

INTEROPERABLE AND AGILE MAINTENANCE PLANNING

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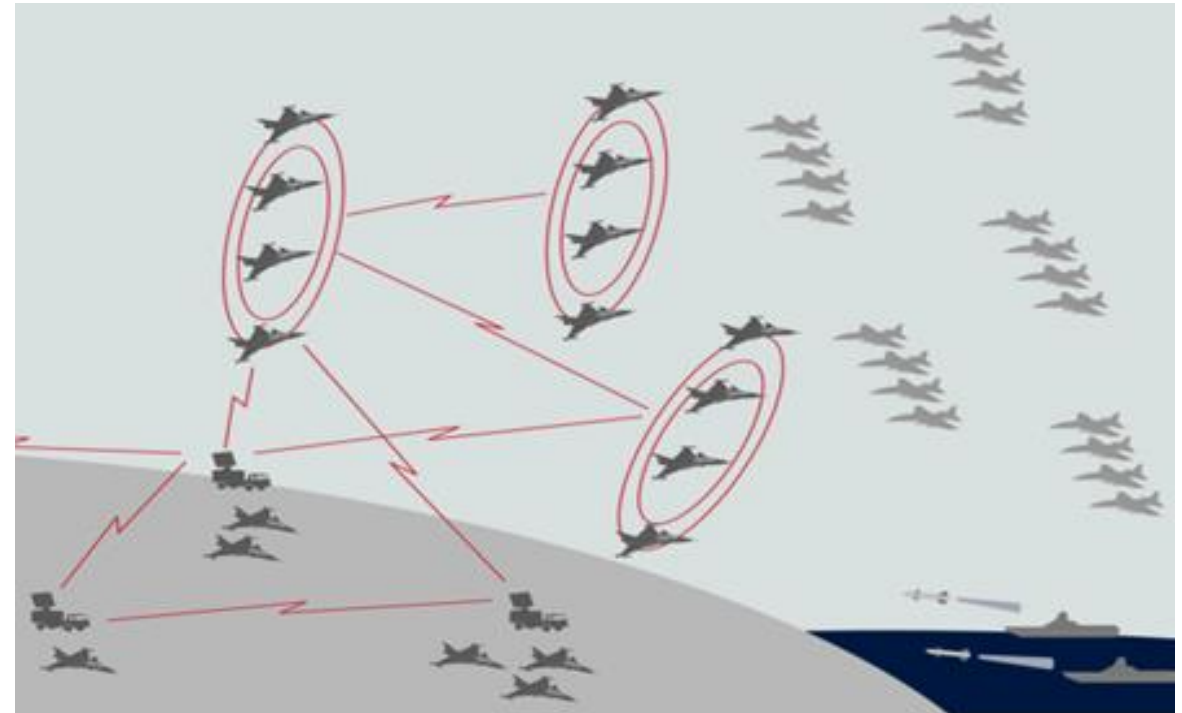
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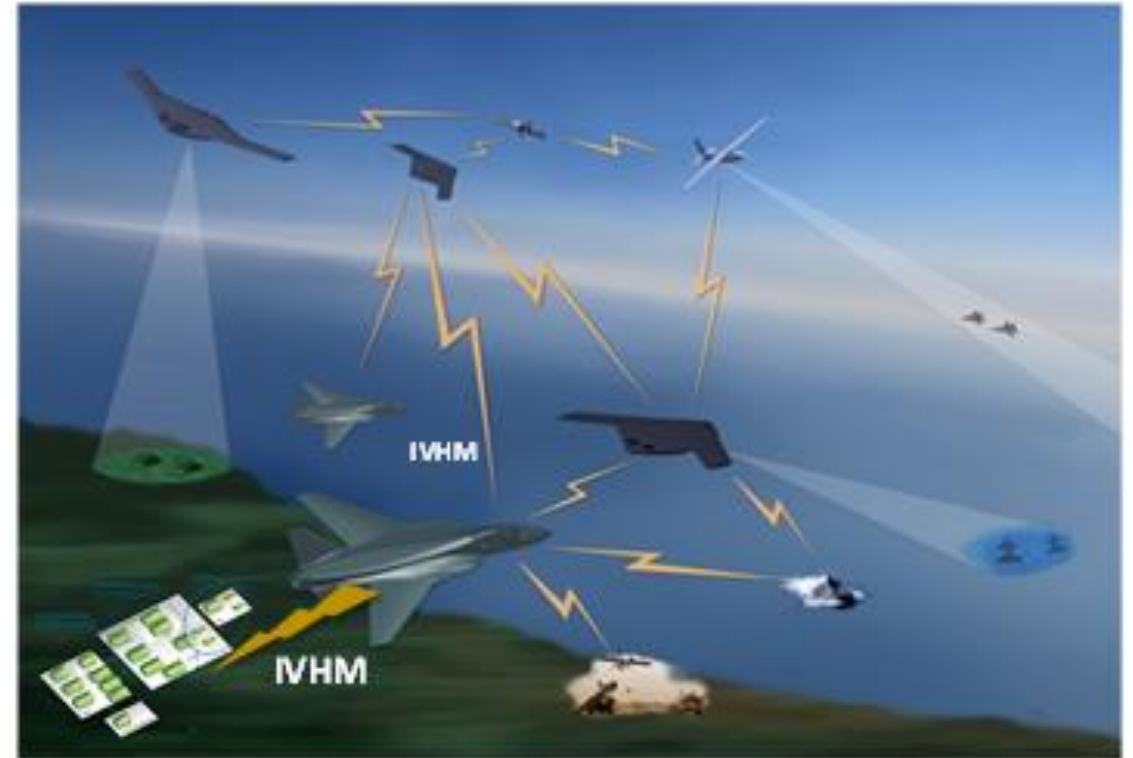
FUTURE MILITARY FLIGHT OPERATIONS VISION

