I think I covered all the questions and comments, if I did miss anything, please let me know. Kind Regards, Ivan @FlyZano

[Dec 12 2014](#) on ZANO - Autonomous . Intelligent . Swarming . Nano Drone.

“ Hey Eirikur: Regarding flying in the rain. Zano isn't water proof, it is water resistant. Also heavy rain will quite quickly add weight. The spray from the propellers could put water into all kinds of uncomfortable places for Zano hence we recommend flying in almost anything apart from heavy rain. Hey Lukas: Regarding the range extender, good question. It will be quite small but the largest part will always be the antenna as once again, physics causes issues. The larger the antenna, the higher natural gain on transmit and receive and therefore the better range. We may well be able to fit the antenna in the Zano carry case lid and will try to do just this. Hey Hiroaki: Thank you. Hey Dave: Regarding the camo case, it will be a premium case like the limited edition case. Have a great evening everyone and I'll be back in the morning. Kind Regards, Ivan @FlyZano

[Dec 12 2014](#) on ZANO - Autonomous . Intelligent . Swarming . Nano Drone.

“ Good evening one and all. Sorry for the delay in my responses today. The trip from Pembrokeshire where we are based to Manchester airport is the best part of a 12 hour round trip. Anyway, I'm back. :-) Hey Matthew: Thank you, I wasn't sure what time we would arrive back this evening and whether I'd be too tired. Everyone here is chilling out so I thought, cool, I'll pop on and say Hi! Hey Larry: No problem at all, thank you

though. I posted this morning on the way to the airport and just got back, got everyone settled and sat down with a cuppa. :-) Hey Bob: Regarding flying autonomously a fixed path, video along the way, land and recharge is a great idea and something you could certainly do. The SDK will support all kinds of neat functions like this. It would be ideal to automate the monitoring of wild animals for instance. Thank you for your kind comments too. :-) Hey Andreas: Regarding payload capacity of Zano. The prototype Zano was able to carry its own weight but couldn't really carry much additional payload. The prototype used 3D printed plastic parts etc so definitely weighed more. The production unit will be injection moulded using plastic with the lowest specific gravity but with the density and flexibility to perform the duties of protecting the Zano electronics properly and under as many possible conditions as we can cover. The upgraded motors will provide substantial increase in total lift capacity. This is partially to allow it to fly better in low density air such as high altitude, flying off the side of a mountain etc. It can do it now but we want Zano to perform brilliantly under all conditions hence the upgrade to the motors for production. I would expect a 25% of total weight as a maximum reasonable payload. If Zano in production weighs 57 grams, then the maximum payload I would expect to be 25% of this. Hey Kelly: Thank you for backing Zano and thank you for your question. Regarding stable HD video, something as small as Zano will always struggle to compete with a 1kg UAV with Gyro stabilised gimbal. Physics gets in the way :-) However, Zano being so small is legal to fly in places larger UAV's aren't and probably won't even attract attention so it will provide opportunities to record video where you'd never be able to with any other UAV. Using all the various compensation and stabilisation functions we are building in, I am confident that you will get HD video that captures the moments you want in the quality you want. Does that help? Hey Doug: Regarding protecting the propellers. Good question and thank you for asking it. Zano under all but extreme conditions should never allow you to bump anything. The in built obstacle avoidance will kick into overdrive in you task Zano within 150mm of an object, let alone close enough to damage the propellers. The obstacle avoidance works out to 1.5m (5 ft) under many conditions. To give you examples of what I mean by extreme conditions, a complete failure of Zano electronics or being physically hit by a tennis racket or the like. A message to everybody, please don't do that to your Zano. They may be tough but ouch :-) Does that help? Hey Joakim: Thank you and glad your involved. We would love to see some of the footage you take if you'd be happy to share it with us once your Zano arrives. :-) Hey Reiter: Regarding optical stabilisation, good question, thank you for asking it. We will provide upgraded cameras as optional add-ons through the www.flyzano.com store once the Zano's have shipped as we develop the various upgraded modules. Your quite right, some smart phones use such cameras. Zano has lots of restrictions, the primary two being cost and weight. We have very tight cost restrictions for Zano and every gram matters so are working to find the best camera for the job and make this the defacto standard, for those who want better camera's, we will work to release various camera upgrades. The camera can easily be changed with

but the use of any tools so is a very easy job. Does that help? Hey Michael: Regarding a new video and update. I was chatting to the guys in the office (whilst I was travelling to the airport today) about the new video and they want some more content for it before we publish it. Once it was all put together, they felt it was a little brief and they wanted me to add some more explanation as to what we are showing etc. I will shoot this additional footage this week and early next week so we can post the new 'In the Lab' video on Wednesday as well as an update to accompany it. The video will show some really cool features, no spoilers but it will be worth the wait. Remember, the 'In The Lab' videos are to show you a progression, piece by piece building on the previous video to the final outcome. Hey Sheri: Are you happy with my earlier response above regarding the propellers and indoor flying? Regarding out of range modes for Zano. These are configurable. You can choose for Zano to hold position, or to fly back to the last position your tablet or phone notified Zano of its position or Zano can fly to another location that you can mark as home. Does that help? Hey Christian: Regarding following indoors, as your phone or tablet isn't able to broadcast an accurate position information, even if Zano knows where it is, it can't follow. However, we are working on developing some generic inertial tracking algorithms that work on all phones and tablets to allow your device to send Zano more accurate position information in doors. We are also working on video tracking so if you were flying in doors and selected a person for Zano to follow, the video tracking would track them in or out doors. Regarding flying through doorways. Zano will automatically centre itself on a doorway and should always avoid collisions. If however you step through a doorway the move left or right, even when we get inertial navigation on your phone or tablet working (this will happen in time), Zano would copy your movement but would be on the opposite side of the door. Now using the SDK, developers can build all kinds of apps to follow you through complex environments by extending Zano's core abilities with maze solving algorithms etc. Does that help? Hey Bosco: Regarding the range extender: It will be likely be a combination of custom made antenna and utilising some pre-existing nano modules suitable for this purpose much like our high grade range extender for our other UAV's. Hey Nathan: Thank you, regarding lost Zano, be gentle :-) We will take all your feedback and continue to refine its avoidance systems, some of you might find them too aggressive and want them toned down and some might find them too gentle. You can do quite a bit of tuning yourself but the finer control algorithms will continue to be refined and released to you all through the Zano app. Hey Oliver: Regarding tracking this project. I think a few people have already pointed you to KickTraq. This is a great site and shows we are currently trending towards very nearly reaching our final stretch goal. We do have more promotional activities lined up so we should get pretty close to that final goal. Regarding the cheesy idea. I think its great. How cool to have message displayed on a number of them. I can see lots of moments where that would be cool. Hey Larry: Regarding the upgraded motors. Very good question and great attention to detail. You are absolutely correct. One of the final aspects before I can finalise the production boards is indeed to test the upgraded

motors on the prototype. We have a production 3D printer which we use for everything (Yup, we have printed novelty coffee cups, pens, impossible puzzles :-)), so we printed some adapters to allow albeit not exactly where they will sit on the production unit, but allow the larger motors to be tested on the flight frame and the control electronics. The issue is the current motors are 6mm diameter, the new motors are 7mm, therefore can't directly fit the existing flight frame hence the little adapters we printed to allow testing. We have done some testing but we are thorough so will perform a full suite of tests before finalising the production boards. Hey Rudy: Regarding the early release of the SDK, noted and thank you. You can leave your Zano plugged into your USB port and it will stay powered up continuously once the onboard battery is fully charged. I did this in the firmware mainly to allow easier development for my team but your absolutely right, this could really help developers, I'll leave it in the production firmware. Does that help? Hey Andreas: Thank you and really great to have fellow developers as excited about Zano as myself and my team. It isn't work to us, I actually have to tell the guys to go home. :-) Noted about the early release. I'll see what I can do. :-) Oh, I just filled the comments box. Wont allow any more letters.....

[Dec 12 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, I logged on this morning and had a chuckle reading some of the messages, thank you, what a great way to start the morning. What a topic, time relativity when travelling near the speed of light. Hey Bader: Regarding propellers in carbon fibre, we will look into these as an add-on once Zano's have shipped. Regarding the frame being carbon fibre, though it would look cool, we simply can't as the frame is all circuit board and tiny circuit tracks run up and down the arms. We are looking into add-ons of carbon fibre tops and bottoms. Hey Grant: Regarding the change in format, your most welcome. It actually makes it easier for me too, thank you for suggesting it. Regarding uncontrolled decent or crash detection, yes absolutely, Zano will power itself off to protect itself and people around it. Regarding recording 1080p video. Yes absolutely. The firmware update in stretch goal 3 will allow the app to download videos from the SD card after Zano has landed using the WIFI link. Hey Adam: Regarding the RGB display being modular, good idea, it is a separate module. If you remove the top and bottom plastics of Zano, the display does just unplug. No tools required. An OLED display, or more room for a higher resolution camera, neat idea. Hey Hiroaki: regarding WIFI conformance in Japan. Really good question and yes I can confirm the WIFI module we use conforms with Japan. It has the following certificates; FCC Class B, UL and EN EMC, Japan, AU/NZ. Does that answer your question? Our module is designed and built by Lantronix and a large part of their business is WIFI in Japan. If additional certification is required, we will work directly with a Japanese certification facility to achieve this, we will do the same with each

region. We will also be working closely with regulators in each region to ensure Zano stays legal as new UAV laws come into play. Does that help? Hey underhund: Regarding the RGB display. Thank you, really great to see other people like the idea. When I conceived the RGB display, I had a few ideas of what it could be used for but I know I barely scratched the surface. Once developers get hold of the SDK, who knows what that humble little display will be used for :-)

Hey Mark: Regarding find my Zano using Bluetooth. Another good suggestion. Thank you. Hey Larry, Hey Leon, Hey Matthew, Hey Ben. Thanks guys. I enjoy reading your comments and banter. For me, it is now part of my daily routine. Wake, get ready for work, have breakfast, log in to this campaign and respond, then head to work. Same thing at lunch, then again after dinner. :-)

Hey Bob: Regarding relaxing an SDK. Absolutely we will be releasing an SDK. I envisaged the SDK a while back and we mentioned as part of this campaign an SDK. However the enormous support and demand for the SDK shows there is already a huge community out there ready and wanting it. Matthew, one of the backers has already started designing things for Zano. He and I are discussing items offline and the potential for developers using the Zano SDK is fantastic. I'm looking forward to seeing what developers come up with. Regarding range extending, Matthews answer is spot on, you could use a high power wifi router, we will also be releasing a Zano special version of our range extender we have for our other UAV's, does it answer your question? Regarding spares available later, Absolutely. Everything Zano related from add-ons to spares will be available at www.flyzano.com, third party apps, add-ons, hardware will also be available here. Thank you for joining Zano :-)

Nice to have you here. Hey George: Regarding shake on the video and stability in gusts. Good question, I'll answer with some information if that is ok. Zano firmware has 200% control over each motor and updates each motor at 1,000 times per second. How can Zano have 200% control over a motor, isn't 100% the maximum I hear you ask. Well Zano can reverse the motors from full speed one direction to full speed the other direction in less than 1/5 of a second. Most UAV's stability can not hit 100% let alone reverse the motors. Zano is very small, it weighs less than 60grams so physics does get in the way as we simply don't have much inertia to help. To deal with this we;

1. Designed and implement awesome physical stability using reversible motors and special stability algorithms.
2. Using the cameras windowing functions we perform a limit video stabilisation in the UAV.
3. We provide free of charge our HPC(Super computer) which is dedicated for Zano. This computing monster allows you to upload videos and photos and choose what filters, correction algorithms etc you want to apply. It will then apply these for you and push the content to where you have chosen, social networks, video sharing sites etc.

Does that help? Regarding videos of Zano in different conditions. If you watch the video, Zano in action, there are quite a few shots of one of the Zano prototypes flying. Admittedly it was fairly good weather. The Zano prototypes used much smaller and less powerful motors when compared to the production Zano's as we noticed Zano would benefit from more powerful motors. I expect to have the first 10 pre-production units back mid January with all the updates,

microSD card, bigger motors etc. If you want videos of the prototype in various weather, we can arrange this however it isn't indicative of the production unit as the production unit has 30% more powerful motors and weighs 3% more. We are also reducing the cross section of Zano which will reduce the area that wind can push against. Are you happy to wait until mid January when the first 10 units are completed? We will continue to post videos and detailed progress updates for all backers right up to June when your Zano's ship. Hey Leon: Regarding uploading to our cloud and privacy of your data. Great question, let me answer with information. 1. Your user account is completely sandboxes without our HPC. There is no way for your data to leak to other users. 2. I'm completely paranoid about network and data security and the HPC runs fully patched and updated Linux virtual machines that are created and destroyed as we need them. The HPC also sits behind full IDS and UTM security hardware devices. IDS means intrusion detection system, this monitors authentication, IP addresses, login cookies, total flow of data. UTM means unified threat management device. This also has an IDS component but also firewall, packet inspection, real time virus scanning etc. 3. We comply with the UK data protection act. 4. You can choose to process then delete your data or store it and share it through the www.flyzano.com site. 5. You can choose to exclude your account from our back up systems and when you delete content in your account, it physically gets deleted then overwritten on our network storage system. Does that answer your question? Hey Ben: Thank you, you have been a huge supporter and answered so many queries for other backers, what a great community! Hey Andreas: Regarding find my Zano. Ahh, I misunderstood. I like your idea. So if Zano suddenly stops talking to the app, the app should switch straight to a map such as Google Maps and put a marker where Zano last reported its position. Really good idea and simple too. I'll make sure this function is standard in the Zano app. Thank you for this suggestion. Regarding early release of the SDK, can I ask, do you think developers be happy with an alpha release SDK which will likely go through a few changes and iterations and may well be a little light in information if we release it early? We would obviously continue to refine and mature the documentation but there is a huge amount to document which is Sent from my iPad Regarding additional items and the survey. Sorry I missed your question, I see your dilemma. Would you be able to respond in February or March? As Zano is scheduled to ship in June, we wouldn't need your additional item request in January, later in the year but before Zano ships would be ok. How does that sound? Would you have access to a phone? We could also put your preferred contact method as phone and someone could call you to reserve the additional items for you. I'm off to the airport to meet family flying in so forgive me if my responses are a little slow today. I've typed all the above on my iPad as we are travelling in the car. No, I'm not driving :-)) Have a great morning everyone. Kind Regards Ivan @FlyZano

