

**CECIL, 1U Amateur Radio CubeSat**  
(Technical Report)

**The Interaction of Private and Public Space Agencies**  
(STS Research Paper)

An Undergraduate Thesis Portfolio

Presented to the Faculty of the  
School of Engineering and Applied Science  
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Bachelor of Science in Mechanical Engineering

By

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### **Sociotechnical Synthesis**

My technical project and STS Research Paper both address the process of getting a satellite to the International Space Station (ISS) and then, from there, into orbit. In what follows, I will explain how each section explores this process. I will then discuss the benefits of working on the two projects in conjunction and how the STS research paper informed my technical process.

For my technical project, I am working in a group to design a CubeSat that operates on amateur radio frequencies and will be launched to and off of the ISS. A CubeSat is a light, compact nanosatellite intended for Low Earth Orbit. Therefore, after reaching the ISS, it can simply be thrown into orbit and will burn up while reentering Earth's atmosphere. The goal of this satellite is to establish two-way communication with the UVA ground station and send signals to the Amateur Radio Community, a group of hobbyists who have a fascination with radio communication. This project is a response to UVA's current satellite, Libretas, and its inability to communicate with the ground station.

In my STS research paper, I argue that the rising success of SpaceX and other private space-exploration companies is due to active efforts by NASA, as opposed to the two groups being independent and in direct competition. After identifying a need to consistently resupply the ISS, NASA began looking towards the private sector as an ally through the Commercial Orbital Transportation Services (COTS) program. Using Actor-Network Theory as a framework, I examine NASA's role as a network builder, SpaceX's role as an actor, and the Dragon capsule as

an example of success resulting from this collaboration. The momentum of an established agency like NASA combined with the innovation and excitement of a newer company like SpaceX broadens the scope of what either group could accomplish alone.

Launching the finalized satellite to and off of the ISS is a necessary component for my technical project to be a success. By working on my STS research project simultaneously with the technical project, I was able to fully understand this process. Had I not been working on the two sections at the same time, I may have simply assumed that NASA is in charge of restocking the ISS or that NASA and private companies work independently. This incorrect understanding could have influenced our group as we set requirements for the technical design of our satellite. Private companies could have different goals and interests than the government, and it is essential to keep this in mind as we work towards our own goals. Overall, working on both of the projects at the same allowed a complete assessment of the social environment in which our technical project will exist.

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