Development of an SRAD Flight Computer

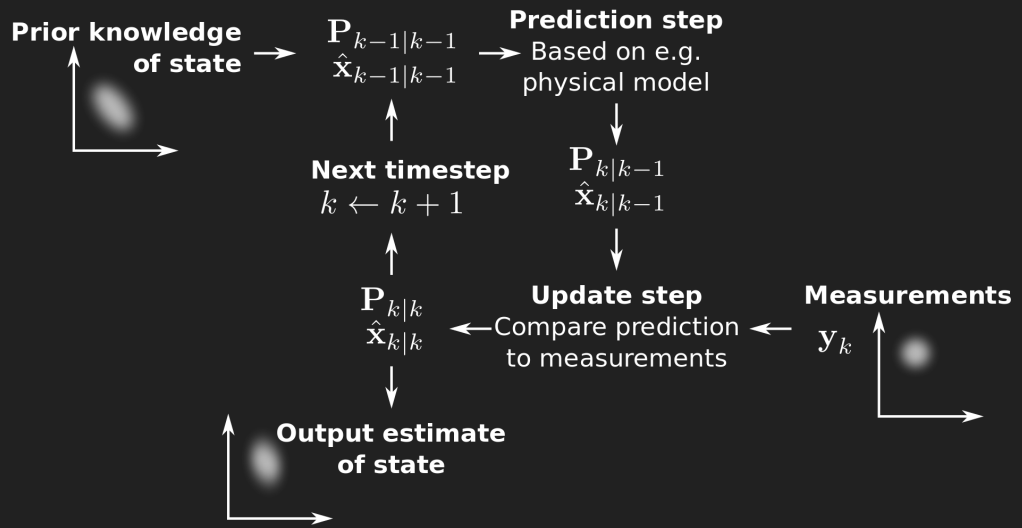
UB Students for the Exploration and Development of Space

Flight Computer Requirements

- Measurement and recording of altitude, velocity, etc
- Deployment of parachutes at proper altitudes
- Video recording
- Reliable GPS tracking

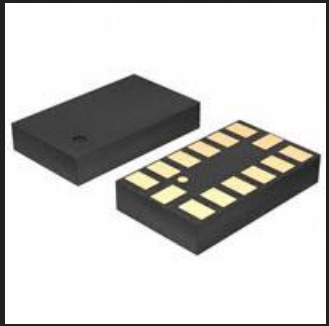
Software

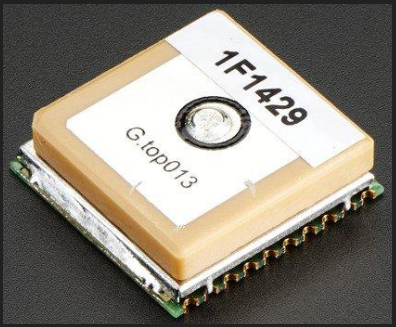
- Kalman filter for apogee detection
  - Sensor fusion
  - Noise estimation
  - Dynamics model
- Arduino API
- Custom scheduler



Component Selection

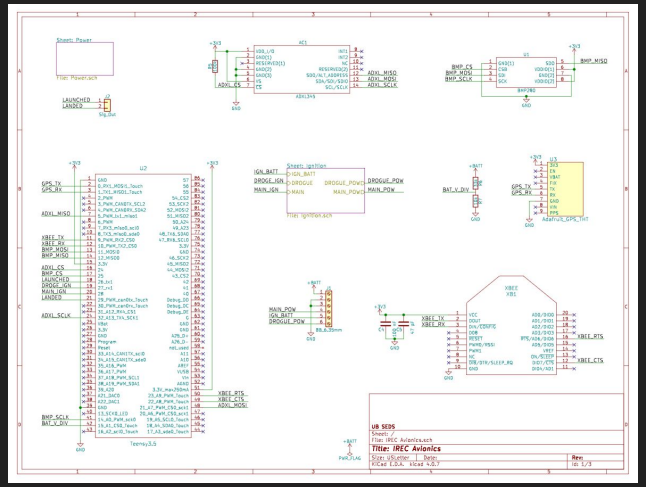
- Teensy 3.5: Speed, space, SD card, Arduino compatibility
- BMP280
- ADXL345
- MTK3339
- XBee-PRO 900HP