“ Oh, I forgot to reference each question. Sorry :-(

Dec 11 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone, Before I respond to the comments below I wanted to express something to you all. Many of you have complemented us (Reece on emails and myself on comments) for our communication. Thank you, your appreciation means a lot. I want to add that it is not a chore, we both look forward to seeing what awesome ideas and suggestions you have and we both genuinely enjoy the communication. To me, I've probably got the best part as it feels to me like a conversation with a great group of people who share our enthusiasm and excitement for the project and the technology. This isn't work, this is fun. Your enthusiasm and excitement encourage us to do more and be more innovative and to challenge even more what others have said previously was impossible. So in response to all your thanks, what is needed is thanks from us to you for your support. So Thank you to everyone of you. You make the communication easy. Hey Doug: Thank you for your support and kind comments. With regards to the fisheye lens options, if we don't ship with it initially, the camera module is very easy to replace and would require no tools. The lens is integrated into the camera module itself. With regards to post processing and how it would work. I would suspect that most users will use it like this; 1. Fly Zano and get some awesome video/photos. These will be stored to the local SD card and to your phone or tablet if you choose. 2. Transfer the videos to your phone or tablet over the WIFI link to Zano. 3. Using your home WIFI, WIFI from a hotel or wherever you are or even your 3G or 4G connection, send the data to our HPC (cloud) for processing. 4. Once uploaded through the app you can select what filters and options you want applied to it and where if anywhere you want the video/photos uploaded too. This could be any of the major social networking sites, video or photo sharing sites etc. 5. Our HPC will schedule your job to occur ASAP, generally within seconds. 6. Upon completion (should be very quick but if a big movie might take a few minutes) our HPC will notify you through the Zano app that the job has completed. This may mean just processing is completed if that is all you have asked for or it might mean processing and uploading to your chosen sites has completed if that is what you have asked for. That's it, as simple and easy as that. No PC required anywhere along the line, all done from your phone or tablet. Does that make sense and help explain the process? Hey Cmd: Oh, good question. The altitude restriction is relative to your tablet or phone. So if your up the side of a mountain and you wish to fly it over the edge to get great photos, the minute the ground disappears, Zano will swap to air pressure sensing and the altitude is then relative to the user. Does that make sense? Thank you for the support. Hey Michael: Thank you for the support and great idea. Our mechanical dude (Thomas) in the office was with the RAF for 12 years. Rather than working on aircraft he now designs all the mechanicals for Nano UAV's. I think he will really like the Red

Zano. Leave that with me. Hey Ego: Sincerely sorry, I just to read the comments and realised I missed yours. The camo case along with all the cases will have as much storage as we can fit into them without compromising the integrity of the case. This will be little elastic pouches, slots, all kinds of places to store your Zano and related attachments. How does that sound? Hey Sheri: Thank you for your reply. As soon as I can post footage and photos from the production camera, I will do so. It will be raw and unedited so you can see the actual footage captured before any post processing done. Hey Holger, Hey Nathan: Holger, that is a really neat idea. Let me brain storm an idea with you. If Zano for whatever reasons detects a crash (rapid uncontrolled acceleration on any axis, such as hitting the ground at speed) and is not able to return to your tablet or phone GPS, or if it returns to where your phone or tablet last reported its position but does not have a signal with your tablet or phone that it makes a siren noise through the speaker and flashes all the landing lights and front display varying colours to help you locate it. How does that sound? Easy to implement in the firmware too. Have a great evening everyone and as always, thank you for your continued support. Kind Regards, Ivan @FlyZano

Dec 11 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi everyone and good afternoon, Hey Sheri: Regarding unedited videos and pictures. Did you get a chance to see my response to your earlier question? I can show you raw content from the previous camera that we used on the prototypes and used as part of the campaign videos but it isn't the same camera as we are going to be using in production. If you are happy to wait, as soon as I have one of the development Zano's back together and working with the new camera, I will record some video and photos and post them in their raw unedited form. If you want to see raw content from the prototype units camera, then let me know and I'll sort that for you. How does that sound? Hey Mike: Regarding whether Zano records to the SD card. Yes, full video and photos will be recorded on the SD card and record to your phone It is your choice. Your Zano, Your way :-) Geesh it does sound cheesy :-) See stretch goal 3, that covers the firmware upgrades to support this. Hey Arnel: Regarding the motors being brushless or not and what is the lifespan. The motors a coreless motors and are the best solution for a UAV of this size. Brushless motors only really come into their own when UAV's get larger due to the efficiency gains as well as longer running life. Zano also has the ability to reverse the motors as you will see from a video that will be posted soon for you all to see. We have not yet had any motor failures but we will run a full control test on motors and lifespan for the production units once we get the first batch built. Hey Arnel: Regarding larger batteries and longer flight time. Matthew is quite right and there are substantial limitations on how much more flight time that can be achieved by simply using bigger batteries. We are looking into making two battery sizes available, a standard and an extended flight time battery. Our concern is that the

extended night time battery may tip Zano over the 80gram limit, for some regions this won't be an issue. We will do whatever we can as part of our engineering to lighten Zano and focus on efficiency as through design is the best way to increase flight time. Hey Skippy: Regarding our delivery estimation. We will do everything we can to meet that. We have project plans working back from our intended ship date to put all the milestones in place that we need to meet in order to ship on time. Sounds like an awesome hike. Have fun and please send us video/photo from Zano, we would love to see what you have taken with it. Hey Nathan: Regarding ship date for the camo-zano :-)

Our goal is to start and finish shipping within 4 weeks. We will immediately on completion of this campaign place orders with all our suppliers and that includes ordering the camo-zano plastics, cases etc. I would expect that they will be built and shipped at the same time. Hey Szabolcs: Regarding if you can use your normal 2.4g radio handset for Zano. Sorry, the 2.4g radio uses a different protocol. Zano is tasked not controlled like normal UAV's so it has its own native language. Hey Guiseppe: Thank you. Hey Grant: Regarding communication and making mention of the question at the start of my responses. Thank you, I genuinely appreciate it, I also genuinely appreciate suggestions. Does the format I have used in this response cover what your saying? I have referenced the key part of the question and then responded? I do see exactly what you mean too, when I am putting together these responses, I get lost sometimes, even though I double check I think I sometimes miss someones question. Hey everyone: I think the rest of the comments were about the SDK. Andreas raised a really good point. Thank you Andreas. His query was about releasing the SDK before Zano's ship in order to give developers time to start developing. I have to say, the Kickstarter community but especially all of you, our backers have made a real difference and a really positive one to this project. Great ideas and suggestions just keep coming. I like your idea and as I write this more support for your comment arrives. I will give it some serious thought and see what we can do (help us hit the stretch goal and its even more likely :-)), thank you for suggesting it. As I mentioned, I think the rest of the comments were in support of Andreas's comment. Have a great afternoon all. Kind Regards, Ivan @FlyZano

Dec 10 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

- “ Good morning everyone, Hey David: At the end of the campaign, we will send out a survey to all backers. As part of tis survey you can select add-ons such as more batteries, or propellers etc. Does that help? Hey Jose, Hey Matthew: Thank you Matthew for assisting Jose. I agree Jose, the Kickstarter community is exactly that, a community. Matthew and many like minded backers have assisted lots of our backers and answered many queries. Hey Alvin: Absolutely. ALL pledges from £139 and above include two batteries, the main and a spare and two sets of propellers, the ones fitted to Zano and a complete spare set. Hey Mike: Really good point, I'll get the next

updates to include a list to date of changes/updates. Hey Ben: Absolutely. Zano exposes the video stream as a separate stream when using the API. A very simple app or program on a desktop could task Zano and use the video stream from Zano for live streaming. Hey David: Really sorry to hear you have had a rotten week. Not sure if it helps but with the super early bird, the price we set that was just about a break even price if we just hit our goal so you really do have exceptional value. I was chatting with some people in the office and showing them how rapidly the cost of materials and production reduce from building 1,000 units to 5,000 units. Being a perfectionist myself, there are lots of short cuts most consumer products use to get the cost down that I simply won't allow. We genuinely want Zano to be superb quality and really good value. That is the reason why we need to get volumes up so the cost of manufacture comes down and we can put more functions in for you all. Does that help? Hey Dataway: Good question, I did cover a bit of this some time back when I was outlining the SDK to a few backers. Yes, Zano supports over 500 way points, each way point effectively has a point of interest GPS location and a GPS location of where you want Zano to fly. Does that help? Hey Marco: Thank you. Yes, the camera would function exactly the same way as the standard camera. When will it be available? Honestly, our first priority is getting Zano's built and shipped to you all. Once that occurs, we have about a dozen small modules and add-ons that we will work on and release of which one is the camera. During the early months of 2015, I will give you all a list of the 12 or so add-ons that we are planning to build initially and get your votes as to which one is the most important to you. Does that sound fair? On the SDK side of things, you can communicate directly with Zano from ANY programming language from any platform if you can open and handle TCP sockets. We will be providing libraries that handle this communication and expose the internal functions of Zano in an easy to use format. These libraries will be a lot easier for developers to use than communicating natively with Zano but if your happy to communicate natively with Zano, you certainly can. Everything will be documented in the SDK. Your genuinely welcome and thank you. Hey Sheri: Matthew is quite right, there are some photos through the videos from Zano, these were then edited into the video. I have another query from another backer asking for some raw unedited video. I currently have the two working Zano's is pieces (literally) whilst I work on firmware updates, the other 7 Zano's have been reflashed for display purposes. As soon as I have one of the two development units re-assembled, I will be taking some raw video and photos to share with you. Sound ok? Now, if anyone spots, 2 working Zano's and 7 display Zano's make 9 Zano's. I did mention in one of the videos that we had 10 built. I have to put my hands up here and say, the 10th is fried, dead, caput. I did a whoopsie months back when the 10 arrived and damaged one. Ok, so now you all know :-)

Hey Matthew: Getting close now ;-) Thank you for your support throughout the campaign. Hey Guiseppe: Thank you for your comment. We will release every piece of functionality covered by every stretch goal whether or not we reach those goals through this campaign. The stretch goals help us to achieve that functionality much sooner. This campaign is about getting the volumes of Zano's

up to bring the cost per unit down. The lower the cost per Zano, the more resources as a company we can allocate to building the functionality. If we hit all the stretch goals, all that functionality will be released a lot sooner. If we don't hit all the goals, the goals we did hit and the functionality they cover will be released first, and the rest will follow as we can allocate resources. The SDK is a key piece of documentation and functionality and I know there is huge interest in this. We will definitely release this, if we hit the goal, we will allocate resources to release this in June. If we don't hit the stretch goal, it may take a few months longer for us to release it but we will release it. Does that help? Hey fr0st: Good question, our plan is to offer all these add-ons at the end of the campaign. Does that sound fair? Hey Joseph: Thank you. Glad your involved. Have a nice morning everyone. I'll pop back later but in the mean time, have a good one Kind Regards Ivan @FlyZano

Dec 10 2014 on ZANO - Autonomous . Intelligent. Swarming. Nano Drone.

“ Good evening all, Hey Oliver: Great question. Yes, Zano is completely functional stand alone. Our cloud (HPC) will provide additional free services like video stabilisation. There are lots of apps available for most phones and tablets now to do the same thing, just not as quickly as using our cloud. No recurring costs, the cloud (HPC) is and will always be free of charge, high end users can subscribe to more storage etc but standard users will be free of charge. No need to upgrade, the upgrade options are simply new functionality. All bug fixes will always be free of charge. The Zano app will always be free of charge. You will receive free functionality updates for 12 months after you first register your Zano. Does that help? Hey Matthew: Not yet, once I know I'll update you. Your correct about the MicroSD card however I believe the fastest MicroSD card (90MB sec) can accept compressed 4K video not the raw frames for 4K video (1.6GBPS) This conversion and compression is done by a CPU sat between the devices. Hey Sean: Good idea, not as standard but we may be able to do an add-on which replaces the normal insert in the case for a landing pad once the Zano's have shipped to you all. Hey Joey: Absolutely, the landing lights are full RGB as is the display. myou can configure them to do whatever you wish under whatever conditions you select. Have a great evening. Kind Regards Ivan @FlyZano

Dec 10 2014 on ZANO - Autonomous . Intelligent. Swarming. Nano Drone.

