AVIONICS FOR SPACE LAUNCHERS
Data & video management, mission computer, safety, TT&C
Safran Data Systems is offering the whole avionics and datalink from on-board data & video acquisition & processing, mission management, safety, control & command to ground decommutation, display and analysis and TT&C through scalable systems.

COTS-based and tailored product portfolio coming from a 50-year experience in space control & command, instrumentation, telemetry and safety
Based on space proven solutions, Safran Data Systems provides the most complete offering in space control & command, instrumentation, telemetry and safety.

**Strong experience and satisfied customers worldwide**

Safran Data Systems supports as an active member the Telemetry Standards Coordinating Committee (TSCC), Recorder Reproducer Vendor Working Group and RF Vendors Working Group.

**Multi-disciplinary expertise**

Safran Data Systems’ basebands cover worldwide needs for companies offering services like KSAT and SSC. Comprehensive solutions for space communication, high data rate image telemetry reception, satellite housekeeping and orbit determination are a full part of the company’s legacy expertise.

**Contributing to the progress of the community**

As an active member of the instrumentation, telemetry and TT&C community, Safran Data Systems takes part in many international conferences, participates in technology advances through numerous publications.

**Continuous innovation for ever improving products**

Market-driven innovation is at the heart of Safran Data Systems strategy to bring the best solutions to its customers’ requirements and improve its COTS offer. We use the most progressive, multidisciplinary technologies to meet quickly evolving market demands.
SCALABLE AIRBORNE ARCHITECTURE
COTS-based products for tailored solutions

**Sounding rockets**
- Ruggedized and compact Data Acquisition Unit (DAU)
- Transmitter & recorder embedded in the DAU
- Wireless on-board data transmission
- Miniaturized remote acquisition system
- Embedded processing & I/O

**Re-usable and LEO launch vehicles**
- HD video acquisition & compression
- Wireless on-board data transmission
- Autonomous Flight Termination System
- Location
- Data recording and transmission
- Avionics

**Heavy and GTO launch vehicles**
- Radiation-tolerant DAU
- HD video acquisition
- Wireless on-board data transmission
- Flight termination receiver
- Location

**Manned sub-orbital flights**
- HD video acquisition
- Wireless data transmission
- High-performance video compression
- Ruggedized and compact DAU

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eZ Software Suite, unique software for data collection and analysis during and after the launch
**SCALABLE GROUND STATIONS**

Answering customer specific requirements

### Mobile ground station
- Small/medium size antenna
- Lightweight mobile antenna
- Modular and compact receiver and recorder
- Mobile shelter-based station also possible
- Processing

### Fixed ground station
- Fixed small/medium/large size antenna
- RF recording capacity
- Modular and compact receiver and recorder
- Multi-station best source selector
- Processing

### Shipborne station
- Small/medium/large size antenna
- RF recording capacity
- Modular and compact receiver and recorder
- TMC software for remote antenna monitoring
- Ship integration expertise
- Processing

### Telemetry, Tracking & Control
- Best in class telemetry receiver
- Highly reliable control & command link
- Continuous tracking & high accuracy ranging
- Mostly used TT&C in the world

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eZ Software Suite, unique software for data collection and analysis during and after the launch

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SCALABLE AVIONICS & TELEMETRY

Wired/wireless distributed system

Scalable solutions based on flight proven COTS

ARU: Versatile remote acquisition, control & command Unit

VID: video acquisition, buffering management, compression & transmission

IMU: compact hybrid Inertial Measurement Unit

Location & Safety

OBC: Compact On-Board Computer

uARU: wireless, low power, remote acquisition, control & command unit

SEQ: versatile & compact payload sequencer
The versatile and ruggedized IRIG 106 Ch4/Ch7 gateways seamlessly expand existing instrumentation systems without impacting transmitting efficiency. Two gateways are possible: one in the XMA system, the other one in the MDR system.

#3 Versatile multi-satellite sequencer

Scalable payload sequencer, based on a modular architecture and a unified interface to the launch vehicle. From 2 to 100 satellites.