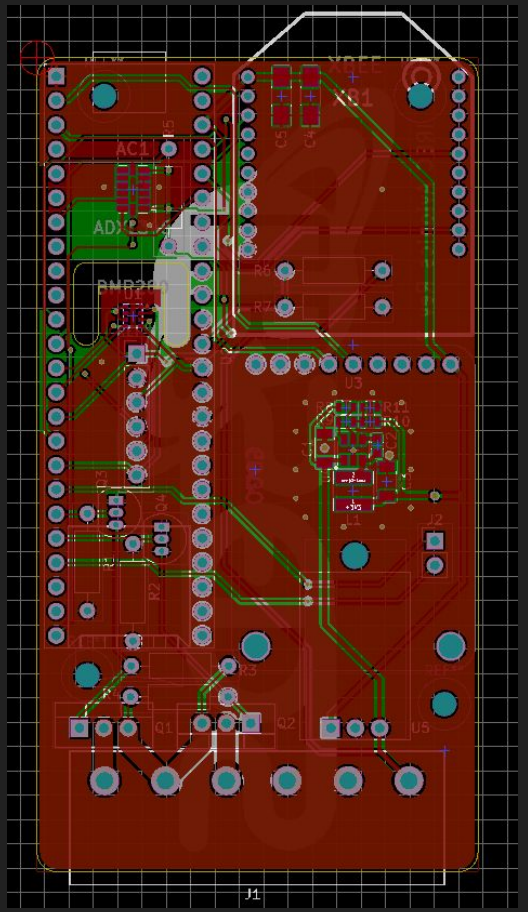




PCB Design

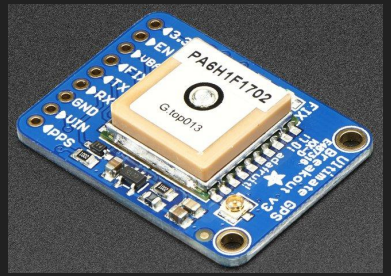
- Reusable modules
- Separate ignition battery

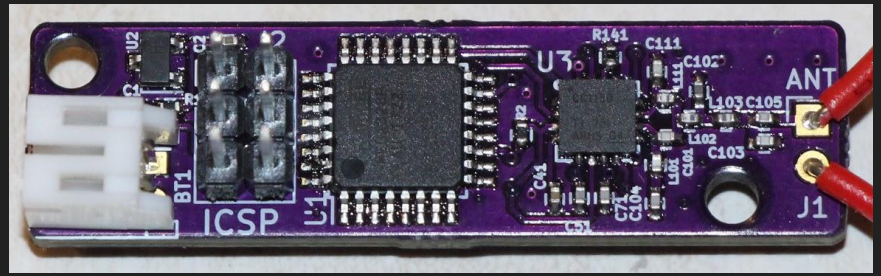




Tracking

- GPS for precise positioning, simple RDF backup for bad signal conditions
- Redundancy:
  - Primary flight computer with GPS tracking
  - COTS GPS tracker
  - Main section SRAD RDF tracker
  - Tail section SRAD RDF tracker
- Custom RDF transmitter with 40 hour battery life





Testing

- Attached to custom built high-thrust quadcopter for launch simulation.
- Test 1
  - Late apogee detection observed.
  - Kalman filter calibration corrected.
- Test 2
  - Unreliable operation.
  - Faulty accelerometer replaced.
- Test 3
  - Accurate and reliable apogee detection observed.

Conclusion

- Working flight computer
- Future design:
  - Optimization
  - SRAD radio