“ Hey everyone, If I may, I'll take a few moments of your time and explain why we have chosen the 5mp camera and what options exist to change this. If this gets a bit technical, please bear with me as I think overall it will make sense. Zano is very small and the main flight frame PCB has barely enough room for a single processor and an SD card. SD cards are very slow in comparison to the high speed bus that modern

digital camera modules use and therefore whatever data the camera sends has to first be buffered in the Zano main CPU whilst being written to the much slower SD card. Now this isn't a huge issue but it does require a great deal of careful coding to make the Zano operating system as efficient as possible to get the frame rate as high as possible from the camera. Now onto the camera, there are two types of mobile phone camera busses, DVP is the first and MIPI is what most phone are using now. DVP is a parallel bus standard which means it transfers an entire byte (8 bits) at a time and a lower clock rate where as MIPI (used in most mobile phones), supports cameras up to 23mp but is a serial interface and as such runs at a hugely fast clock rate. So for a MIPI camera to have the same frame rate as a DVP camera, the MIPI camera might use 2 MIPI channels, combined they are 1/4 the speed of a DVP bus so require 4 times the clock frequency. Bear with me. Why don't we just use MIPI I hear you ask? Zano is a massively dense and complex board and handles a great deal of power (electrical current) when flying. This electrical current effects digital signals such as those from high speed serial camera's. Have you ever heard that click click noise that happens when you put your mobile phone close to a radio? It isn't the same but similar effect, the power going to the motors affects the digital signals. The slower the digital signal (lower clock rate as per my DVP and MIPI comparison above), the less susceptible the digital signal is to this noise from the motors. We use DVP because it is less susceptible to electrical noise but this does mean our choice of native camera's for Zano is more limited. MIPI can solve this problem too because it is what is called a differential logic bus. However, DVP vs 8 channel MIPI, this would equate to both transferring 8 bits at a time, MIPI requires 17 digital lines where as DVP requires 8. We simply don't have the room to support an additional 9 data lines. There are ways around this but it gets very complicated very quickly to explain and there are reliability reasons why we can't implement these changes. However, we have an adaptor board that we use in another one of our UAV's that connects to the same Camera port that Zano uses. This adaptor board provides thermal imaging to one of our other UAV's and is a direct replacement for the camera that UAV is fitted with. The current camera we are using also meets the tight cost constraints we have for Zano, if we change the default camera to a much higher spec camera, that cost will have to be reflected in the sale price of Zano. So where does this leave photography enthusiast? We will design and build a camera adaptor that allows Zano to use all the latest MIPI camera's up to 23mp and make it available as an add-on through the www.flyzano.com store once we have shipped the Zano's. If you want superb photos from such a camera, you can buy the upgrade and easily fit it yourself. This upgrade would be a simple matter of unclipping the top and bottom of Zano (the two main plastic parts), unplugging the camera, plugging in the new camera and putting Zano back together. The firmware update would then automatically be applied to make use of the new camera and associated adaptor board. These larger camera's will weigh a little more but should still be within a few % of the total weight of Zano so the effect to flight time will be minimal. Now I'm not saying we are only going to use the 5mp camera OV5640, if I

can find another suitable camera (which I am looking for) that meets the size, weight, price and interface standard yet offers higher resolution, I will definitely look to making it the defacto standard and still make the upgrade above an optional item for those who want it. Does that help and make sense with regards to the camera? Hey Darkz0r: Your quite right, personally I like the white and thought white would do well. I lost that bet in the office as black seemed to be much more popular. Hey Kev: Thank you, really glad that you have backed Zano. Hey Matthew: Thank you and noted. I'll see what I can do. Hey Luke: Flash, torch or smiley faces. The display can serve lots of functions :-)

Hey Joseph: Thank you for your comment and support. What do you think about my comment above regarding the camera? Hey Holger: Thank you, that is a huge milestone and it is because of the support from our backers. You are all great! Hey Stefan: Please know that every comment is important and does matter. Your concern is one that has been mentioned a few times and one that I am looking into options. If I missed any questions of yours, please let me know. Hey Lukas: Good point, we have a few idea's. I'll come back to you on that one. Hey Gabriel: Absolutely. Leave that one with me, Zano firmware is currently in pieces on the two development Zano's as I am working on the camera and the other Zano's have been reflashed ready for display reasons. The minute I get the firmware back into a working state, I'll record some video and post it unedited for you to see. That sound ok? Have a great afternoon and I'll pop back in later. Kind Regards, Ivan @FlyZano

Dec 10 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon everyone, Hey Bob: Zano in its default configuration will return to the last position that it was aware of that your phone or tablet was located. In the event of lost signal or low battery you can configure Zano to hold its current position, return to land or return to home. Return to land would come back to the last know position of your tablet or phone and then land automatically, return to home would come back to the last known position of your phone or tablet and hover, only landing when the battery is depleted. Hey Ben, Hey Jennifer: Jennifer, Ben is absolutely correct. Every Zano will come with a spare set of propellers and a spare battery. The reason this isn't in the description of the pledges is that once someone has pledged for a certain reward, we can not edit that reward or description. Our Kickstarter backers asked for a spare battery and those pledge levels had already been defined, hence they don't reference the spare battery or propellers. Does that help? Hey Dennis: Yes, every Zano will have a full spare set of propellers. Hey Matthew: Thank you. I'll have a look to see if there is a possibility of routing those signals. No promises though. Hey Jon: The camera is fairly good in low light but you can use the display as a torch or flash. Spare parts for Zano will be available on www.flyzano.com and repairs are very easy to do yourself. Most repairs wouldn't require any tools at all. Hey Alexander: Thank you. It is pretty neat. Hey Midhun: Absolutely, every Zano has a spare battery and a

can set or spare propellers. Hey Tim: Good question. Zano will return to the last known position of your phone or tablet. If you were flying from the shore line, then Zano will return to you there. Does that help? Hey Omura: Absolutely you can take photos and video whilst flying, following or even landed. Hey Ben: I think you will like the video. It is a short video, no spoilers :-)

Hey Tom: Your absolutely right. If a typical run took you 8 minutes then you'd be fine, Zano flying flat out manoeuvring all over the place is going to consume the battery much faster than normal flying. If your like me and my downhill skiing is more amusement for others than a sport then Zano could idle along with me catching all the embarrassing moments :-)

Hey Holger: I'm waiting on some information about lenses. Once I know more, I will update you. Have a great afternoon each and everyone of you and thank you as always for your support. As I write this we are now less then £115,000 from our second stretch goal. Every pledge, share and like helps us get the cost of manufacturing down and therefore allows us to add more features and functionality. If you wouldn't mind, sharing what we are doing here with anyone you haven't already and help us get the word out. Thank you. Kind Regards, Ivan @FlyZano

Dec 9 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning all, Hey Szabolcs: I was speaking with our camera supplier last night and am waiting on some pricing for a few options. I will see what lens options we can offer too. We will definitely offer different lenses as add-ons. I'm just trying to find the best match for the standard Zano camera and lens to meet 95% of the requirements. So the answer is yes, we will offer different lenses as add-ons, I just don't have the details yet. Does that help? Hey Lukas: Thank you your suggestion. We are actually working on a video at the moment, due to be uploaded today and some new rewards. Hey Jonathan: Sounds like a great idea. Zano electronics are rated to -45c so no problem there. Hey Matthew: Sorry, Zano is very tight on space. The top plastic his the electronics to within 1mm all the way around. On the expansion point, once again, sorry, every pin is used on the Microcontroller. By removing the RGB display you do get a high speed SPI port as well as power. Hey Sean: Thank you and glad you joined and thank you for your support. Noted regarding the batter combo. The camera itself is very easy to remove. We could certainly offer different cameras later on. You can charge Zano directly using a standard USB cable or the batteries can be charged externally. We will offer an external USB charger unit for the batteries as part of the end of campaign survey. We are working on a number of videos, the problem is, to take time away from finalising Zano to make more videos does slow the project down. However, we want to keep showing you all the cool features of Zano. I'll see if we can compile a video on the obstacle avoidance before the end of the campaign and use it as one of our in the lab videos. Number 3 is due out soon. Landing and take off are fully automated as is hold position and follow me. You hit a button to launch, that

battery then changes to land. If you press that button again, Zano lands completely controlled. Hey David: Thank you. We have some cool things in store for you all, new videos and new rewards coming out very very shortly. Hey Leon: Sounds perfect. To give you an idea, Zano could fly 10m ahead of you, as you cut left and right, your phone will use GPS and accelerometer to send new position information to Zano. As Zano flies, it will turn left and right whilst flying backwards to keep you in frame. Does that help? Hey Matthew: Good question. Yes and no. The objective of this campaign is to get volumes up on Zano itself which is how we get the cost down and therefore we can allocate more resources to building new functionality. On the survey at the end of the campaign, if you want another Zano then absolutely, this goes towards the stretch goals. If you want more batteries then no it doesn't because it doesn't help us get Zano volume up. Also, we will build all the functionality in those stretch goals regardless of whether or not we reach the goal during this campaign, it will just take us longer to release them. The stretch goals will allow us to develop and release those functions much much sooner. Does that help? Hey Larry: Very well put and thank you for your comment. That aligns very well with our business plan. Get a rock solid working Zano out the door, continue to improve functionality and provide updates. Once that is done, we can focus on release cool add-ons, things that a photographer might want such as optical zooming lens, HDR etc. Hey Jasse: Did Matthews answer give you the information you needed? Have a great morning all. I'll be back later on. Kind Regards, Ivan @FlyZano

[Dec 9 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening all, Hey Nicholas: Absolutely, on the survey at the end, there will be the opportunity to buy bulk battery packs of probably 4,6,8 units. The same will apply to propellers and other spares. You will also have the option to order another Zano or case, whatever you wish apart from the really limited edition items. Hey Matthew: Good point, it would be easy electrically to interface to that port where the RGB display currently connects. Hey Midhun: No worries. All that information will be available in the developers documentation. Have a great evening, I'll pop back in the morning. Kind Regards, Ivan @FlyZano

[Dec 9 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, Hey Midhun: Thank you, approaching 500% now. Hey Stevens: :-) Too true. Hey Matthew: Sorry, every single pin of every single device is used. The only expansion options are to remove the RGB display, this exposes +3v3, GND and a 85mbps SPI channel. Hey Midhun: I like your idea, for each of our UAV's, we go through an extensive research period where we try numerous motors for

reliability, performance, weight etc and the the same with propellers looking for the best match, performance, reliability etc for the target weight of the UAV. I'm sure with more modelling we could further improve the efficiency however I am confident that we are probably pushing 95% of what we can achieve for the cost restrictions. Hey Larry: Thank you, much appreciated. Hey Gabriel: Fair point and thank you for raising this. I think the difference is many of the features of our editing suite will be able to utilise the HPC. So once (if you choose too) you upload content to the HPC, you can edit it remotely using the editing suite, applying filters etc and seeing the result much more quickly than if the processing was done locally. Your quite right, loads of apps offer the functionality and I would think many people have their preferred app for this purpose. If we find out suite is rarely used, we will look at other ways of providing real value to the Zano users. On the transfer point, I agree, this is important. It is one of the functionality updates mentioned in stretch goal 3, the firmware updates to not only use the SD card but to retrieve content over WIFI from the SD card directly to your phone or tablet. On the camera front, I am looking into options. To get so much technology to a consumer price as we have with Zano, we have pretty tight restrictions on prices. If a better camera in volumes is financially feasible, we will certainly look to making this the defacto standard for Zano. Hey Rupert: Thank you. Hey Ben: I agree. It shows how exciting Zano technology is if within 12 days of the public launch of our Kickstarter campaign that some are trying to rip it off twice within a few days. :-) Have a great morning all. I'll be back later. Kind Regards, Ivan @FlyZano

[Dec 8 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey everyone, just a quick update. The ONLY place to get involved with Zano is on Kickstarter, this will continue until the Kickstarter campaign finishes. After that, all genuine distributors will be referenced on the www.flyzano.com site. We know there will be cheap copies, they may even look the same. The fact we are making 3D models available for you to 3D print probably makes it easier, However, Zano's functionality can't be copied. We genuinely believe in doing business fairly and we ask for everyone to keep a look out and let us know of any fakes or fake campaigns. Hey Stevens: Really appreciate the heads up, thank you. Kind Regards, Ivan @FlyZano

[Dec 8 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone, Hey Stevens: Thank you. I'll go check it out. Hey CD: Your very welcome. Once the campaign finishes, we will offer all the add-ons we can in the survey so if you want other bits, you can certainly add them. Thank you, we genuinely appreciate it. It is only through comments we know if we need to make changes or implement ideas that you, the backers come up with. Hey Matthew: Yes it would and

your quite correct, however if it is normal spray paint from pressure pack cans, if the layers are kept thin, the impact should be minimal. Hey Jasse: Noted, this is one item I am still looking into. I'll come back to you once I have more information. Hey Dudley. If you were to use a paper mask and spray a few layers of camouflage on Zano using thin spray paint from pressure pack cans, you should be fine. You can remove the top and bottom plastic parts of Zano, you could then clip them together away from the electronics and spray them. Once dry, you could reassemble. The normal enamel or epoxy paints would be fine, just keep the layers really thin and light. Hey Szabolcs: Noted :-)

Have a great sunday folks and as always, thank you for all your support.

Kind Regards, Ivan @FlyZano

Dec 8 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon all, Hey Ben: Absolutely. the future is limitless. Once we get version 1 out there, all these add-ons can enhance your version 1 with whatever functionality we can build. Docking stations etc. Exciting stuff. Hey Tim: We are looking into making Windows Phone a standard supported item. I like the idea of wireless charging, the issue is the about of power that can be sent that way vs how quickly flying robots use the power. We have had quite a few comments about a base station charger that Zano could return too and recharge, I think once Zano's are shipped to you all, this will be an idea we will certainly look seriously into. Hey Lukas: I agree, it would, it is a good idea. Something certainly worth further investigation. Hey Simon: Thank you for the suggestion, I like the idea, I would use it myself. Definitely something we will look into. Hey Jerome: Your absolutely correct, Zano, the SDK and the firmware all support flying by waypoints. One reason we aren't releasing that function in the standard Zano app is legislation. See my response to Bosco for a little more detail on this. :-)

Hey Bosco: We want to ensure that we can always work with legislators to keep Zano legal everywhere and a lot of the legislation states that you must be in control and the UAV must be in line of sight. I suspect this will become common world wide. So long as what we provide as standard assists us meet legislation then Zano should always be legal. If however third party developers build apps that make use of other Zano functions, it would then be a users responsibility. We don't have any hard or fast answers yet as so much legislation is a little bit fuzzy especially around nano UAV's but our aim is to continue to work with legislators to keep Zano legal. Hey Miroslav: I have a surprise for you :-)

We use a small WIFI module that has its own ARM7 processor on board and can run CGI/PERL code directly. This module has direct serial access to the Zano main processor and subsequently the Zano OS. I suspect you could do exactly what you want using that. Hey BonanzaNLD: Thank you for your question, please see my response to Bosco and Jerome. Hey VDW: Good question, there is always a little latency in any digital system due to the nature of packing frames. However, Zano captures >30fps, and the frame sent to your phone/tablet is

never more than 2 frames behind the current captured frame. Based on that what you seeing is never more than 1/15 of a second behind the actual frame being processed. This is about 80ms and to most people is not perceivable. Does that help? Hey Larry: That is a really interesting idea, I'll take that away and have a chat with the team. Thank you. Hey Matthew: Thank you, I know the Zano team all enjoy working on the project too. Good idea, I'll mention Reddit to Reece (Head of Marketing and Sales), he is pretty thorough so may have already done it but I'll mention it anyway. Noted re: Range extended (+1 votes) :-) Hey Grant: Noted :-) Hey Will: Zano can fly completely disconnected from any WIFI source, our standard Zano app will disable this function for safety but with the SDK (I know third party developers will make use of this) Zano supports >500 waypoints and each way point can have complex actions programmed as part of it, such as reach point x,y, face point a,b, climb to altitude q and take 5 of 5mp stills, then move to next waypoint. Hey Bjoern: Noted. This is looking like a popular add-on :-) Hey Joseph: Zano app's (iOS, Android) will support all regions they are supported in. 2.4g WIFI is also unregulated virtually everywhere so you should be 100% fine. Hey Jose: Good questions. Zano has a built in charger. So you can leave the battery permanently connected to Zano and Zano will power down to standby when not use. Zano has a MicroUSB socket and comes with a charge cable that allows you to connect Zano to any USB port or USB compatible charger. Regarding updates, Zano uses OTA (over the air) updating. So the Zano app that we release will update Zano firmware using the WIFI connection so no computer is required, only a device that can run the Zano app and supports WIFI. Hey Lukas: Noted :-) Hey John: Yes, through future updates we will be making use of every cool feature of every piece of hardware including assisted GPS, very well spotted and absolutely we will make use of it. Zano will also power up the GPS every 60 minutes or so for 35 seconds or until it gets a lock, whichever comes first, coupled with downloading satellite information from the phones GPS, the lock time will be as quick as is possible. Fantastic comments everyone. Really good to see so many people looking at the technology from different angles. We have already taken so many of your ideas on board and as such, we deliver a better product than we would have done with your your input. Thank you. Have a nice sunday and I'll check in later. Kind Regards, Ivan @FlyZano

[Dec 7 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

- “ Good evening all, Hey Giles: Thats a neat idea. Zano does have direct control of the IR transmitters positioned on each face of Zano. They are 45 degree transmitters, maybe not quite what your suggesting but they could certainly be used for an aerial dogfight game between two or more Zano's :-) Or we could build an add-on after we ship Zano that is a laser diode of the correct frequency in a small package that when the IR receivers on Zano detect a particular signature, they know they have been hit.