- MOVING TOWARDS MORE COMPLEX AND DYNAMIC SCENARIOS AND MISSIONS
- HETEROGENOUS FLEETS AND AIR VEHICLES WITH COMPLEX CONFIGURATIONS
- FREQUENT (RE)DEPLOYMENT TO DIFFERENT BASES
- INCREASED SYSTEM-OF-SYSTEM INTERDEPENDENCIES BETWEEN AIR VEHICLES, COOPERATING SYSTEMS AND ENABLING SYSTEMS



OPERATIONAL AIRCRAFT MAINTENANCE CHALLENGES

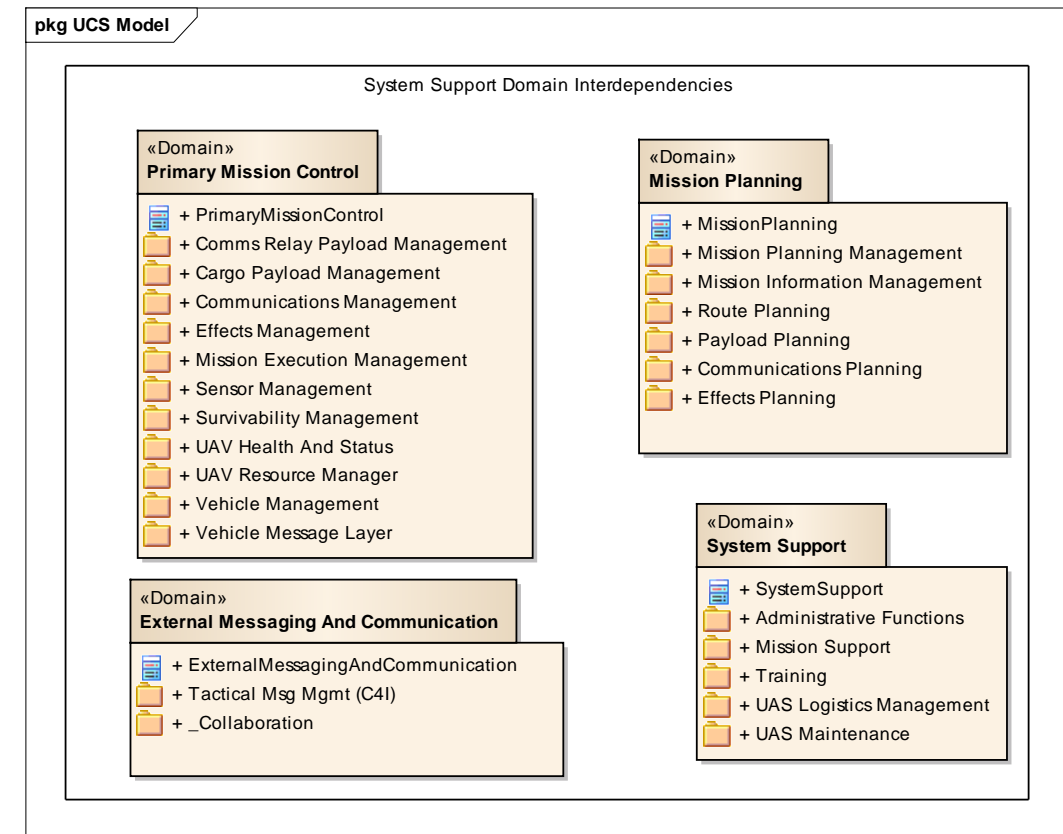
- Interoperable and Agile Maintenance Planning envisioned to be required
 - To be more responsive to changed situational analysis/awareness
 - to exploit on-board aircraft Integrated Vehicle Health Management systems (IVHM)
 - for monitoring status and availability of maintenance and support resources
 - dynamic planning and utilization of maintenance and support resources
- To be integrated dynamically in the overarching operational perspective



