Pilot Health Monitoring System
Executive Summary

The original plan for this project was to design and build a system to monitor the health of a pilot as they fly an aircraft, the goal was to increase the overall safety of flying for both the pilot and passengers. Risk involved with flying could be mitigated by continuously collecting and analyzing biometric data from the pilot as they operate the aircraft. Once analyzed the system will then determine if the pilot is currently in good health, if it is found that they are not the system will alert the ground and copilot. The system may also trigger an autopilot system onboard the aircraft.

From the start of the project the system was broken up into nine blocks: the microcontroller, Software, HR sensor, SP02 sensor, Haptic Feedback Module, Bluetooth Module, Storage Module, Enclosure and Power Module. Each of these blocks was distributed to one member of the team who was responsible for designing and implementing the block. The first 10 weeks of the project where the project definition phase, the scope and requirements of the system were determined, and the blocks were created. The second ten weeks of the project included block design and verification. After each block had been designed and tested the integration phases began, where all blocks were combined into the final system. While combing the final system some issues with the PCB design were found, many of these could be solved with some simple rerouting but others required the introduction of external modules into the system, one example of this was the Bluetooth module, the onboard Bluetooth module was routed through a serial line that was connected to a logic converter, causing communication errors. Another unresolved issue with the final design was the onboard SD card module. The original PCB routed an enable pin to high when it should have been routed to ground, even after changing the connection of the enable pin, the SD card module still did not fully work, it only opened and wrote to files during a small percent of its operation. Future work on this project would include another version of the PCB being designed, the next version of the system would contain two PCBs mounted on two levels of the enclosure, this would give the optical sensors more space to fit through the enclosure and make good contact with the subject's skin.

The biggest lessons we learned throughout the process of this project have to do with time management and project planning. Most parts of the project were planned out well in advanced through our block assignments, but other things slipped through that process, such as the PCB design. No single individual owned a PCB block, so there was no timeframe that it needed to be completed by. Because of this lack of hard due date on the PCB it ended up being completed very late, giving the group very little time to debug and test the entire system. The group should have had a completed PCB finished the week after the final block checkoff, but instead it was completed over a month later. If there had been earlier versions of the PCB completed the final design would have come together much smoother and would have met more of the system requirements. A lesson the team learned is to assign the PCB work as a block for an individual to own throughout the duration of the project. The team also learned

that it is important to keep up to date on the progress of other members on their blocks, this helps ensure that no members fall behind in their work.

Project Timeline:

Fall Term

Initial Project Partner Meeting (Week 5)

Define Engineering Requirements (Week 6)

Define Project Block Diagram (Week 9)

Sensor Research (Week 9 – 12)

Begin Detailed Design of Individual Blocks (Week 11)

Project Definition

Winter Term

Team Winter Meeting (Week 11)

Project Partner meeting 2 (Week 13)

Individual Block Testing #1 (Week 15)

Individual Block Testing #2 (Week 17)

Individual Block Testing #3 (Week 20)

Mock System (Breadboard System) (Week 21)

Testing and Implementation

Spring Term

Project Partner Meeting 3 (Week 22)

PCB V1 Order (Week 23)

Initial System Checkoff (Week 24)

PCB V2 Order (Week 26)

Final System Checkoff (Week 27)

Project Closeout

Mock System (Breadboard System) (Week 21)

System Integration and testing