Hey Georg: Thank you, check out www.origingps.com. We are releasing 1.0.1 this year, our biggest UAV is 120mm by 120mm and is a heavy lift platform but is designed for heavy commercial usage, law enforcement etc and as such is lower volume and higher cost. Glad you like the removable LED display, we will provide various CAD files on the www.flyzano.com site that will allow you to download and 3D print a bottom without the display space. The SDK will also outline the electrical, and data communications used by that display so indeed, you could design and fit other sensors etc in place of the display. Hey Joseph: Noted, this is something we are seriously looking into. Hey Jose: Good point, the other team members and myself are haven a chat over the weekend about rewards and what you have all been asking for to see what we can do. I'll come back on this one. Hey John: Thats a neat idea. Yes, with a functional update, Yes, the IR transmitters on Zano could certainly communicate with other devices. Thank you for the suggestion. Hey underhund: We use the worlds smallest fully integrated GPS. Please check out http://www.origingps.com/?post_type=products&p=182 OriginGPS are one of our partner suppliers and will be doing some announcements about Zano using their product next week. The Nano Hornet that we use is actually designed for indoor tracking, have a read of the data sheet. Neat little device. We assume no indoor tracking but you may well have GPS inside many sorts of buildings. Hey Lee: Noted and thank you for the suggestions. We will see what we can do. Hey Midhun: Noted, we do have a range extender for our other products but it is design to high specifications which makes it more expensive. I'll see if we can do a Zano version, much cooler than our commercial extender. :-) Hey Rupert: That is a really good idea. Zano lite. Leave that one with me, that may well show up soon. :-) Hey Matthew: We are looking into bulk battery rewards, will keep you posted. Hey Jarkko: Noted, thank you. We are seriously looking into a tillable camera, it will have to be manual due to space and weight constraints for now but given time, I'm sure we can expand on this. Maybe an add-on for the www.flyzano.com site. Hey Ben: Great idea, one of our discussions within the team is looking at these suggestions. Also thank you for your support throughout the campaign, really appreciate it. Hey Georg: Thank you and good suggestion. The camera's are a difficult item to change because of the significant firmware change to support camera's from different suppliers. All the SCCB data to initialise and control the camera, exposure etc change from one manufacturer to another. In saying that, Zano supports firmware updates so it certainly is possible. I am looking into what camera to ship with Zano and also what options we can make available on the www.flyzano.com site. Hey Szabolcs: Excellent point, we are looking into the reward levels and will no doubt have some pretty cool updates very soon. I think the rest of the comments were about range extending and batteries. Leave both me with me, these are both points of conversation we will be having internally to see what we can do. Thanks as always to every single Kickstarter backer. All your support, questions and comments help us shape Zano to be what you want, that is so important. Can I ask that as we are getting close to our second stretch goal that you

share and tweet about what we are doing here and help us hit that goal. From that point, the third goal should be easily in reach. The higher the volumes, the lower the cost of manufacture and our thank you to you for helping us achieve this is to build more functionality into Zano because as the cost to make Zano decreases, our resources are freed up to develop more cool functions for you all. It is that simple. Have a great evening everyone. Kind Regards, Ivan @FlyZano

Dec 7 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, I have a question to put to you all, do you think we need any new or different rewards? We have had some great idea's and I'm wondering if you feel we are missing a set or package that might be popular. This project is all about volumes, the stretch goals are out way of saying thank you because as the volumes go up, the cost per unit decreases and we can allocate more of the raised money towards adding features. Hey Eijar: That would be so neat. This would be an ideal function for developers to get involved on. Zano has a good onboard microphone and can stream the audio to your phone or tablet. Developers out there, another really good idea. Hey Paco: Thank you for your email. Your absolutely right, our key focus points in the refinement are exactly that, stability, video quality and compliance with legislation and law. With the SDK we will be providing, we will definitely support developers with the integration of cool things like the cardboard one you have suggested. Never silly comments, the only silly question is the one you don't ask. Hey Phil: I really appreciate that, thank you. Always great to see all our backers getting so involved and engaged. Regarding the HPC, yes, it is extremely expensive. The HPC we have now costs £2,000 per month in electricity alone. We are planning to keep it free of charge permanently. What we will do is generate revenue through advertising on the www.flyzano.com video section, much like some other video streaming sites as well as providing a base level of usage that is free and a charged premium level of services on the HPC for professionals. Premium usage would include more storage space, priority over processing time so your videos process faster etc. We want it free to everyone and to provide an exceptional service to everyone. There will however be people who want that little bit extra and for that premium we will offer a premium package, at a fair price. From the Zano app, you can choose if/when to upload content for processing. Really good question and roaming charges could be extreme otherwise. You could wait until you return after a holiday and use your home WIFI if that is what you wanted to do or do it at the time of taking the content. Entirely your choice. Regarding low battery, that is really good idea. That is a function I will ensure is included in the firmware and as a option you could select. Thank you for the suggestion. Swarm pack, I like that. If we can get a few people to vote for that, we will certainly add it as a reward. Hey David: Another good question. Let me answer it this way, Zano with the new motors (production Zano) will fly at sea level with about 55-

50% of maximum power flying at 20m above the ground at high altitude is a really good question. The tallest mountain in Wales is 1085m, as soon as we have the pre-production units back, we will try and see what % of maximum power is needed for flight. From that we should be able to extrapolate based on air temperature the maximum altitude Zano can fly well at. Hey John: Excellent, we will collect that information at the end of the campaign. Hey Matthew, Hey Ben: I'm happy to look over the idea, may well be something we can assist a third party to make and provide through the www.flyzano.com site. Zano is and has to be our focus but we will support third parties where possible to help expand the Zano eco-system :-)) I think that is everything. I'll pop back later. Have a nice morning all. Kind Regards, Ivan @FlyZano

Dec 6 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone, Hey Giles: As Matthew said, being a quad, you can tilt the camera on any angle but in doing so, the UAV will travel in the direction of incline. Hey Larry: Good question, no not yet but I know we will and I hope developers out there have some fun doing that kind of thing with them. We do go work to have play time, it certainly is that much fun sometimes. :-)) Sorry, that probably didn't help. Hey Robert: Thank you, even if we aren't able to implement every idea or request, but we do try, the suggestions are all noted and will help formulate new add-ons once we deliver the Zano's. Don't be surprised if in 2015, you see a new bottom for Zano that does exactly what you are suggesting. Hey Alan: Good comment, just an FYI, the led display just plugs into the flight frame. To remove the LED display is a matter of unclipping the top and bottom of Zano and unplugging the display. You could also 3D print a new bottom and re-assemble it. Hey John: Fair point. At the end of the campaign when we send out the survey, if you would like other add-ons such as spare sets of propellers (Zano comes with a full spare set), more batteries or whatever, would you be happy to let us know then and we can adjust your package? Hey Will: Thank you, really appreciate that. Hey JW: Have a look at my response to Robert. Zano is designed to be easy to assemble and consequently easy to disassemble and modify. I'm sure in no time, we will have not only add-ons, new 3D models for people to download from ourselves and third parties on the www.flyzano.com site as well as all kinds of cool stuff. Your Zano your way :-)) Sounds cheesy but it is what we have tried to achieve. Hey Matthew, Hey Giles: It would look pretty neat though. Do you agree? A super lightweight carbon fibre frame that interconnects a swarm of Zano's for heavy lifting. Have a nice evening everyone. Kind Regards, Ivan @FlyZano

Dec 6 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

Hey everyone, I thought I would pop in a little bit earlier than normal. Hey Antal: Thank

“ you. Yes, batteries will be available both in single and various pack sizes. We are looking all sorts of add-ons at the moment. We are also putting as many battery slots in both the standard and the limited edition case as we can reasonably fit. Hey Matthew, Hey Holger: You spoilt one of our surprises but really glad you did because it is a really cool idea. We are going to be releasing CAD files in most formats including STL, STEP, IGES etc for the top and bottom of Zano. These will be available on the www.flyzano.com website. We will also encourage Zano enthusiasts to design their own parts and upload them to www.flyzano.com. Some will be free but to encourage others to design cool parts, I'm sure some will have a nominal charge for them. The Zano developer community is not just about software, it is about helping others design hardware for Zano as well as cool add-ons such as cool tops and bottoms that you can download and 3D print from home. You could for example down a Cat top if your a cat fan and make your Zano a flying cat. If your into certain cartoons, you could download the top and bottom, using the RGB display as the face and make your Zano your personal interactive version of that cartoon character. The possibilities are endless. Hey everyone: I think the rest of the comments are about the display. I'll give you a few examples as to what we feel it could be used for if that is ok. Might help answer your questions. 1. For taking photos, a countdown is an obvious one. 2. Photos: The display can act as a flash. 3. Videos: The display can act as a light. 4. Games: You can animate and display how many lives you have left as well as explosions if your shot down. 5. Games: You could show arrows for hide and seek giving you hints as to where someone is hiding. 6. General: If flying in autonomous mode, you could display battery % 7. General: You could display GPS data, ground speed or whatever information you want too. 8. General: You could send your friends messages by flying it to them, hovering, speaking and texting the message on the screen before flying away. 9. Swarming: Display the number of each device so you know which one your tasking and which one is swarm leader. The list goes on. When we specified the capabilities of Zano, we didn't want it to just be another UAV, which it isn't but we wanted to create something that you take everywhere. We wanted to make it interactive and to support idea's that you might come up with that we hadn't dreamt of. Yes it can take photos or videos but you can also use it for games, general fun out and about with your mates. The display weighs 1.5grams in total and the plastic shell around it is about the same, we are looking at 5-6% of the total weight so it isn't huge. Does that make sense? What are your thoughts on this? Hey livio: Absolutely it can film from any angle. Front, back, sides, entirely 360 degrees around you. Being a quad, it can fly in any direction. If it is travelling quickly it will lean the direction of travel but if your for example riding a bike downhill, you probably wouldn't notice the camera is on a slight angle. Once again, this could be post-processed out if you wanted on the HPC. Have a good afternoon everyone and I'll pop back later. Kind Regards, Ivan @FlyZano

“ Good afternoon everyone, Just a quick update, we are filming a video as I write this. The video is to form part of Chapter 3 of our "In The Lab" series. The crux of the video today is showing Zano changing motor direction continuously, full speed one direction, to full speed the other, and to demonstrate the motor endurance to this torture. It has been running well over 30 minutes so far at full power, the motors are warm but everything is holding well. Should be an interesting video once completed. Hey Ben: Your absolutely correct. Every Zano will ship with a full set of spare propellers. Hey Feng: Really good point, we are looking how small and compact a case can be. We have had queries about whether we can add a shoulder strap to make it easy to take everywhere and the smaller the case so long as we can fit everything, certainly helps make it more portable. We are in discussions with our case manufacturer and as soon as we have specifics, I will post the details here. Hey Matthew: Zano can be tilted but will then fly in that direction. Eg. if Zano is following you from behind Zano will tilt forward and this will drop the angle of the camera quite significantly. Hey Dekany: Sorry for the mis-spelling, I can't find the proper characters. Thank you, really nice comment. Every Zano will have a full set of spare propellers supplied with it. Have a nice day everyone and I'll be back later on. Kind Regards, Ivan @FlyZano

[Dec 5 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, Hey John: I agree, I suspect there is a risk. It is an unusual problem because Crowd funding is about supporting new technology, developments etc and in return you get a reward so it isn't purchasing a product in the usual sense. Hey Bosco: Interesting question. Some countries may apply some customs fee or duty, some may not. We will ship the Zano's from the factory in bulk on pallets to various regions around the world where a courier agent will then ship the individual Zano's to you all. We should minimise custom's fees this way too. I can not be specific for a country though, if in doubt, you are best to speak with your customs and excise division within the government. Crowd funding is also a new idea to many of the taxation and customs bodies, we do have your question and a few others with our taxation people. If we hear anything specific, I'll post it here. Hey Angus: We are trying a few ideas at the moment for a manually tillable camera. Hey Alan: Good comment, we are looking into different lens options for the camera and are expecting to be able to offer different camera add-ons through the www.flyzano.com site as they become available. Regarding volume, I use a decibel meter yesterday afternoon. Zano in free air away from objects inside at 1m the average volume was 65db. with a peak at 70db during harsh stabilisation. If you look up 65db, its a normal human conversation at 1m. We are looking forward to shipping you all your Zano's. Hey Larry: Cheers and stay well. I'll be in contact regarding seeing what we can do about working with a third party developer on that app. Hey Amog: Noted, can't promise anything as my focus is on

