Hybrid Rocket Filling Station
Ground Crew UIC – AIAA Spaceport

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The competition known as the Spaceport America Cup, run by the group ESRA (Experimental Sounding Rocket Association), is a challenge for college students with the goal of designing and building a rocket able to deliver a payload to a specific altitude. This project's objective is to provide a safe and reliable means to remotely fill a hybrid rocket with a cryogenic oxidizer (nitrous oxide). Regarding the plumbing associated with the filling process, it is important to understand the involved risks and mitigate them as much as possible when working with high pressure fluids. The electronics portion of the project involves sending signals to remotely operated valves and receiving data from a pressure transducer. The communication and data acquisition will be done via radio signals sent and received by a radio transmitter operated by the ground crew stationed over a mile away from the rocket. Through thermal and mass analysis, it has been determined that the sponsor's current N_2O tank is insufficient and a 25lb capacity tank is recommended. The final design of the remote-control box meets all our sponsor requirements, can control all valves, and is durable enough to last a substantial amount of filling/dumping procedures. A schematic of the plumbing configuration in relation to the control box is provided below.