#4 Compact & modular avionics

Tailored avionics built from COTS toolbox merging computing, instrumentation and control & command modules.
THE ULTIMATE TOOLBOX

Design your own avionics & instrumentation system from COTS modules

Best-in-class ruggedized acquisition unit
XMA system provides a wide range of modules for acquisition of comprehensive data signals and buses, with best in class accuracy. Generic acquisition modules make reconfiguration by software very easy.

Questions about telemetry budget or on-board recording capability?
Multiple processing options available for sensor acquisitions or bus acquisitions enable optimization of telemetry bandwidth or storage capacity. With user-written algorithms, XMA system On-Board Processing opens many perspectives such as external command, sounding rockets payload control and data protection.

Control & Command
Newly developed Control & Command modules interfacing to valves and actuators will allow implementation of full avionics system and payload sequencer.

Mass saving at all stages

Reduced footprint
- 3”x2” and stackable design of the XMA system
- Miniaturized remote acquisition & recording solutions

XMA system DAU embedded functions reduce architecture size
- Recording
- Transmission (to telemetry)
- Data streams
- Accurate synchronisation

Wireless
Dedicated wireless solutions have been developed to enable reliable and synchronized data acquisition at all levels of the architecture, in the XMA and the MDR systems.

HIGH-PERFORMANCE VIDEO RECORDING

Process any video on-board

Versatility enables acquisition of SD to 4K video, from analog, digital or IP cameras. Large HD video streams as well as harsh environments are fully supported by the MDR and XMA systems.

Take advantage of onboard high-capacity MDR-GT recorder to acquire high data rates of aggregated HD-video SDI streams or 4K video streams. The video acquisition module of the ruggedized XMA system DAU offers a very compact video recording capacity for remote and harsh environments.

Multiple video processing capacities

Highest compression rates
Take advantage of H.265 High Efficiency Video Codec compression format for HD or 4K video, improving compression by a factor up to 2 compared to H.264. No compromise for the user between video quality and telemetry bandwidth.

On-board processing capabilities
The MDR system enables many functionalities such as filtering, frame rate decimation, video resolution conversion and powerful buffering. Conversion of IP-Camera streams to instrumentation and telemetry IRIG 106 telemetry standard data format.

HD ruggedized cameras
Take advantage of low-latency, synchronized SD or full HD video recording in your installation for applications ranging from external communication to live monitoring and image analysis.
eZ SOFTWARE SUITE

eZ software suite offers end-to-end data management. It provides configuration interface for definition of sensors acquisition and digital bus acquisition, down to real time data display and/or post flight data extraction.

- **Easy configuration of acquisitions**
- **Manual or Automatic data output generation**
- **Automatic configuration of eZ Processing**
- **Definition and/or importation (option)**
- **Quicklook & Monitoring**
- **Launcher avionics**

**eZ Setup**

- Sensor to output configuration of FTI
- Loading of configuration into the system
- Control of operation status of devices
- Maintenance

**eZ Processing Workstation**

- Real time display
- Record of data for playback
- Record of data into csv/Excel/matlab files

**eZ SOFTWARE SUITE:**

- **eZ SETUP**
- **eZ PROCESSING**

**eZ SetUp**

configuring a single acquisition and control & command unit to a full distributed avionics architecture:

- Definition of individual units (DAU, Recorder, Switch, Workstations) compatible with: XMA, MDR, MDR-GT, GMDR, µMA and µDR
- Network connection definition
- Data Acquisition (Sensors and Digital Bus) defined at high and low level, with Excel importation optional feature
- Manual and automated data output generation compatible with: PCM Chapter 4, Chapter 10, Chapter 7, IENA and DAR
- Loading of FTS
- Real time monitoring of devices and channels status
- Real time Quicklook of acquisition data

**eZ Processing (Advantys)**

eZ Processing (Advantys) provides advanced data display and decoding functions:

- Real time display of parameters in view windows completely customizable by the user (up to 10 windows)
- Playback of recorded data with display of parameters in view windows completely customizable by the user (up to 10 windows)
- Extraction of parameters from recorded data, and conversion to physical values stored into EU files (Engineering Units), with calibration function used when applicable
- Generation of computed parameters through C language functions
- Generation of user configured alarms based on parameter’s value (which can trigger record or display of a particular view)
- Record of data in raw format for playback
- Tool for converting EU files into common formats (text, Excel, csv, Matlab)
- Tool to generate curves from EU files

The configuration of the decoding performed by this software is automated thanks to eZ SetUp software (see above). The user can then focus on data analysis.
SECURE YOUR FLIGHT

Specific levels of ruggedness

All on-board equipment provided by Safran Data Systems is suited to the harshest environments enabling installation in all kind of aerospace platforms.