... firmware updates, if the opportunity presents itself, I'll do what you have suggested. Hey Takuya: Excellent. We are looking to also stream telemetry to the SD card. So you have accurate frame by frame information about what Zano was doing, where it was etc. Just another piece of information that may help enthusiasts. Hey Matthew: Great comments and responses, thank you for being so involved with the campaign. Anything you build for Zano, of course you can make open source. Hey Robert: That is a question I aim to answer next week. We have some adapters for our prototype that allow the mounting of the larger production motors so I can test total thrust to weight and see what lift capacity we have left over. I'll come back to you on this one. Hey David: Parts of the video where you could see Zano in frame were not shot with Zano. All aerial video work was post processed for stabilisation. Zano is tiny and physics is not on our side when it comes to stability which is why we have spent a lot of time on stabilisation routines for the flight frame itself, reversible motors and very importantly building a supercomputer (HPC) to provide batch processing for all Zano's users free of charge to allow capabilities such as video stabilisation, colour correction, stitching etc to all be applied post capture. Does that make sense? I have had a few people ask for raw footage captured from the Zano. I'm currently working on seeing how high I can push the camera bandwidth. When I do my next lot of testing with the latest firmware, I'll ensure we capture as many scenarios as we can and show both the raw and post processed content. Have a great morning everyone. I'll be back in the afternoon, now it is time for me to focus on the camera firmware and hardware and see just what we can squeeze out. Kind Regards, Ivan @FlyZano

Dec 5 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening all, I had to pop in to say thank you. We have just passed the £500,000 mark and are 66% of the way towards our second stretch goal. This fantastic response is down to you all, your support is making this happen. Thanks personally from myself and every member of the Zano team here at Torquing Group. Hey Philipp: Thank you and really glad you are part of this. We can't open source the work we have done as I'm sure you can all understand, however the SDK will be open. As with most developer communities, there is a terms and conditions document to agree to online, nothing onerous, just very standard and then as a developer you will have access to all the programmings interfaces, documentation, FAQ and developer support so people can do exactly as you say and build for previously unsupported platforms. Hey David: Zano will have an onboard MicroSD cradle so you can use your own MicroSD cards to store video and photos locally. There are examples in the Kickstarter videos of video taken from Zano. With our in the lab series, we will be showing various technical aspects of Zano in each chapter. If you want specific videos, let us know and we will see if we can accommodate your request. Hey Larry: Your most welcome. My

parents wanted that nice that various levels of education as your request and name that me. I will post my offer onto the developer community too so please stay connected long after this campaign finishes and I'm sure we can arrange a good outcome. Have a great evening everyone. Kind Regards, Ivan @FlyZano

Dec 5 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone, Hey John: Your correct, the stretch goal is to use video processing to follow a target as in keep your face within frame and make refined and rapid movements at the frame rate of the camera to compensate. If the object gets smaller, Zano will fly forward trying to keep it in the frame of view. Hey David: Thank you, it is really important to us to try local first. Some parts are made overseas, but as much as we can including the PCB assembly, full build, test and box is all done in Wales. Something we are very excited about. Hey Matthew: Good question, I'll take that one away and check with the guys responsible for the pricing. Hey John: Thank you. Part 3 will involve more technical stuff, we just want to show our backers the full Zano picture. Hey Nagamendo: Thank you. Really great comment and much appreciated. I'm not sure if you read in an earlier response from me that that camera will support software pan and tilt so you could fine tune the frame position without losing video resolution using the camera's windowing capability. Hey Stefan: Well spotted, that is one we missed. Yes, all pledges from £139 and above get two batteries, sorry we didn't mention it on the £189 but I promise it will be included. If that pledge is not already updated, it will be soon. Hey Wei: It is very exciting. We love the technology and are passionate about it but to see the enormous response from all of you is reassuring that our time developing Zano has been well spent. Hey Larry: Really interesting comment and one that has got me thinking. I am personally passionate about education at all levels and giving opportunities to those who may not have those opportunities otherwise. I really like your idea, so much so that I put it to the developers out there, I will personally provide my support to a suitable developer who takes up the challenge to provide what Larry has suggested. A friendly app that allows young users to task Zano to do the sorts of things Larry has suggested. After the Kickstarter campaign finishes, I'll put this on the developer forum too. Have a great evening everyone and as always, thank you for your support. Can I ask that you continue to share, tweet and like what we are doing here and help us reach as many people as we can. It is only with your support that we can achieve this. I'll be back in the morning. Kind Regards, Ivan @FlyZano

Dec 5 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

Good afternoon everyone, Hey Miroslav: The SDK will have two levels, one which is

“ the explanation of the native binary language used to communicate to Zano, with this you have very good access to the Zano OS and core functionality. The other aspect to the SDK is nicely presented programmers interface which abstracts developers from the native binary language and will have functions such as launch to 1m, fly to GPS point x,y etc. You will also be able to interrogate most of the same information as available in the native binary language but it will be presented to be much more friendly. Glad your excited and keep going with your project too. It is a great deal of fun and very rewarding to develop. Hey Livio: With the SDK, you could disable the auto return to home function and then set a waypoint outside the WIFI range, yes. You could also set another waypoint to bring it back within range. Hey Midhun: Thank you, really nice comment and much appreciated. We have one of our partners, a company that makes and supplies one of the key pieces for us launching some publicity very shortly. Have a nice afternoon. Have a nice afternoon everyone and I'll be back this evening. Kind Regards, Ivan @FlyZano

Dec 4 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, Hey Alvin: It is always a difficult question to answer, however I can give you some examples from my own use on the prototypes. I ran the motors on a number of prototypes full speed one direction, then change direction to full speed the other direction and did this 4 times per second for over 4 hours and the motors still worked and with no noticeable wear on bearings or brushes. Bear in mind, this test operation is the about the most harsh test that could be run on the motors. I simply got bored and after 4 hours turned it off. I will run this test again until the motors fail so I can gather MTBF data (mean time between failures) Hey Midhun: Thank you, we are so passionate about this project and the technology. A manually tilting camera is looking more and more likely. We are looking into tooling costs as well to implement all the small plastic parts required to make this reliable. Hey Amog: Thank you, I appreciate the support. From our point of view, suggestions that we can implement at this stage and will result in a better product we will implement, some suggestions as much as we would like too, simply aren't feasible. Our goal is and has remained unchanged, to deliver Zano on time and on spec. Hey Matthew: Regarding GPS, you can set position LAT, LONG, Altitude, hold time, action (land, take off, transit, take photo etc) as well as focus point LAT, LONG so Zano knows what to look at. Over 190 other communication parameters exist at the moment and these will be added too with every functional update which will expand upon the API. You can also interrogate hundred of internal values as well as the 90 odd configuration parameters that can be set or retrieved. You can also name your Zano through the SDK so if your planning on flying a number of them on the same network, your code can interrogate each Zano to attain it's name/id. Does that help? Good question about the sensors, I do cover it one of the videos but your quite right, it hasn't be written out below. Zano has GPS,

magnetometer, accelerometer, gyroscope, barometric air pressure sensor, IR obstacle avoidance, microphone, speaker, echo sounding sonar, 32 bit 330DMIPS processor and now an SD card amongst loads of other filters, digital processing components and other key components. Does that help? Please note, this will all be covered in the SDK, full documentation on how to communicate with Zano, what to expect back, how Zano will respond to misformed requests etc. Hey Stevens: Thank you, really appreciate that. I assure you our level of communication will continue. One reason Reece and I put our names to this and have been so open is to reassure everyone that we are accountable to every one of you and we genuinely appreciate your support, comments and questions. Hey Marco: With the SDK you certainly could. Really good idea. Hey AngusCNH: Thank you. We have with a 6" square phased array antenna on 2.4g, controlled our prototype from nearly 2km away. I would say over 1km is easily achievable. We have a booster for our other UAV's that does exactly this, takes the WIFI signal from your phone or tablet and retransmits it to the UAV and vice versa. Have a great morning everyone and thanks again for the great suggestions and comments. Kind Regards, Ivan @FlyZano

Dec 4 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone, What an afternoon, brilliant questions and comments. I didn't respond this afternoon as I have been visiting a data centre that we are looking to build a twin of our HPC in for resilience. Anyway, I'm back now so let me get started. Hey NX: Good question, I don't have the dimension with me however the display is 22mm square, so 37mm top to bottom or 1.5" is going to be pretty close. Hey Alwyn: Zano can sense objects anywhere from 1.5m away down to just beyond the propellers so complex environments so long as there is enough space to deal with minor position oscillations typical with rapidly changing distance measurements, it should be fine. On top of that, the obstacle avoidance is configurable so you can set the response speed and force and tune it up or down depending on your environment. Does that help? Hey Mark: If I miss a question, sorry, just let me know but I'll try and answer your queries. I'm not sure if the OV5647 is a current camera. It isn't shown on the Omnivision website so I suspect it may be superseded, I'm not sure though. The lense options on the camera certainly is something we can look into and possibly release replacement camera's with different lenses for different purposes. The camera is very easy to replace, it is on a small flexible circuit (industry standard) that easily inserts into a ZIF (zero insertion force) connector. Once again, all industry standard. If we are able to do replacement cameras with different options, it should be a 30 second swap out procedure. Yes, all camera options will be available through the app. Hue, Contrast, Exposure etc. Regarding the SDK, if you use the PHP SDK, you could do exactly what you want and write very simple PHP code that uses the SDK to perform whatever you like. The web based interface I mentioned previously is actually on a

might end commercial. But we are releasing, it was an example of what developers could do with the SDK. Zano will communicate by default directly with your phone or tablet anywhere in the world, even if your phone doesn't have a phone signal as Zano creates its own special WIFI hotspot. Regarding the HPC. Yes, all your content is saved locally, either on the SD card or on your phone. You can choose to use our HPC to process the video but you don't have too. Its entirely optional. We are seriously looking into options to make the camera manually adjustable. We love a challenge so we will find a solution. If I missed anything, please let me know Hey Lukas: I'm not 100% sure what your asking. You could tell Zano to fly ahead of you and to point ahead so it records what your seeing and with inertial sensors on your phone or tablet coupled with inertial sensors on Zano, the reaction speed will be very quick, much faster than that of GPS alone. Hey Midhun: Zoom will have to be digital and will certainly be included. If zoomed in, the camera supports a window feature that would support pan and tilt within the optical frame of view for the camera. Does that help? Hey Lukas, Hey Larry: Sorry guys, I'm confused. Have I answered the query? If not, please let me know. If I haven't answer a particular question, sorry, please let me know and I'll respond. Have a great evening. Kind Regards, Ivan @FlyZano

Dec 4 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, Hey Paul, Hey Larry: Thanks guys. New technology is always met with mixed reactions. Some people immediately embrace it like all our Kickstarter backers have, some people are scared by it and some simply just don't get it. Given time, I think most people will see just how cool this technology really is and as always, its not the technology that is scary but the people who do wrong with it. Hey Matthew: Thank you. If you couple that with a 30db phased array antenna and good low noise amplifier, the range of full speed communications is fantastic. True about 3D printing an object. I would think it could be used to create pretty good colour 3D models of famous buildings too. Good point about battery life. Hey John: Absolutely agree. This project is all about volumes. The higher the volume, the lower the manufacture price and the more goodies we will stuff into the package :-) Hey Andreas: Your quite correct. You may have joined after I posted it but fairly early on I mentioned that Zano listens on TCP port 10000. If you connect to that, you can communicate in Zano's native binary language and do exactly what your saying. The reason we are planning to build API's in many languages is to remove the complexity of encoding and decoding those messages, conversion of types etc but if your confident with network programming then as you say, you can indeed talk directly. All the information about the structure of the binary language will be in the SDK. It is basically a binary command interpreter. You send a command followed by the parameters. Zano parses this, cleans and checks it then handles your request. You can pack hundreds or thousands of commands into a single payload. Each message

sent to Zano can be up to 255 in size and a typical command such as "action 1" takes 4 bytes. We have a web based user interface for one of our other UAV's that is a website with full dynamic and responsive user interface, artificial horizon, compass, live video and it is powered by a PHP module sitting on a server. This PHP module uses the SDK for another one of our products to control and task the UAV. It is cool to watch. Are you going to join up to the developers network? Have a great morning everyone. Kind Regards, Ivan Reedman @FlyZano

[Dec 3 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening again everyone, Hey Ben: Thank you, I have noticed that you have handled quite a few queries. Much appreciated. Hey Matthew: Good point. Regarding your second query about circling a target. With the SDK you can easily upload over 500 compound waypoints. So Zano could circle a target keeping the camera pointing towards a particular GPS LAT, LONG continuously and upon reaching each way point, you could set an action of take photo. You would end up with 500 high resolution still photos on the one point with a angular resolution of nearly 0.5 of a degree. The 3D models you could build from that, would be fairly impressive. Thoughts? Hey Eirikur: The priority for languages will be based on the demand from developers. The obvious ones are iOS and Android, then Windows Mobile I would think. Beyond that Java, PHP and all the desktop languages. All based on what our developers tell us they want. If you wish to use the SDK, as soon as the developer site is open, please register and start to provide feedback as to what you want. Your feedback will help us shape the developer tools we make. Have a great evening. I'll be back in the morning. Kind Regards, Ivan @FlyZano

[Dec 3 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone, Hey Adrian, Hey Larry: Absolutely: Our first priority is refine what we already have built and then delivering exactly what we have promised. It is one reason we are providing free "In App Purchases" to all Kickstarter backers for 12 months so as we build new and exciting features, you all benefit as a thank you for your support. I assure everyone, our first priority is 'bombproof' operation. We want you to enjoy Zano as much as we do and making it super easy to use, auto recovery, loads of fail safes so it does everything you need it to do. All the cool features we want it to do, will come, I assure you but at the right time so as to not distract from the primary objective. Zano :-) Hey Andy: All good points. I like the glow in the dark propellers. A simple one for us to look at later on. Hey Matthew: Good point, however have you considered using post processing on our HPC. If you take 80% of each frame by allowing a border of say 100 pixels on each side, top and bottom, that is 10% of the

