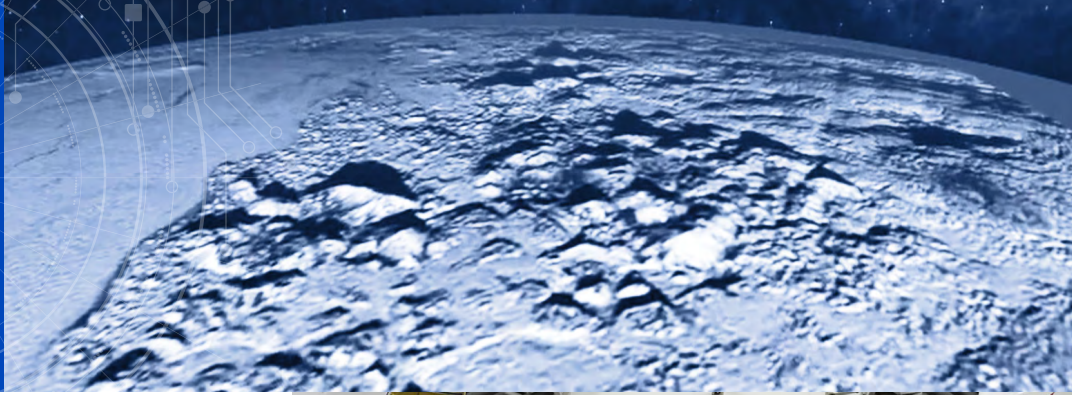




SOUTHWEST RESEARCH INSTITUTE



SpaceFlight Systems

Southwest Research Institute® (SwRI®) is a world-renowned supplier of mission-critical systems for the aerospace industry. With a long history of successful spaceflight missions, we have core competencies in software development, computer networking, real-time operating systems, and systems engineering.

Space Flight Software

With more than three decades of experience, we have developed software and systems for many government and commercial space flight missions:

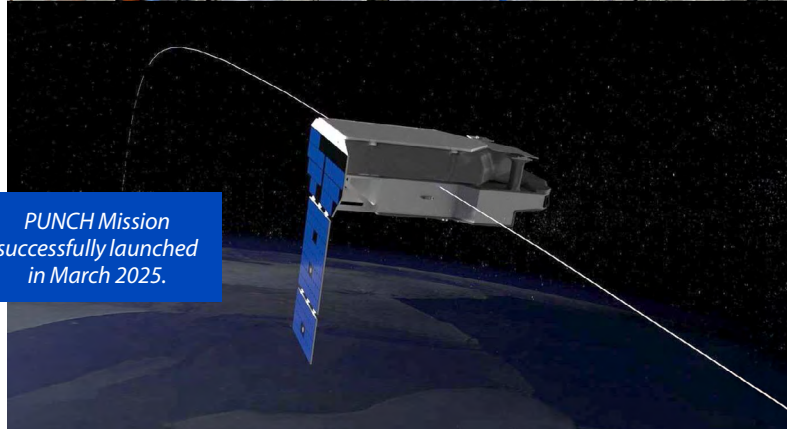
- Science instrument suites
 - Magnetospheric Multiscale (MMS) mission
- Satellite systems
 - Cyclone Global Navigation Satellite System (CYGNSS) mission
 - Polarimeter to UNify the Corona and Heliosphere (PUNCH) mission
- Ultraviolet imagers and spectrographs
 - New Horizons mission to Pluto
 - Rosetta mission to Comet 67P/Churyumov-Gerasimenko
 - Juno mission to Jupiter
- Gamma Ray Burst Instruments
 - Fermi Gamma-Ray Burst Monitor
 - Swift X-Ray and Ultraviolet/Optical Telescopes
- Avionics and command and data handling software
 - Many government and commercial missions
- Space networking modeling and simulation
 - Architecture design, modeling and simulation
 - Integration and testing

Capabilities and Experience

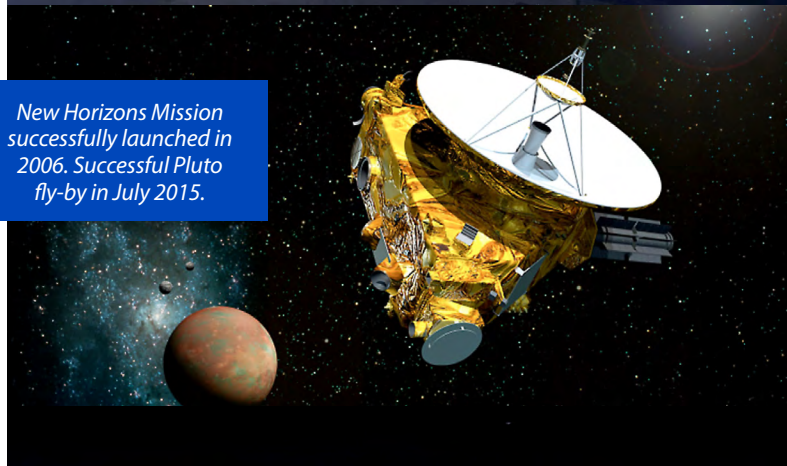
- Flight software frameworks:
 - NASA cFE/cFS
 - SwRI's Reusable Flight Software (RFS)
- Processors:
 - BAE Systems' RAD750, Freescale MPC8548E, Atmel TSC695, Atmel AT697F, Frontgrade-Gaisler GR712RC, ARM Cortex-M and Cortex-v8, Intel 8051, RISC-V
- Operating Systems:
 - VxWorks, RTEMS, uCOS, Linux and custom executives, FreeRTOS, seL4, and Zephyr
- Device Drivers:
 - Spacewire, Ethernet, MIL-STD-1553B, I2C, SCSI, Flash, EEPROM, CRAM, MRAM, PCI, Serial (various), RapidIO and SPI
- Backplanes:
 - VPX, CompactPCI, I2C and custom
- Bootstrap software



