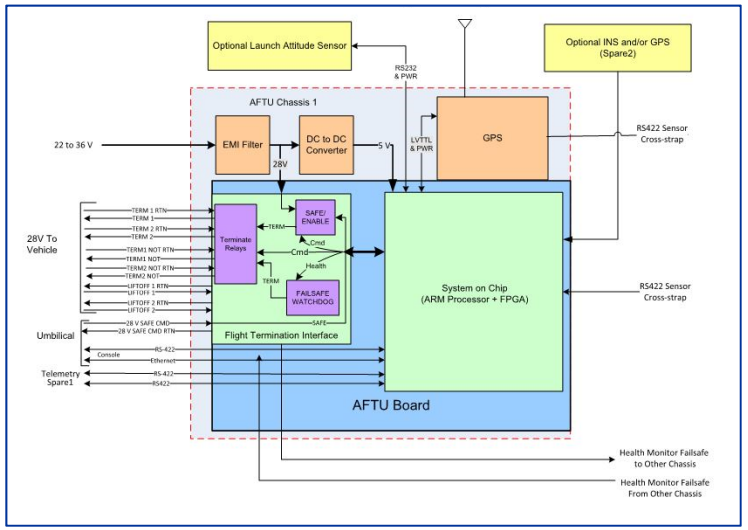
Autonomous Flight Termination System (AFTS)

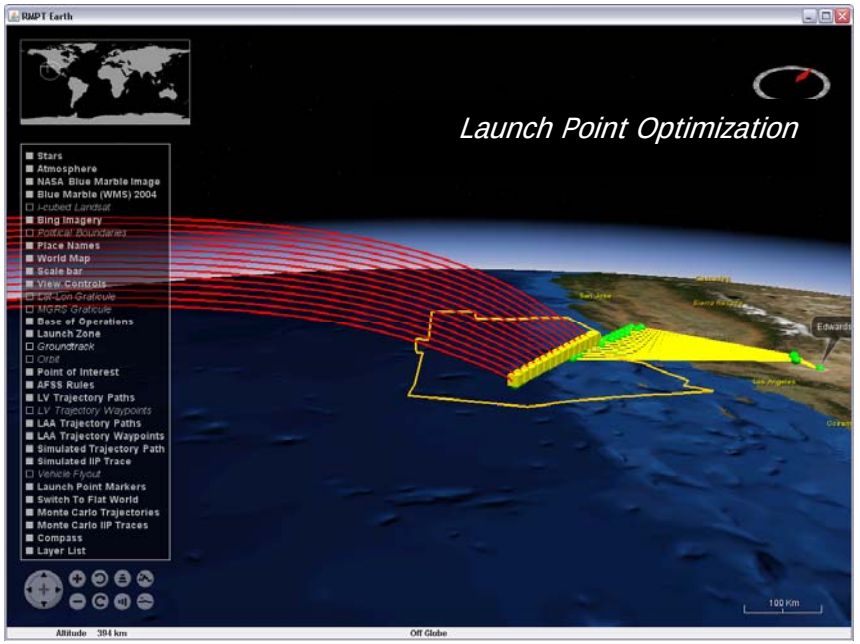
- The Autonomous Flight Termination System (AFTS) is an independent launch vehicle subsystem designed to enable unmanned range safety operations, with the goal of eliminating cost and operational constraints imposed by ground-based tracking assets
  - Autonomously makes flight termination decisions using configurable software-based rules using data from redundant GPS/inertial measurement unit (IMU) navigation sensors
  - Being developed through DARPA's Airborne Launch Assist Space Access (ALASA) program
- Flight software: Core Autonomous Safety Software (CASS) is currently available – implements and enforces flight safety rules
  - Vehicle-specific wrapper software is needed to accommodate external interfaces
- Ground software: Flight Analyst Work Station (FAWS) software is currently available – used for preflight mission rule generation and simulation
- Flight hardware: AFTS hardware is in currently in development and test. Final hardware design is expected to be complete and available in summer 2016. Demonstration flights are planned for 2016, and range safety certification is expected in 2017



NASA AFTS Flight Design

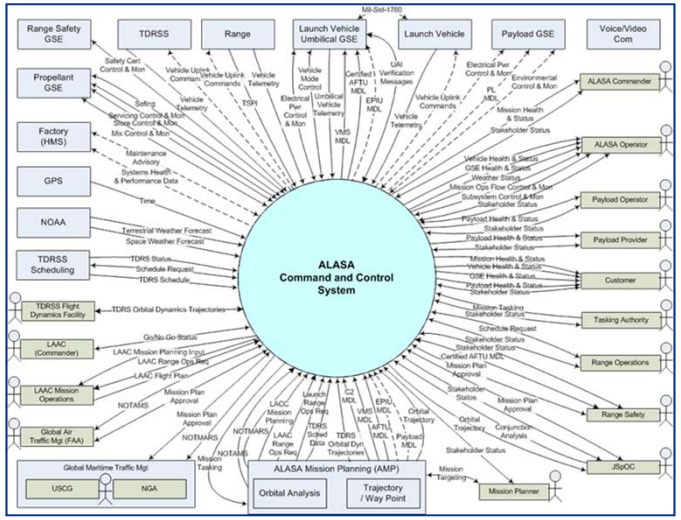
Rapid Mission Planning Tool (RMPT)

- Another tool developed through ALASA, the Rapid Mission Planning Tool (RMPT) ties together all the prelaunch mission planning functions required for air launches of small launch vehicles
  - Launch point optimization algorithm (LPOA) to generate aircraft tasking orders and determine the optimal launch point
  - Optimal ascent algorithm (OAA) to generate optimal ascent trajectories from each possible launch point
  - A six-degrees-of-freedom (6-DOF) launch vehicle simulation for high-fidelity trajectory analysis
  - Calls government-furnished Joint Advanced Range Safety System (JARSS) software to automatically generate the flight safety rules used by CASS or other flight safety software algorithms
  - CASS or other flight safety software algorithms to verify the mission data load and perform mission analysis
- Base software version is complete and currently available; users can modify as needed



Automated Launch Coordination (ALC) Tool

- The Automated Launch Coordination (ALC) tool being developed through ALASA seeks to streamline and automate many of the required launch-day interfaces with approving authorities and service providers, such as:
  - Aircraft and launch range operations resource scheduling
  - Joint Space Operations Center (JSpOC) collision avoidance analyses
  - NASA Tracking and Data Relay Satellite System (TDRSS) coverage and bandwidth
  - Federal Aviation FAA airspace management & notifications
  - U.S. Coast Guard & National Geospatial Intelligence Agency (NGA) maritime notifications
  - Department of State treaty notifications
  - National Oceanic & Atmospheric Administration (NOAA) weather & space weather forecasts
  - Range safety mission plan & flight safety approvals
  - Sharing predicted separation conditions of payloads on orbit



Complex web of external interfaces

- Software is currently ~90 percent complete but at this time is not planned for release. Design and interface documentation is planned for release in summer 2016