...any can be compensated for quality by Zano but can be post processed out and combined together for 3D content. Hey Andy, Hey Rina: Interesting idea, can you leave that with me, I will take that one away and come back to you. Hey Joey: At the end of the campaign we will send out a survey to handle exactly that sort of situation. If you pledged for one item, then pledged more and want to change to another item, we will capture that and ensure you get the items your after. Hey Giles. Good idea, it could be even be done using the Zano mesh network built in that we will use later on for swarming. See our final stretch goal. With this running, Zano's could sync data including frames and timing between each other. Hey John: Good idea. Easy one to do to. Another one I'll take to the carry case manufacturer. Hey Rupert: Thank you. Hey Lukas: Absolutely. So many cool possibilities. We will have a field application engineer available in the 2015 to work with developers both software and hardware alike to help third parties create cool add-ons for Zano. A huge thank you to all our Kickstarter backers. You have helped us now push through £400,000 in 8 days. We are now well over half way to our second and significant functionality update stretch goal. Your support inspires us to keep doing what we do best, that is to create awesome technology that until we announce what we are doing, people said was impossible. Like I said, we love a challenge but your support makes it worthwhile. Have a nice evening. Kind Regards, Ivan Reedman @FlyZano

[Dec 3 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon everyone. I didn't respond this morning because I was in a meeting discussing some of the questions, I wanted to come back to you with some answers and I have a few. Regarding the free lifetime "In-App Purchases" for Kickstarter backers, I'm sorry but we have looked at this and it just isn't feasible. A key part of our business is going to be these functionality updates and by staying profitable as a business means we can continue to develop and release the very best functionality we can for every one of you. I can assure the cost per function will be nominal though, as a business we genuinely believe in doing business fairly and will continue well beyond the Kickstarter campaign to develop, refine and release really cool features. Hey John: Fantastic post. Let me answer your questions. 1. Yes, hue, contrast, exposure, banding filters etc will all be accessible. 2. We are looking into software means of dealing with high dynamic ranging and post processing on our HPC to get brilliant results. We are also looking into other compatible camera's to offer the best we can for the price, weight, power restrictions we have. 3. I am waiting on production pricing for the OV5670, once I know more, I'll come back to you. It is a sweet camera. 4. I hadn't thought of that. It would depend on a few factors, mainly SD write speed as we have decent but limited memory on the Zano itself to buffer from the sensor itself before writing. Can you leave that with me? That is a really good idea. Hey Tom: If you have a look at the FAQ, we have put some detail in there about Zano's ability to fight the

which it also does internal compensation in that it detects acceleration on all axes and will fight to arrest that so it provides much finer position control than GPS alone. Hey Midhun, Hey Holger: We want to encourage a strong developer community for Zano and I think there are developers out there with excellent experience already in 3D filming and composition using multiple camera who would be ideal to tackle the challenge. We will support developers wherever possible to help bring you cool functions like that. Hey John: It is a standard 1s 400mAh battery. However, please know not all batteries are created equal. We have a battery supplier that also supplies the batteries for our other UAV's and they have consistently delivered batteries that meet their stated capacity. We have tried lots of manufacturers and batteries as part of the research process and most have failed to deliver on stated capacity when put under load. So yes, you can buy replacement batteries locally and they will work fine but you may not achieve the same flight time. Also know the Zano charger is tuned to the battery we supply so that it charges just below the batteries maximum recommended charge current. This charge current may be above that of other batteries and will shorten the life of other batteries. We will provide all the spares on www.flyzano.com and I assure you they will all be fairly priced. :-)

Hey Brady: Absolutely. We can restrict either or both ground distance or altitude. Some countries may not need either in which case Zano will be unrestricted. Hey Peter: Wow, great question. I'll run through some figures, Zano runs top, front, back, left right obstacle avoidance 1,000 times per second. Zano has the ability to react to both strength of signal and speed of change. If you adjust the avoidance response (a simple slider on the config panel), then yes, I would think it could. Hey Matthew: If it helps, Zano has an internal time base running at over 100,000 times per second and all internal updates are done 1,000 times per second. You could film using two Zano's and use the high resolution time stamps on each feed to align them very accurately. Hey Kyriakos: The camera supports 720p 60fps, we will be building the SD card hardware in and continue to refine the firmware to support better and better video quality. The initial goal is 720p at maximum fps then 1080p at maximum fps. Hey Amog, Hey Larry, Hey Matt: Thank you. Our goal is to deliver Zano hardware and standard functionality ASAP, we will then continue to release new and cool features as fast as we can build them. We are working on a project plan for manufacturing this week working back from our ship date to ensure all milestones are specified and achieved on time to deliver our promise. Hey David: Good point, It is a camera I am looking seriously into. The advantage is similar control set to the 5640. Once I know more, I'll let you know. Hey James: Thank you, I think it would work really well. Hey Mark Howard: Fantastic idea, such a cool function and brilliant for outdoor people. Hey Mark Simms: Fantastic idea. I can picture it now. ZanoWear. The marketing guys here smiled when they read that. Thanks to every one, absolutely brilliant support, questions, comments, suggestions. The support you have all shown is way beyond what I could have imagined. We will implement every idea we can and will support our developer community to do the same. Have a great afternoon. Kind Regards, Ivan @FlyZano

“ Good evening one and all, Hey Ben: Fair point and as you have quite rightly said, our priority is getting all your Zano's manufactured and delivered. I do like the idea thought and I will look into an add-on once we have delivered. Hey David: Good to hear. :-)
Hey Matthew: Absolutely. We will be running competitions once you all have your Zano's for the best photo and video shot using a Zano. Good idea, two Zano's flown as one. Great use of the SDK. You could even fly many more all on slightly different angles and allow post editing to change angle to get the best shot. Could be some awesome footage. Hey Jens: Regarding bandwidth, we use a third party nano-WIFI module that is already approved by the FCC etc. As updates and upgrades become available for that, Zano will be automatically able to upload the latest firmware and take advantage of the improvements. Changing from b/g/n would involve an RF chip change and all the relevant certifications that go along with that, time simply wouldn't permit it. Good suggestion though. Hey Gizmo: Yes, you certainly do. Hey David: I was thinking something along those lines, we could use small neodymium magnets on Zano and electro-magnets on the base, that way we could help Zano align itself on return and even launch Zano by reversing the polarity of the electro-magnets to launch Zano. Good to hear about being a tester too. :-)
Hey Holger: Great concept. I like Matthews idea. This is a good idea for potential Zano developers. Fly two Zano's at a fixed distance from each other. This can be achieved using the obstacle avoidance sensors for close proximity flying and then splice the two separate video feeds into a 3D stream. Have a great evening everyone and I find myself saying this a lot recently but thank you Kickstarter backers. We have now passed £350,000, we have passed our first stretch goal and are well on the way towards our second. Kind Regards, Ivan @FlyZano

Dec 2 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon everyone, With regards to free lifetime functionality updates for backers, we haven't ruled this out. If we do it, it would be for all Kickstarter backers. It would be the only fair thing to do. We do however, need to look at the financial viability of doing so. Please don't see this as a non answer, we will look into it and see if it is feasible. Hey intherainyseason: Great name, do you live in a tropical region? I am looking into the camera and what options are available. Hey Jonathan: Zano has many fail safes built into the software including an automatic return to base on low battery. Hey Amog: Great idea about a dog tracker. We are looking into the idea of small transceivers that communicate on Zano's mesh network and would allow exactly what you have suggested, a follow me option on a dog collar or pretty much anything else. These are add-ons we will look into, much like the docking station and will

release it please on www.flyzano.com. Hey Zano: Zano already has an onboard charger. I'll explain my thoughts on this to date, to use something like inductive charging I feel would take too long to charge a battery for the duration of flight. I am thinking about a small module that could connect to the onboard charger and then that connects to the docking station and allows charging like you have suggested. We might be able to magnetically connect the docking station to the charger on Zano. I'm thinking about solutions, whichever way, it certainly is possible. What we will do is on the survey at the end of this campaign is ask for anyone who would like to test any new ideas for us and provide feedback. Maybe something you would like to be involved in? Hey Pollock: We are actually looking into the feasibility of doing just that and making the camera adjustable even if it is just two angles, 45 degrees down and straight ahead. I can not impress enough just how tight space is and even the small plastic parts to allow a tilting camera are going to be a tight squeeze. In saying that, we are looking at it to see what we can do. Back to work for me, but before I do, a quick update for you all. I'm working on pushing the camera bandwidth up so I can see at what point it no longer works. Looking for the point at which parasitic capacitance causes bit errors. From there I can work on refining the digital layout. This is all required to maximise frame rate and resolution and possibly support different camera's. The new native iOS app is also in development. Focusing on the user interface at the moment, the previous app did it's job but now its time to really polish it up. Mechanical designs are being working on for possibly tilting the camera, making the plastics easy to assemble and taking into account some of the shape changes from our prototype to the production unit. Lots more happening in the background but I won't spoil any of it, you will just have to wait and see what we have in store. :-)

Kind Regards, Ivan @FlyZano

Dec 1 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning all, Hey Jason: Yes, Zano has one RGB landing light under each motor and these are controllable during flight. You can set any colour you want these to be and they are remarkably bright, especially at night. You could also have them flashing to help locate it if you chose. Yes, Zano has a full set of obstacle avoidance sensors. One pair on each axis including the top so it won't hit the ceiling. :-)

Hey John: Zano can operate in two modes, one is where it creates its own WIFI hotspot meaning you can use it anywhere, the second mode is where Zano can connect to a pre-existing WIFI hotspot. Zano can actually do both at the same time. So in answer to your question, it is up to you, your Zano your way.

Hey Matt and every Kickstarter backer: Firstly thank you for your comments about our communication. Reece (who is answering your emails) and myself answering comments really appreciate your comments, thank you. Regarding communication on-going, especially after this campaign finishes, everyone at the Torquing Group is very customer focused. As a co-

~~repeatedly promising that we will continue to keep you all updated on progress~~

Beyond my personal promise, on the Torquing Group website www.torquinggroup.com there is a contact form and that form is received by myself, Reece and other senior members of staff. Once this campaign finishes, if you feel we are not keeping you up to date (I promise we will), but if you feel we are not, please send us a message and we will rectify whatever we can. We are accessible, accountable, professional and passionate. As time progresses, I am confident we will deliver on all our promises. Hey Fateh: Reece and Sam (our brilliant videographer and all around good guy) are with our production partner today and are working on a video for you all. No spoilers but stay tuned mid to late this week for the release :-)

Hey David: The guarantee will be in a two sections. Guarantee for workmanship is one part, the other part will be guarantee for components. Some of these components will never fail, some like motors may. The actual guarantee periods are not yet finalised mainly because the production parts list is not 100% completed. Once it is, we will also obtain the guarantee periods from all the suppliers. Sorry, I don't have a specific answer for you yet, I will however take this question away and come back once I have an answer. I do like the idea of a charging station, this seems to be quite a popular request and something we will look into once we have delivered everyone their Zano. The ability of Zano to monitor movement, temperature, sound levels etc are all built into the hardware and your suggestion is really cool, it is for these reasons we are releasing an SDK that will allow third party developers to build all kinds of cool functions to further expand the functionality of your Zano. Stay tuned to see what developers release for Zano. Regarding spare propellers, yes, an entire set of spare propellers will be shipped with every Zano. The blades are friction fit and quite easy to replace.

Hey Matthew: It is an interesting problem, flight time vs battery size. Please excuse me if you already know this, motors have a sweet spot, a point at which the power input and power output is at its most efficient, Zano operates fairly close to that sweet spot. If we increase the weight above that sweet spot all that happens is that excessive heat is generated in the motors for less lift per watt of input when compared with the sweet spot or below. So by increasing battery size, you can get a slightly extended flight time but the marginal gain is very quickly outweighed by the losses in efficiency resulting in not a significant increase in flight time. However, there are two ways of increasing flight time, the first and most difficult is batteries with a higher power density rating. That is power stored per gram of battery weight. This is reliant on battery technology which is improving but not much we can do about that right now. The second and complex way of improving flight time is through design. We work to shave off every single gram of weight we can, if we shave off 1gram that is 2% longer flight time give or take. The other way is efficiency in control electronics. We use high efficiency low R_{DS(on)} H bridges, what this really does is ensure as much energy from the battery as we can possibly get through into the motors occurs and isn't wasted in heat. We have also done extensive work on the Zano PCB layout, making tracks as wide as possible and as short as possible, all helps maximise efficiency and minimise heat. Sorry, I

...I guess everyone can relax, sleep and dream about the start in answer to your question, better batteries is critical to longer flight time as is the design process. We are still trying to reduce weight to maximise flight time. Hey Barry: The camera is a 5mp 1080p camera, same sort of camera you get in lots of modern smart phones. We have had a few enquiries about higher resolution camera, no promises, it all comes down to cost but it is something I will take away and have a look at. Thank you to everyone for your comments, as always, keep them coming. Kind Regards, Ivan @FlyZano

Dec 1 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone, Hey Jasse: We are not finalised on a fisheye or normal aspect lens. If we do go fisheye, we will also provide functionality to remove the fish eye effect so either way your photos and videos will not be distorted. Zano through future functionality updates will indeed store the highest resolution video it can directly to the SD card. Regarding the range limit, there is much discussion about this point and one I will take up with our legal people and also do some more research into. I will come back to you on this one once I have an answer. Hey Marc: Zano uses compound GPS information. By that I mean you can tell Zano where you want it to hold position as well as the GPS co-ordinates that you wish it to video or photograph so even if Zano gets blown off course, it will adjust its heading automatically to keep whatever you have chosen in the field of view of the camera. Now all this happens transparently to the user through the Zano app. Yes, it will work anywhere in the world with or without a cellular connection. Hey Andreas: We will keep all developers posted on the SDK. As soon as developers can register for beta access to the SDK, we will notify everyone. Really glad you want early access. The possibilities for this technology are boundless. Hey to everyone else, looks like matt surface wins. The injection tool can either be bead blasted to achieve a matt finish or bead blasted then highly polished to achieve the gloss finish so it does mean only one finish can be available but looking at the responses, I would say Matt surface finish is the choice. Have a great evening and I'll be back in the morning. Kind Regards, Ivan @FlyZano

Dec 1 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey all, just popping in to comment on the indiegogo site. Zano is on Kickstarter ONLY. If anyone spots Zano on another crowdfunding site, please let us know. We received an email from one supporter notifying us of the fake campaign on indiegogo. We have already got in contact with indiegogo and asked for the fake campaign to be removed. Thank you for notifying us. Hey Michael: Well spotted. We have been in discussions with our injection moulding company about the surface finish. I personally

finish? It is just about how the injection tooling is finished so we can take your input now and see what we can do. Kind Regards, Ivan @FlyZano

