

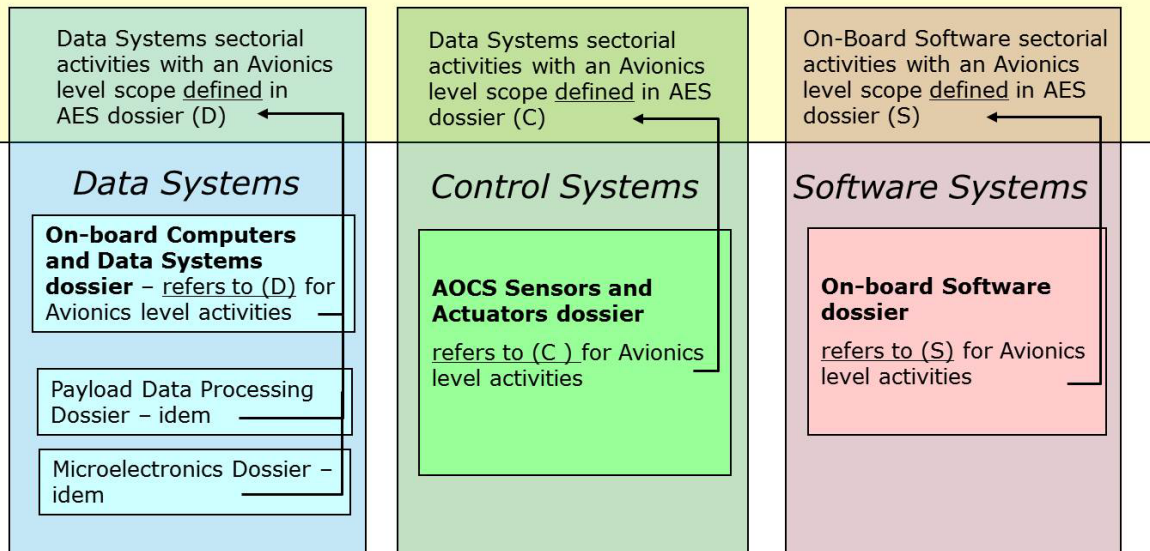
Avionics roadmap

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Technology Overview

Avionics Embedded Systems dossier: roadmap listing Avionics level cross-sectorial activities and sectorial activities with a cross-sectorial scope

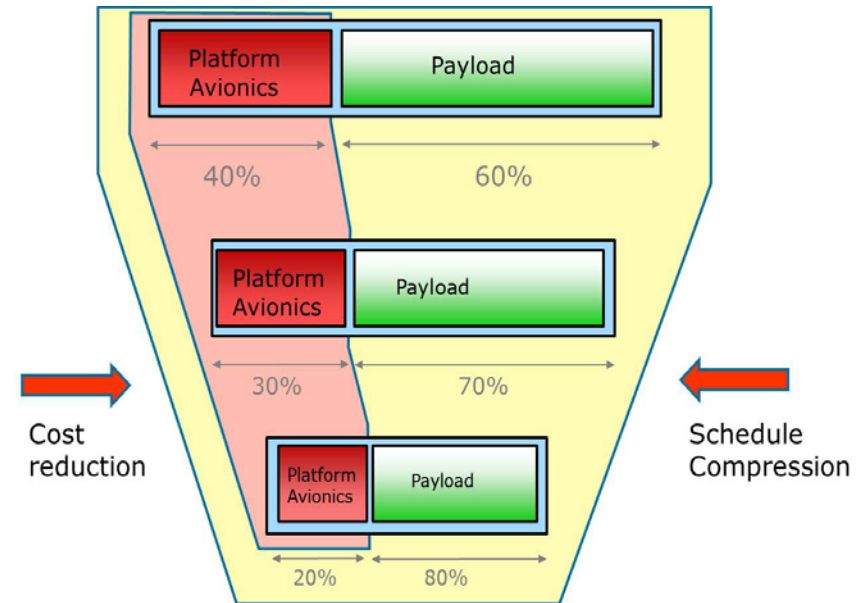


Basic functions implemented by the Avionics Embedded Systems :

- Mission and Vehicle Management;
- Command & Control;
- Fault Detection Isolation and Recovery (FDIR);
- Attitude and Orbit Control / Guidance Navigation & Control;
- Thermal control processing;
- Power control processing;
- Telemetry & telecommand handling;
- Data processing, storage and transmission;
- Data handling;
- Payload control.