The XMA technology is specifically designed for very harsh environments and remote locations as a baseline.

- XMA can handle from -50°C up to 105°C, up to 30g RMS vibration & 120g acceleration.
- CMA is specifically designed for missile testing handling high acceleration, stage separation.
- LMA has been designed to withstand highest constraints of space environment like exposure to radiation, vaccum, ...

Expertise in cybersecurity constraints

Safran Data Systems closely partners with its customers in setting strategies and technologies in order to protect their systems.

Capitalizing on its experience in military mission recording and flight testing, Safran Data Systems is continuously working towards better data security and maintaining full compliance with evolving cyber regulations.

We track™ network of autonomous RF sensors continuously tracks any visible active spacecraft, independently of any other service, and regardless the location of customers spacecraft. With three main tracking networks, WeTrack™ covers the entire globe.

End-to-end range safety capacity

Safran Data Systems offers the whole system for range safety from on-board flight termination receiver down to ground antennas, amplifiers and command systems.

The highly reliable FTR140 Flight Termination Receiver offers a compact package and fully digital operation for use on any type for launch. Full compliance with IRIG-319 (4 tones).

Dedicated and scalable design of Range Safety ground stations is possible, based on our past experience in safety for launcher or missiles ranges.

Multi-purpose location

Hybrid location system is based on multi-constellations GNSS and Inertial Measurement Unit.

This hybrid system offers highly precise and robust location. It is autonomous and adaptable to any launch vehicle, it is battery-powered and offered with own telemetry system.

Successful first flight of the new autonomous location kit on Ariane 5 VA253 on August 17th 2020. This kit consists of CMA, IMU, transmitter and batteries.
HIGHLY RELIABLE DATA TRANSMISSION

Scalable data link to ground

Stand alone or embedded transmitters
5 or 10W transmitters are available, and embedded transmitting capacity is also offered in the XMA/CMA data acquisition unit.

Full range of telemetry antennas
The SPARTE antenna system provides full coverage of every need whatever the distance to the launcher and the constraints. As a complement, the highly transportable COMTRACK antenna enables short distance telemetry reception close to the launch pad.

Antennas are controlled by the Antenna Control Units. In addition, the TMC (Telemetry Monitoring and Control) software enables users to remotely control multiple antennas.

Data retrieved directly from the source

Highly reliable ground recorders
Recording of the RF signal immediately after the antenna provides the highest availability of data after the flights, both for analysis and for complete station check while following launches.

Based on the same architecture as the MDR widely used in flight test of aircraft, the GMDR allows easy recording and replay of baseband data, as well as regeneration of on-board captured video signals or reconstruction of telemetered data.

Aiming at the future of the ground station

Best Source Selector
With multiple ground stations, ensure a live selection of the best source.
- Selection of the best signals out of up to 8 antennas
- Seamless switch between the different sources

Questions about C-band migration?
Safran Data Systems ensures its customers the utmost upgrade options and flexibility in baselining its L/S/C tri-band concentric feed on all SPARTE series. The tri-band feed can be proposed in multiple configurations. It allows field upgrades in any telemetry frequency bands while keeping cost under control.
SUPPORTING FROM A TO Z

Extended experience in the field

Long experience in the field enables Safran Data Systems to support its customers from very early stage.

- Definition of on-board systems and ground stations
- Advise on the selection of sensors, on-board antennas...
- Technical trainings at Safran Data Systems sites or at customer sites

Standing by customers

Safran Data Systems supports its customers through the whole life cycle of the products, with tailored solution from standard repair to long term total care maintenance contract.

- Equipment and system installation service
- Embedded firmware and software update
- Obsolescence management service
- Extended warranty