Nov 30 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon All, Hey Matthew: Good idea, I'll take that away and see what can be done. Hey Dave: Thank you, great to see you. I'm not aware of any comment regarding 12fps. Your quite correct, 12fps would be effectively useless. PAL is 25fps and NTSC is 30fps, the camera itself is easily capable of 720P 60fps and 1080p 30fps. We are looking into other camera modules with higher specifications but that has not been decided yet. I can confirm the camera will shoot initially 720p 30fps and we will then work on 1080p 30fps and 720p 60fps through functionality updates as mentioned previously. Hey David: That is exactly what we had in mind, a Zano app store. Fantastic to see you picked up on that one and your quite correct, I had not mentioned it. Hey Frans: Zano at 2m is about as loud as a quiet conversation. I will take some db readings and publish those over the coming weeks: I'm off for now and will be back this evening. Have a great sunday. Kind Regards, Ivan @FlyZano

Nov 30 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, I apologise for not responding to comments last night, I was unwell but feel better now, so I'm back! :-) To all our Kickstarter backers, you have all helped us hit not only our initial target in less than 4 days but our first stretch goal within 6 days. WOW!! What can I say apart from thank you from the entire team at Torquing Group and every single one of you is making this possible. Your support makes this project work. We spent a lot of time and resources developing the technology but your support allows us to get the volumes up and the prices down to make Zano available and helps us bring the even cooler features to you sooner. Go Kickstarter backers!!!! We are compiling a new video this week to better help explain how production of all your Zano's will work and some other neat stuff. No spoilers here, you will see the video this week. The continued support, suggestions and appreciation we are receiving is honestly very humbling. We have had somewhere in the order of 100 really good suggestions and recommendations, many are things we had never thought of. Thank you. Please keep it up as your input helps refine Zano even further. Hey Jel: Thank you. I really like the idea of a docking station. I'll take this idea away and see if this is something we can make available through the www.flyzano.com site in the new year. The HPC processes requests using industry standard SOAP protocols. As part of the SDK and developer support, there will be ways for developers and users to sign up and make use of the HPC directly through

multitude of security measures and every user is sandboxed. This means no way of leakage of one users data to another account, it is all part of the architecture we have designed. Yes, Zano has a PDM (Pulse Density Modulation) digital microphone. The propellor noise will be an issue, however we will release in 2015 a functionality update to implement noise cancelling for the microphone so it can be used during flight. Hey Adrian: Snow would not be a problem, even light rain shouldn't cause an issue especially if Zano is flying. During flight, the flow of air over the shell of Zano and through the propellers creates almost an air shield so light rain would be pulled away. Hey Raimas: Thank you, that is a huge compliment. Regarding the camera, the main issue regarding pushing the resolution to 4k is simply digital bandwidth. We have a brand new processor on board Zano, one that wasn't commercially available when we did the Zano designs and though it is very powerful, 4k video at 30fps would use huge digital bandwidth. Now I love a challenge!! So leave that one with me and I'll see if it is an add-on we can offer in the future, simply be a matter of swapping out the camera if we can handle the bandwidth. Stay tuned in 2015! Regarding carbon fibre, its all about volumes. As much as I think that would look so cool, it isn't something on the cards right now. In saying that, Zano will continue to evolve and various add-ons will be available in the future. If the demand is there for it, we will certainly do what we can to accomodate. Hey Ruud: I agree. The display is such a nice piece to work with. You can upload 250 icons into the onboard memory of the display and over 50,000 can be loaded into the main processor. One of my tasks is to do exactly as you say and support scrolling. Left to right, right to left, top to bottom and bottom to top. Thank you for the offer. In the Zano SDK it will have quite a bit of detail on what developers can do with that display as well as icon formats etc. Hey John: The fundamental technical limitation with range is not Zano but the small ceramic antennas used in phones and tablets. With a decent phased array antenna we have controlled our prototype from over 1km away with full video and telemetry. There is a lot of grey areas around legislation for UAV's, and very little legislation around nano UAV's. Also as Zano is autonomous and actually flies itself, you're not technically in control. As such, we believe from our research regarding other UAV's we work on, that legislation will start to appear over the coming 12 months that have quite wide impact of UAV's. However, I'm not a legislation expert. If any of our Kickstarter backers know the people writing the legislation for your respective regions, we would very much like to hear from them. What we are trying to do is to ensure that Zano will always be legal for all users. Good idea about a disclaimer and the user accepting the risk if they want to extend the range, this is something I can chat with our legal people about. Thank you, it is fantastic to see so much support. As for a 'local', perhaps when your Zano is ready, we can arrange for you to visit us at our office to take personal hand delivery of your Zano and we can do a demo then. Would that be of interest? Hey Nicholas: Our current production plans have us shipping Zano's in June 2015. We are working with our production partner to formulate this plan working back from our ship date. This

more information directly from our partner available to share with you all in the coming weeks. Hey Dazza: Thank you! Hey Mark: You can use the 8*8 RGB display as a torch, not just a flash so if you were flying inside a roof space, you have a built in torch. Does that help? I love the idea's you are all coming up with. Hey David: Definitely. How about TV Aerial inspection? Even check gutters for leaves? Hey Larry: Absolutely. Great idea. Thank you, it is so great to see so many people really seeing the potential for this technology. From a marketing point of view, the ultimate selfie drone is a great way of getting people excited, then to see you all brain-storming new and innovative uses for the technology is absolutely fantastic. Hey James: That would look amazing. I'll take this request to our case manufacturer. I'll let you know if there is anything we can do on this front. Hey Shaun: All pledges £139 and above get two batteries, the main one and now a spare battery. We had so many requests for a spare battery, we simply included it in the rewards to say thank you for the support we have received. Does that help? Hey Manfredo73: Absolutely. iOS, Android, Linux or Windows desktops etc. We will release an Android and iOS app and the SDK will allow developers to build in virtually any environment including linking Zano to a website. That's all for now folks. Have a great Sunday and I'll be back later in the day. Kind Regards, Ivan @FlyZano

Nov 30 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

- “ Good afternoon, I have seen a few questions about the SDK, I'm excited to share this with you as it really is very exciting technology. Zano listens on TCP port 10000 and will attempt to establish communication using its native binary language whenever a connection attempt is made to this port. The Zano SDK will have libraries that take the hard work out of communicating with Zano, as mentioned previously, these will be in every major programming language from C sharp, Visual Basic, Java, PHP, Objective C, Swift etc. These libraries will expose all the functions and capabilities of Zano from setting waypoints to retrieving video frames to playing back audio through Zano's on board speaker. In answer to the questions, if your on a Raspberry Pi, yes, the SDK will support this. If your coding on a windows variant, yes, the SDK will support this, same with iOS and Android. Simple functions such as 'launch' and to your chosen altitude exist. Eg Launch to 1m. Upon receiving the command, Zano will launch and hold position until you send another command. All the smarts of Zano are built into the firmware so the SDK just has to expose all the functions that are available. As we do capability updates, the SDK will grow to expose those new functions too. Right now, apart from the smart device apps we have, I have a test harness piece of code written in Visual Basic and running on a desktop that uses the SDK to control Zano. It allows us to test functions in the firmware, test the SDK and test the electronics as well as generally have some fun with Zano. From a rapid development point of view, I can

...very intelligent drone, some coming from comments, others from the values as well as control Zano's every move. Does that help? Hey Jens: Yes, Zano has some remarkable capabilities. In the event of a failed motor, Zano can actually reverse the direction of the opposing motor in less than 200ms (fifth of a second). In one of the coming "In The Lab" documentary series we are posting on Kickstarter, I will show this ability amongst some other cool features. Hey Andrew: Thank you. Expected flight time is between 10 and 15 minutes. We have achieved such times with the prototype. Hey Christopher: The format of the photos taken will be JPEG (JPG) and the videos currently are MPG. Other camera that are compatible with the OV5640 we are using are available and do have higher ratings but at a higher cost. Hey VDW: I wouldn't advise flying Zano in the rain. Fog and mist shouldn't be a problem. We have a range extender for our other products that also use WIFI and this will be available via the www.torquinggroup.com website mid 2015. Hey RL: Absolutely. We will ensure quite a few extra battery slots are in both cases. As I write this, we edge closer and closer to our first stretch goal. It is due to all our Kickstarter backers support that this is happening. The number of tweets, likes and shares we are seeing from all corners of the world is fantastic, we genuinely appreciate the support. Thank you. Kind Regards, Ivan @FlyZano

Nov 30 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey Dragonbait: Absolutely, it is those sorts of functions we want to work on to make Zano truly remarkable and continue to evolve long after you all receive your Zano. Nano is not just a drone, it is an continuously evolving and developable platform.

Nov 29 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good morning everyone, Hey Dennis: Zano has the ability to reverse it's motors from full speed one direction to full speed the other direction is less than 200ms (fifth of a second). It also has a good power to weight ratio and some pretty neat stabilisation algorithms so it well outperforms anything else we have seen of it's size and actually quite a bit larger. An actual gust figure will be published when we test the first production versions. Hey MR: The final dimensions are still be finalised. As we are now supply a spare battery with every Zano, we need to fit this, the limited edition case has space for the Zano Fuel as well as charge cable to Zano can be charged whilst in the case. If you would like a precise figure, I will ask our case manufacturer. Nano uses brushed motors, brushless motors when this small are actually less efficient than coreless brushed motors and assist in making the cost of Zano possible, it isn't just motor efficiency, it is the control electronics that go along with it, total cost of weight and efficiency of the small coreless motors is better at this size for the cost.

Hey Ron: The functionality updates are actually firmware updates so are written to your Zano itself. If you had a tablet and a phone, they could both control the same Zano that has been enhanced with an "In-App Purchase" of a new function. These "In-App Purchases" will also be registered against your account so if you lose your Zano or it is damaged, all extra functionality you have will migrate to your new Zano when you register it. Just like modern iOS and Android phones, your apps follow you. Remember: All Kickstarter backers get 12 months of free "In-App Purchases" for the new functionality we develop. Regarding the timeline, our stretch goals are actually all functionality based. Our goal will be to include the functionality of each stretch goal reached by the time the Zano's are ready to ship. In the event certain functions aren't ready, we can still ship the Zano's and release the functions as "In-App Purchases" as soon as possible which are free to all Kickstarter backers for 12 months. So in answer to your question, no, the stretch goals should not delay the shipping of Zano's, the stretch goals allow us to build the extra functionality much sooner. Hey Dragonbait: Absolutely, it is those sorts of functions we want to work on to make Zano truly remarkable and continue to evolve long after you all receive your Zano. Zano is just a drone, it is an continuously evolving and developable platform. Hey Ron, Hey Shai, The question about range is dependant on the device but please also remember that Zano complies with region by region legislation on the use of UAV's/drones. Technically it is possible to fly Zano over 1km away by using a special antenna however that would not comply with legislation in urban areas in the UK, Australia, USA etc. We want Zano to always be legal and for everyone to be able to use them everywhere so software failsafes and maximum distance from the operator are specified by region. Does that help? We are continuing to get great correspondence all round, thank you to everyone for the thought and effort put into the questions, comments and suggestions. You are all helping to develop Zano. Kind Regards, Ivan @FlyZano

Nov 29 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening everyone. Another outstanding day, the continued support is fantastic and we are rapidly approaching our first stretch goal, that means more functionality sooner for all our Kickstarter backers. Thank you. Hey Larry: Thank you and that is really great to hear. I am pleased we have been able to excite others as much as this technology excites us. In answer to your question, Yes, Android and iOS tablets will work just fine for controlling Zano. The app has been built with both phones and tablets in mind. Zano creates its own WIFI network so you simply connect to the Zano WIFI and load the app to start flying your Zano wherever in the world you happen to be. Be it at home or on holiday, Zano can help you record and share those moments. Hey Gavin: Fantastic, the case will protect your Zano and look good too. No need to worry about the queue, we will contact you at the end of the campaign and get your

whilst in the car and you keep your speed down, yes you could set Zano to video you from any angle whilst you drive. Hey Tigertai: Our Zano app is all about close proximity to the operator video and photo. Zano itself can store and handle over 500 compound GPS waypoints. However those functions would have to be accessed through the SDK. Hey Lukas: I'll take your question to our case manufacturer. The case shell itself would already be water resistant, the means by which the clam shell closes would be the question. I will raise this question and see what we can do. I'm signing off for the night, really great questions and suggestions again today. It is great to have so many additional members (all our Kickstarter backers) of the Zano team, we have received some brilliant suggestions both here in the comments section and via email. We will take onboard and implement as many as we can without affecting cost or functionality. Really great support, thank you. Kind Regards, Ivan @FlyZano

Nov 29 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi all, I know this isn't my schedule time for responses but a few really good questions I wanted to respond to. Hey Paul: Absolutely. The on screen controls are the way our Zano app works but with the SDK, you can build an interface for a VR headset (I don't want to mention names but there are a few really cool pieces of tech out there that could be easily interfaced for augmented reality projects etc) or an attached phone in a headset like you mentioned. All very possible. Hey Rudy: Yes, the SDK will be available even if we don't reach the stretch goal. It will simply take us longer to release it. The SDK will come in two parts, one will be a library that exposes all the core functionality. This will be available on iOS, Android, Windows etc. The second part will be a prebuilt set of functions added to the raw exposed interface. This would be ideal for connecting Zano to a web server. Hey Abdul: Yes, Zano can be charged from ANY USB source. Hey Holger: Yes, you certainly could use Zano as a streaming camera. When the SDK is released it will have information about configuring Zano to talk to your own WIFI network and how to connect to the video output. Now back to work for me, thanks again everyone. Kind Regards, Ivan @FlyZano

Nov 28 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good afternoon everyone, Hey Qualle: Thank you, I am really pleased that you have joined. What a fantastic community here on Kickstarter. Hey Lukas: Really good comment, thank you. Yes, once you purchase a new function 'In App Purchase' after the 12 months, it is assigned to your account. That means if you loose your phone or Zano, when you register the App or a new Zano to your account, the function will automatically be available. Hey Jens: Not a silly question: We are working on the

...panner angle for the camera and expect to get the camera angle about ideal. As Zano flies forward, for example following you down hill skiing, Zano would tilt further forward anyway. Have a nice afternoon, Kind Regards, Ivan @FlyZano

