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## **Fighting the Odds Completing NUTSAT Launch Services**

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### **ABSTRACT**

NUTSAT is the one of the 3 NSPO's Capstone Cubesat Program, which will be launched in Dec. 2020. Gran Systems is the launch service provider of NUTSAT. In 2016, the concept of new space industry was just forming in Taiwan. By 2017-8, NFU won the NUTSAT project and then Gran Systems gained the launch service provider. Before the confirmation of the final bid, Gran Systems began sourcing around the world. As Gran Systems was one of the earliest entrants in the industry here, we were able to have discussion with most of the world's premier launch service providers and discover their business coverage and fit for completing our projects. We have concluded then that supplier from Russia had the best offering, was able to be friends, but was not able to do project together. The US, EU, and Japan suppliers had higher pricing. The choices would be India or innovative discussion with suppliers. So Gran Systems started intensive discussion with several industry players. Finally, we had Nanoracks able to support us with business exchange to enable us to bid, and we have since formed a tight business partnership with Nanoracks. During the interaction, Nanoracks spent more than 6 months getting



NUTSAT frequency coordination with different departments within NASA and US Government for access to launch. It was finally approved to have commercial launch access for NUTSAT after much coordination, explaining and waiting. Gran Systems became the first Taiwan company to gain such access for cubesats, and was able to allow others to follow suit. During this time, Gran Systems decided to design our own test pods, as we have the confidence to make such a device work. We went through design iterations to make the product more robust for customer requirement, and it has since received international notice and reporting, including on the NASA SmallSat Database through third party referrals. The launch services has many facets that need taking care, including coordination with all related organizations, parties, and government agencies. The largest part of the work is to keep all technical and administrative documentation within specification or to apply for exclusions on topics such as launch safety, material characteristics, outgassing, battery, testing reports, RF signals, EMI emission limits, range safety, shipping and transportation requirement, ability to react and switch from one country to another, being able to react to launch changes, etc. Towards the end of one launch service review cycle, we had to decide to change to another launch service supplier due to CIVID-19 pandemic, and had to go through the above technical review process the second time. We had to react to cope with different requirements from different countries and launchers, from Antares to SpaceX Falcon 9, and to make things happen in a short time in order to keep the launch date(s) and procedures, communicate to all related parties, and deliver the cubesat to the destination for launching. Overall, it has been a good learning experience for capacity building exercise.

***Keywords:*** *Cubesat, NUTSAT, Launch Service, Cost Structure, New Space Companies, Interface Control Documents, Launch Service Documentations, Switching Launch Services, COVID-19 Pandemic*