Advanced CCSDS Solutions from SwRI

- **CCSDS Uplink Telecommand Processing**
  - SGLS or SDST transponder interfaces
  - BCH Error Detect / Correct
  - Full COP0 or 1 protocol (including FARM)
  - Uplink rates up to 125Kbps

- **CCSDS Downlink Telemetry Formatting**
  - SGLS or SDST transponder interfaces
  - Up to 2 fully independent telemetry formatter engines supporting 4 Virtual Channels (VCs) each
  - Options for Reed Solomon Encoding, CRC, AES Encryption, Turbo Coding (in development)

- **General Purpose I/ O**
  - Analog / Differential & Bilevel Inputs
  - Discrete Output pulses (5V and 28V)

- **Additional Options**
  - MIL-STD-1553B, 2MBytes SRAM, Mission Elapsed Timer, UARTs

- **Backplane Interfaces**
  - cPCI, VME, custom
- **Uplink Telecommand Processing**
  SwRI’s CCSDS command processors provide full COP0 or COP1 uplink command processing. Uplink command decoding features BCH error detect and error correct, and command de-randomization. Autonomous execution of level 0 commands provides mission critical safe mode command and control functions. Level zero commands include +28V pulse drivers, TTL output drivers, switch signal interfaces, configuration latches and system settings.

- **Downlink Telemetry Formatting**
  SwRI telemetry formatter engine provide complete formatting of flight software CCSDS source packets into VCDUs and CVCDUs. Hardware support for up to 4 separate Virtual Channel (VC) buffers are available for each formatter engine. SwRI telemetry formatters provide configurable formatting options including Reed Solomon, CRC, Advanced Encryption Standard (AES), and Turbo Coding (in development). Downlink telemetry rates of up to 3Mbps with output options of RS-422, or LVDS, encoded as NRZ-L, M, or Biphase-L.

  Complementing the level zero command processing and execute, the SwRI telemetry formatter engines provide autonomous level zero telemetry collection. Mission critical health and status information can automatically be collected, formatted, and downlinked with no flight software intervention necessary.

- **General Purpose Inputs**
  SwRI Command and Telemetry systems provide general purpose inputs designed to collect mission health and status information. Up to 32 analog channels (12 bit, single ended or differential), and 32 bi-level input channels are supported.

- **Additional Interface**
  Additional space system avionics interfaces supplied by SwRI’s command and telemetry modules include: MIL-STD-1553B BC/RT interfaces, bulk SRAM storage for FSW data, system timing maintenance through a Mission Elapsed Timer, and UART debug ports facilitating software development.

- **Bus Interfaces**
  Available in multiple bus configurations including: cPCI, VME, and custom bus interfaces.

- **Radiation Hardened Designs**
  TID tolerance of up to 100KRads, SEL immune, and SEU hardened for mission critical command and telemetry interfaces.

- **Flight Heritage**
  Missions using SwRI CCSDS hardware include: IMAGE, ICESat, QuikSCAT, Deep Impact, Calipso, Orbital Express, NPP, and NextView.

- **Contact Information**
  Southwest Research Institute
  San Antonio, Tx 78230
  Mike Epperly (210) 522-3477
  mepperly@swri.org