P09561: Assembly and Manufacturing Plan

Vibration Isolation Subsystem

All components of this design were fabricated in the RIT machine shop. The aluminum components were rough-cut on the band saw and final machining was done on the 3-axis Bridgeport mills. Because of the decision to use the linear guides, some of the cuts needed to be accurate to within 0.005” and parallel to within 0.3°, necessitating careful use of the milling machines.

In addition to the aluminum, the Sorbothane mounts needed to be modified as well. To fit into the VIS, one side of the threaded stud mount on each vibration damper needed to be cut to less than 0.25” long. To achieve this, the mount was clamped in a small vice and slowly cut on the band saw. Final filing of the rough edges was done with a hand file. It is important to follow these directions to ensure that the metal does not heat up past 160°F during machining. If the metal becomes hotter than this, damage to the elastomer may occur, causing the elastomer to become soft and exhibit excessive creep.

Since this project is not predicted to ever be manufactured in large quantities and none of the components in this design are overly complex, CNC machining was not deemed a necessary manufacturing option. In addition, many of the components require multiple setups, making it difficult to efficiently automate the manufacturing process.

Final assembly of the system is straightforward, and the P09561-VIS assembly drawing should be followed. The only items to note are over the linear guides. Only the outer two mounting screws are required for attaching the guide rail to the respective mounting location. This eliminates the need to remove the guide block from the rail, and still provides adequate mounting strength. Also, while installing the guide rails, the rail should be held against the ridge of the pocket into which it mounts. This ensures that the rail is mounted in the correct orientation to eliminate binding issues. The rail can be held in place by hand or with a clamp.

Imaging System Frame

The top and bottom surfaces of the frame consist of aluminum plate where material was removed from the interior via an end mill. All other joints are welded together. Four small brackets are welded near each corner of the top plate for mounting the frame to the UAV. The bolt pattern is drilled into these brackets after welding to ensure correct positioning.

The boards in the forwards compartment of the frame are secured via hexagonal standoffs which are cut to length to fit between the boards themselves and the boards and the frame. A pin in placed through the front of the frame, through and the standoffs and into a threaded hole on the middle crossbeam and screwed into place. The SD card reader attaches from the side using a piece provided by the manufacturer that has been altered to fit mounting needs. This place holds the board and is also attached to the frame via threaded fasteners. The boards for delivering power to all systems are also attached in this fashion.

The entire frame is manually fabricated using 3 axis milling machines provided in the Mechanical Engineering Department’s machine shop. The construction is not complex and can easily be repeated by any future project if a change of size is needed. The width of the frame must remain near the same but the length can be changed as needed as long as the same bolt pattern for mounting is used. Manual fabrication was chosen because of the fact that this is a single unit project. If many more of this frame were to be made then the production could easily be automated.