Technology Overview - Key issues

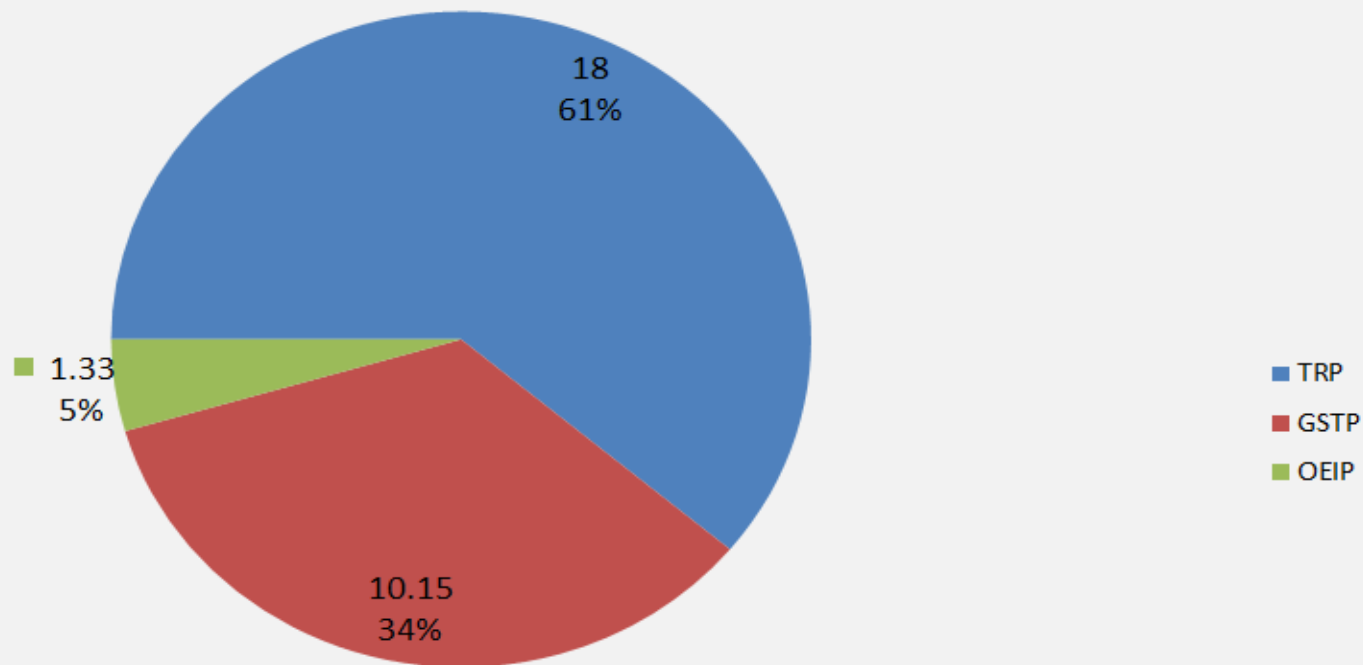
- **HIGH DEMANDING MISSIONS**
- **OBSOLESCENCE** and evolution of technologies
- **“BIG-DATA”** challenge starts on-board
- **DETERMINISTIC PROTOCOLS** multiplexed with asynchronous ones
- **SPACE LAWS** collision avoidance reliability and safe disposal.



- More budget dedicated to the actual mission needs implemented by the payload, while decreasing the “infrastructure” cost of the platform.

Distribution of RM budget per program (total 29.5 M€, including running activities)

**Distribution of RM budget per Programme
(Total: 29.5 M€)**



Distribution of Roadmap proposed activities budget per priority (criticality): total 23.7 M€

TOTAL Reference Budget (k€)		11500
Criticality	Budget request (k€)	Target budget (k€)
High	8600	9200
Medium	13350	11500
Low	1750	N/A

5.75 M€ TRP
2.25 M€ GSTP

ROADMAP General Development Approach

AIM A: Avionic Systems Architectures and Building Blocks

1-Reference Architectures

2-Interface Standardization

3-Mass of the harness

4-Communication network

5-Communication protocols

6-Integrated Modular Avionics

7-COTS enabled systems

AIM B: Advanced Functions

1-Autonomous Functions

2-FDIR

3-Distributed command and control proof of concept

4-Evolvable/Reconfigurable H/W and system

5-Operability

6-Security

7-Modular and scalable systems

AIM C: Avionics Development

1-Model-Based (Avionics) Systems Engineering

2-Electronic Data Sheet

3-Hardware/Software Co-design

4-Multicore

5-Avionics Test Means

AIM D: Technology Demonstrators / Pilot Applications

AIM A: Avionic Systems Architectures and Building Blocks

1-Reference Architectures

2-Interface Standardization

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SAVOIR:

- Small missions
- Payload (OSRA-P)*
- Other architecture*



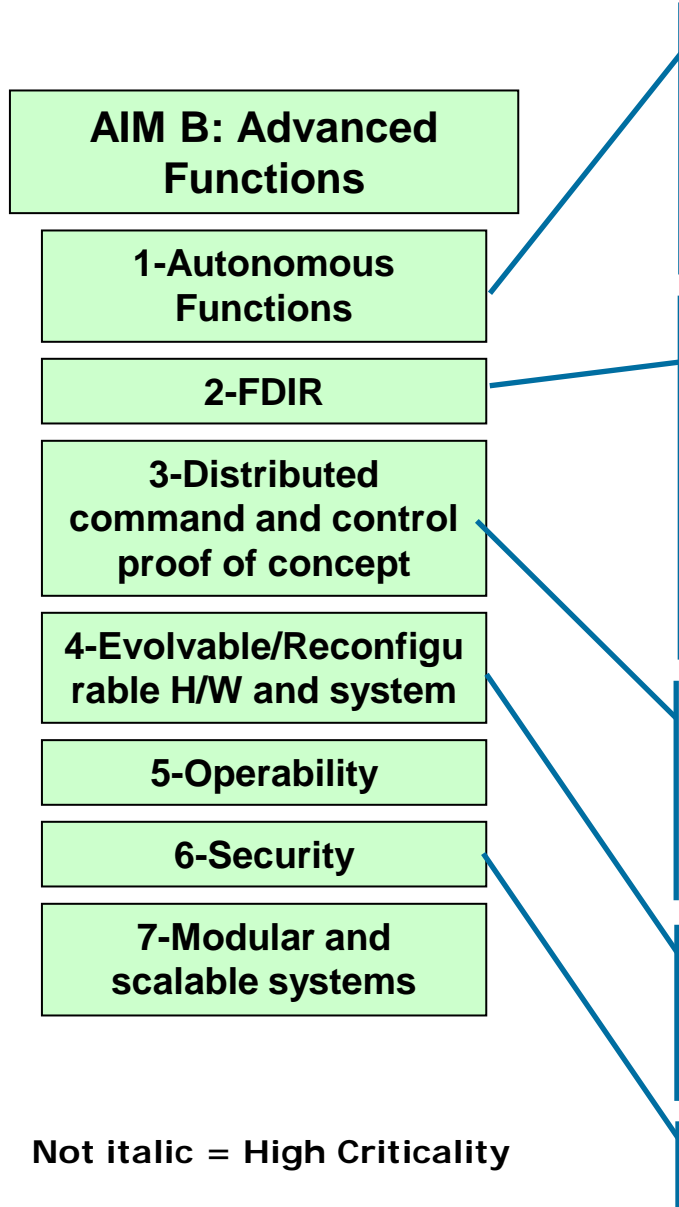
COMMUNICATION

- OSRA-NET follow on
- Ethernet4Space
- AOCS network, *AOCS spacewire for FDIR*
- TTEthernet*
- CAN for payload

-*Adaptable IMA*

-COTS based OBC/Data storage, low cost, with fdir

Not italic = High Criticality



AUTONOMY

- Autonomy development process
- PMOPS follow on
- On-line energy management

FDIR

- SAVOIR Handbook
- FDIR Metrics
- Model based FDIR (combine COMPASS and AAML)
- Industrialization of COMPASS

OPERABILITY

- Distributed C&C
- Impact of large constellation on avionics

- Reconfigurable FPGA methodology (BRAVE) (follow on CORAx3)

- Secured CFDP, security & FDIR

AIM C: Avionics Development

1-Model-Based
(Avionics) Systems
Engineering

2-Electronic Data Sheet

3-Hardware/Software
Co-design

4-Multicore

5-Avionics Test Means

- Model Based Avionics trade-off*
- Model based RAMS data handling + AOCS*
- Data modelling*
- Library of Components and tools for System-Software Co-simulation and trade-offs*
- From system to avionics model based engin.*
- Formal verification for system engineering*
- Multidisciplinary design optimization*
- Use case maps*

- SEDS update*
- EDS device simulator*
- Automatic test generation from EDS*

- Non symmetric, not shared memory hw/sw architecture*
- HW/SW co-design*

- Probabilistic analysis of shared memory multicore*

- Avionics V&V*

Not italic = High Criticality

**AIM D: Technology
Demonstrators / Pilot
Applications**

-Multicore/TSP demonstrator
-*FDIR demonstrator*

Not italic = High Criticality



SYSTEM

requirement
analysis



dependability
analysis
[FDIR]

control
analysis
[EDS]

multi
disciplinary
analysis



data
modeling

**AVIONICS
MODELS
EDITOR**

avionics bus
analysis
[COMMS]

behavioral
analysis

taste

hw/sw
generation



BRAVE