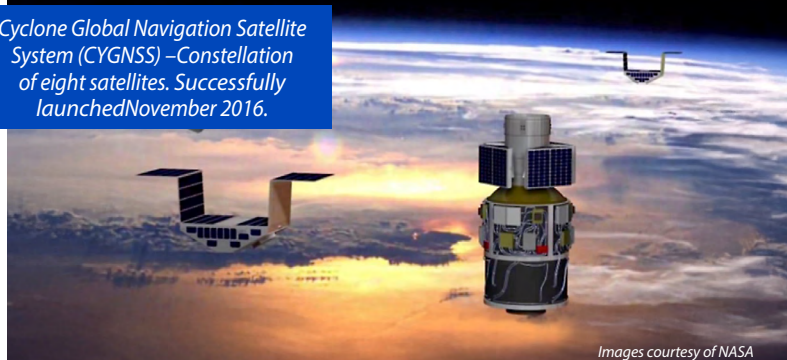
MMS observatories in preparation for launch. Mission successfully launched on March 12, 2015.



PUNCH Mission successfully launched in March 2025.

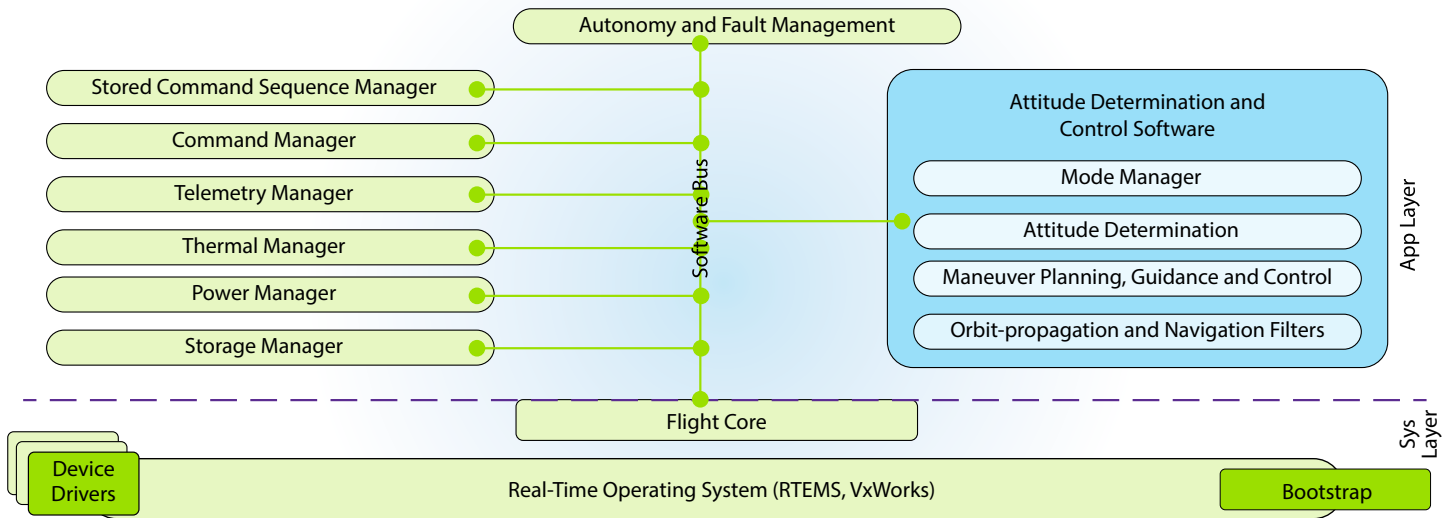


New Horizons Mission successfully launched in 2006. Successful Pluto fly-by in July 2015.



Cyclone Global Navigation Satellite System (CYGNSS) – Constellation of eight satellites. Successfully launched November 2016.

Images courtesy of NASA



Mission Roles

- Instrument and spacecraft flight software development
- Ground systems development
 - COSMOS
 - Galaxy
 - ASIST/FEDS
 - OASIS CC
 - LabVIEW
 - GSEOS
- Systems engineering
- Independent review, verification, and validation

Edge Computing

- Explore how to solve demanding computational problems on resource-constrained platforms
- Deploy machine learning (ML) models on spaceflight platforms
- Decisions
 - Make decisions at edge to intelligently reduce data volume and solve problems quickly
 - Develop applications including spaceflight, autonomous vehicles, and smart cities
- Applications include space, autonomous vehicles, and smart cities

Systems Engineering

- Capability Maturity Model Integration for Development (CMMI-DEV) level 3
- System design and architecture
- Requirements and software lifecycle management
- Modeling and simulation
- Safety and security assessments
- Extensive experience working with other organizations to support joint/shared flight software development

Satellite Cybersecurity

- Penetration testing of space systems
- Zero trust architectures (ZTA)
- Micropatching secured to space assets
- Secure over-the-air (OTA) updating
- Encryption of satellite communications
- Secure booting
- Intrusion detection and prevention systems (IDS and IPS)

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