Nov 28 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good Morning All, Thank you to all our well wishes and all our Kickstarter backers. Hey Wolfgang: That is great news, thank you for letting us know. Hey Midhun: That makes sense, thank you for your suggestion. I'll keep you posted on this item if that is ok. Regarding MicroUSB, I'm always happy to clarify a query, the MicroUSB is the connection used to connect Zano to a USB power socket for charging. That USB socket could be the ZANOFuel, wall adapter or USB socket on a computer. All those sources can charge Zano. The batteries use a different connector because they have different requirements. As such, the JST or another plug is a standard on small batteries like this and therefore supports most 1s (single cell) Lithium Polymer battery chargers. We will be providing lots of add-ons in the www.flyzano.com store after the Kickstarter finishes. Does that help? Please say if your confused and send an email to hello@flyano.com so we can respond with more detail. Hey Sang: Your query about camera angle is actually a conversation we have had internally some months back and it is something we are looking to address. Due to the size of Zano making the camera adjustable even manually may just not be possible, however, we are looking into it as part of the production part design. I'll keep you posted. Hey Evan: In the event of motor failure, absolutely they are replaceable. All spares will be available at www.flyzano.com after the Kickstarter campaign finishes. Hey NX: Great idea and I would love to be able too, however due to the weight of motor, gearbox and lens to make this work, I fear we would simply go over the 60gram limit. It may also make Zano front heavy and possibly affect performance when flown outside in gusty weather. Ok, back to work for me, I have a lot to achieve today, I have to work on getting the production revisions of the flight frame finished so we can get a pre-production sample batch built to check everything before we wind up production. Thanks for all the questions and suggestions. I'll be back later in the day. Kind Regards, Ivan @FlyZano

Nov 28 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi All, Time for one quick response. Hey Matt: Thank you, fantastic worldwide support, very humbling. Hey Robert: May I ask you visit www.flyzano.com and send an email with more specifics of what you want to do? How does that sound? Good evening everyone. Ivan @FlyZano

“ WOW, you are all fantastic!!! You have all shown so much support that we have reached our target in less than 4 days. A personal thank you from me and every member of the Torquing Group Team to each and every one of you for showing your support and enthusiasm for our project. May I personally ask that you all keep tweeting and sharing what we are trying to do here. Our ultimate goal is to give you all Zano with every single feature and function we can jam into the tiny little package as soon as possible. With your continued support we are going to make that happen. Have a wonderful evening everyone. Kind Regards, Ivan @FlyZano

Nov 28 2014 on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Good evening all. Hey JW: The only silly question is the question that wasn't asked. We are always happy to clarify or answer questions or queries. The marketing around Zano is about taking selfies. If you look carefully at the pictures of the App, there is a direction control at the bottom, this allows you to set the direction relative to where the operator is. Yes, you could easily rotate Zano 180 degrees from the operator and use it for videoing sporting events, taking stunning scenic photos etc. The same with the ability to lock onto a target, when the video based image tracking is released, you could select anything that Zano can see and so long as Zano doesn't fly too far from the operator that software fail safes engage, you can video and photograph to your hearts content. On the question about wind. We are going to address this in a 'In the Lab' video update over the coming weeks, however to answer your question, the prototype Zano's have less powerful motors than the production unit. Zano does have the ability to reverse any motor and can do so in less than 200ms (a fifth of a second) and as such can compensate for turbulence remarkably well. Can I quantify an actual wind figure? Not yet simply because everything we have done is with our pre-production units. As the weight of the prototype and the production units are different and the production unit has more powerful motors, there will be significant improvements in the production units ability to fight the weather. Sorry I can not give an actual wind gust figure but at this stage, I don't know. To help with stabilisation is another reason to make use of our HPC (Supercomputer) to post process and stabilise video content. Does that help? Hey Robert: The maximum tested range with a special antenna called a phase array antenna is over 1km. However, Zano has fail safes built into the firmware that restrict the distance from the operator to whatever the local region will allow. Another limiting factor is the antenna in typical smart phones and tablets do restrict the range, as such, to ensure we can offer a consistent and reliable product, we have suggested 10-30 meters depending on regional legislation and the smart device used (Phone or Tablet). Does that help? Have a good evening

and in the morning to answer any questions and regards, Ivan
@FlyZano

Nov 28 2014 on ZANO - Autonomous, Intelligent, Swarming, Nano Drone.

“ Good afternoon, Hey Midhun: The functionality updates are free for 12 months from the time you first configure your Zano. We will look into your request but I can not make promises. Regarding the micro USB, yes that is correct. Zano has a micro usb socket on the left hand side and a built in lipo charger fully integrated into the control electronics. You could charge the spare battery from any 1s lipo charger that supports the standard connector. At this stage we are looking to use JST but the final connector will be a standard one, just not confirmed yet. Hey Abdul: The HPC (Super computer) is a 100 blade dual quad core xeon monster. Let me expand on that, it means each blade has two Xeon CPU's and each CPU has four cores. Each blade has 16GB of local memory and 73GB RAID 15,000rpm drives. All connected to a 15TB fibre channel NAS (Network storage) via multiple multi-gigabit connections. It is very very powerful. We will be using this HPC to batch process photo and video footage from Zano's but only if you choose to submit your content. The batch processing will be able to apply various correction filters and processes to video and photos. You choose what filters and processes you wish. A common one will be video stabilisation. Let me give you an example. You could take a video, upload it and request all through the app that our HPC stabilise the video for you. This should only take a few seconds once our HPC has the content, it may take a little while to upload depending on your internet connection speed. Once processed, your configuration options allow this content along with comments to be posted to any of the standard social network sites. Each user will also have an allocation of local disk space where you can keep and share special content with your friends, family etc. This will be done via the www.flyzano.com site. The functionality of the HPC is something we are working on now so if anyone has comments or requests for functionality, please send them to us now. The ideas and suggestions you, our Kickstarter backers have made to date are brilliant, so keep them coming please. Hey Stefan: Regarding timing. Once this Kickstarter campaign finishes, we will order all the parts to make the Zano's for everyone. We will then do a small production run of 500 to 1000 Zano's to help iron out any assembly issues before we move to the full production run. Our aim is that from the time we start the first small production run to the time the full production has completed should be fairly short so that once we start shipping Zano's, everyone has them as quickly as possible. I hope that helps. That is all for now, once again, thank you to all our Kickstarter backers. We have been working long and hard on Zano and the support we have received is what is really going to make this project. I'll be back later, I'd better stop here and get back to those PCB revisions. Kind Regards, Ivan
@FlyZano

“ Good morning all, Again, we want to say thank you to our wonderful backers. Your support makes creating technology like Zano so much fun, a big thank you from everyone here at Torquing Group Ltd. Hey Tigertai: Zano is small, it weighs less than 60 grams and as such, the inertia is small. As such, Zano tends to just bounce rather than crash. Many months back, I was doing some test flying outside our office and to test how tough Zano was, at 15m altitude I simply turned off the motors. Nano tumbled and hit the car park. Now I wouldn't suggest anyone try this, in fact the software fail safes won't allow this to happen. Zano is small and it tumbled, and the impact with the car park outside our office only damaged one propellor. Zano apart from a few scratches was unscathed. On the point of spares, every Zano comes with an entire spare set of propellers. Hey James: In response to your question. The ZANO app will always be free, bug fixes will also be free for Zano, after 12 months, because Zano supports customisation, if we release a function that you want, it will be available as 'In App' purchase. We may release functions you don't want. You only buy the ones you want. These function updates will always be a small cost. From a product point of view, that is how we continue to be profitable. We sell Zano which has a huge amount of technology in it, we provide the HPC facility free of charge and our core business beyond building and selling Zano is adding new functions. Does that make sense? Hey Ben: Thank you, we are very excited. designed and made in the UK. In the event of loss of connection, Zano will automatically fly to the last know position of your smart device (phone or tablet) and wait a short yet to be defined period, if it doesn't re-establish a connection with you, it will automatically land. Hey Tairai: The camera we are currently using is an OV5640 5MP camera, capable of 1080p video at 30fps, this camera is not finalised as part of the production build, the OV5670 is a higher spec camera but it's inclusion will depend on cost at production volumes. Either way, the camera is 5mp and 1080p video. We will start at 720p video and check all the digital on board electronics and as soon as we can push to 1080p and 30fps, we will as mentioned with the stretch goals for MicroSD recording. That is all for now folks. I'll log back on and give you all an update on the production PCB revision progress later in the day. Have a good morning/afternoon/evening (region dependant). Ivan @FlyZano

[Nov 27 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey SungLi: That is a really good suggestion. The Zano Black will now have the RGB display at the front on a black PCB. Thank you, Ivan @FlyZano

[Nov 27 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi All. Wow, the support is fantastic, thank you to everyone. Hey Kenneth, to answer your question. The Fuel stick is a custom made, branded good quality power stick that meets our quality requirements. The USB cable is indeed detachable and you could use it to charge Zano or any other USB charged device such as Smart phones. It also looks good :-). Hey Carl: We chose WIFI due to its ability to connect many devices and send IP packets over the internet. In the SDK documentation, it will explain how you can make Zano connect to your own WIFI router and then how you can task many Zano's all over your own WIFI network or over the Internet. Zano is not just a one device to one controller, you could with our SDK build augmented reality games, do robotics research, or many other really cool things. Hey Abdul: On the bottom board (flight frame) where the battery sits underneath, there are a series of sensitive analogue filters that take a bit of room on the prototype. The production version has these retuned to relevant values and the filters are simpler, therefore removing just enough components that with some careful shuffling of other high speed digital camera lines, I can squeeze in the MicroSD cradle and power supply. Please bear in mind that Zano can power down to milliwatts so by adding an MicroSD card, we also have to add the ability to completely power down the card so that it doesn't affect Zano's low power sleep mode. Your query about the MicroSD card adding cost to the hardware and why is it a firmware stretch goal is a valid question, let me if I might answer that for you. The MicroSD cradle in production volumes is not expensive, the minor change to the injection moulded case is only a tooling change and production tooling has not yet been finalised. The firmware that is required to support the MicroSD card is more complicated. We have to build the File allocation table handling code, implement relevant timestamps as well as allow the firmware to playback the recorded video or photos through the app so you don't have to remove the MicroSD card to get the content. As such, the challenge is more in the firmware additions than the hardware ones. I think that is all the outstanding queries. I will continue to try and respond as quickly as I am able too in-between working on the production revisions of the PCB's and the Firmware. So If I go quiet for a little while, please know I will respond as soon as I take a break. Kind Regards, Ivan Reedman

[Nov 27 2014](#) on ZANO - Autonomous . Intelligent. Swarming. Nano Drone.

“ Hi All, A comprehensive update has just been published. The general gist, An on board MicroSD recording facility will be added to ZANO's hardware. A spare battery will be shipped with every pledge reward over and including £139. A "standard" protective carry case has been added to the rewards list. For more information, head on over to "Updates". Thanks! Reece

[Nov 27 2014](#) on ZANO - Autonomous . Intelligent. Swarming. Nano Drone.

“ Hi All. Just a quick comment to let you know we will be posting another update very shortly which we believe will cover most of the requests to date. We are also adding a short video which I think you will find interesting. I won't post any spoilers here as the update we believe is comprehensive. We have had a few enquiries about range. ZANO has been designed to allow us through regional configuration to comply with any new legislation the relevant governing bodies may release. One recurring theme seems to be UAV's must be flown within the operators line of site, not over populated areas, not within certain distances of facilities and factories etc. To allow us to ensure ZANO continues to meet these requirements, which means ZANO will continue to be legal for all users, we need to potentially restrict distance from operator, conditions of flight, safety overrides etc. So technically range can be increased, doing so may cause other issues for our users. As regional legislation changes, we will release automatic configuration changes based on region to ensure ZANO's continue to comply. Hey Joel: No problem, one of your questions is not actually covered by the main campaign. ZANO uses WIFI, it creates a local WIFI Hotspot with your own encryption key for security which you set when you first configure your ZANO. Regarding the operating system, ZANO has its own purpose built operating system entirely written in house in pure Assembly language. This is one way we are able to pack so much into such a small space. Hey Wei: HDR through software is something we may look into later on after launch, with the post processing capabilities we are offering through our dedicated ZANO HPC (Supercomputer), the usual editing, compensation and correction capabilities should all be there so though the raw content may not have the dynamic range adjusted, the post processed version certainly could do.

[Nov 26 2014](#) on ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi Kendrick, Post processing optic compensation through our HPC will be able to remove the fish eye effect. We are looking at the fish eye option in order create a wider field of view for maximum "windowing" possibility. Thanks! Reece

[Nov 26 2014](#) on #1: from the project ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hi Paul, Unfortunately we are extremely pushed for space on the PCB, both boards are already double sided and stacked together to fit all the existing components in! At this stage we will be proceeding without a MicroSD slot. Thanks for all of your feedback, We have earmarked your comment regarding Swarming for an update post/video later this week! Thanks Rupert, we're glad you backed the project also! Every share and like is very much appreciated!!

[Nov 25 2014](#) on #1: from the project ZANO - Autonomous. Intelligent. Swarming. Nano Drone.

“ Hey RL! First of all, thanks for your interest in our project ZANO! And my apologies for the delay in reply, we have been inundated with messages, we are trying our best to get to all of them in a timely fashion. Let me now provide some answers to each of your questions below. Please upgrade to HD camera: See FAQ and our update! ZANO will come complete with 5 megapixel HD video camera. What kind of battery will you use (easy find at local shop)? We will be using a 400 mAh standard lipo lithium polymer battery. Yes, it is replaceable. After our Kickstarter campaign is complete, all the spares will be available at the flyzano.com website. Can i add a extra battery to my pledge? Currently we are not offering spares, however, this may change if the demand is there. Need to through the ZANO to charging? Need more clarification on this one? However, I am assuming you mean, do you need to remove the battery from ZANO to charge it? You can do both! ZANO comes complete with a removable battery (For easy interchange and sustained flight time) however, you can charge ZANO's battery whilst it is docked inside of ZANO. Will the ZANO with carry bag for basic protection? Yes, a limited edition carry-case is available upon launch! See our rewards!

Nov 25 2014 on ZANO - Autonomous . Intelligent. Swarming. Nano Drone.