BACKGROUND AND MOTIVATION

DOMAIN INTERDEPENDENCIES

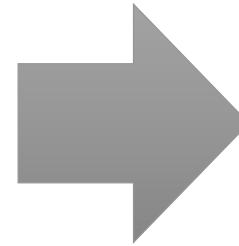
- Important for Maintenance planning and logistics domain interdependencies with
 - External Messaging and Communication (C4I) - supplies orders and tasking
 - Primary Mission Control domain containing e.g. the on-board aircraft Integrated Vehicle Health Management systems (IVHM) and flight ops
 - Mission Planning domain for mission planning in overarching SoS domain context.
- Domains both produce and consume information
 - domain services enabling domains to operate effectively together
- *One aim is to study technologies that will enable multi-domain information sharing and interoperability between the commonly seen stove-pipe systems of today*



PROBLEM STATEMENT

Operational aircraft maintenance information systems of today lack in agile response to changes in the surrounding environment.

- In-flight technical faults detected by on-board IVHM
- ... have direct consequences on the ability to execute an ongoing mission
- ... requires rapid mission re-planning
- ... propagate as urgent needs to re-plan flight line maintenance activities (within System Support domain)
- ... have an impact on logistics

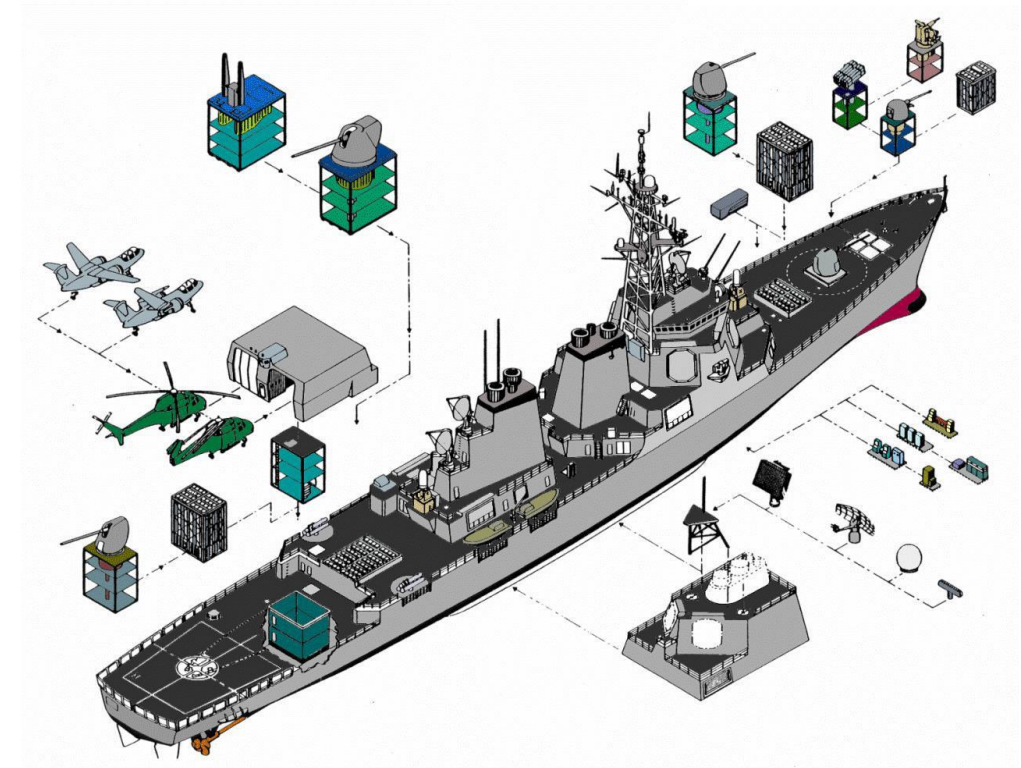


Threatening to result in:

- failure to perform planned maintenance operations
- aircraft-on-ground severe degradation
- of the effectiveness of air operations

INTEROPERABLE OPEN ARCHITECTURES (IOA)

- To meet rampant development costs
- Promote integration
- Reuse and communication
- A multitude of IOA standards are under development. E.g:
 - Future Airborne Capability Environment (FACE) The Open Group, DoD
 - Joint Common Architecture (JCA), US Army
 - Open Mission Systems (OMS)
 - Sensor Open System Architecture (SOSA) The Open Group, DoD
 - Unmanned Control Station Architecture (UCS) DoD

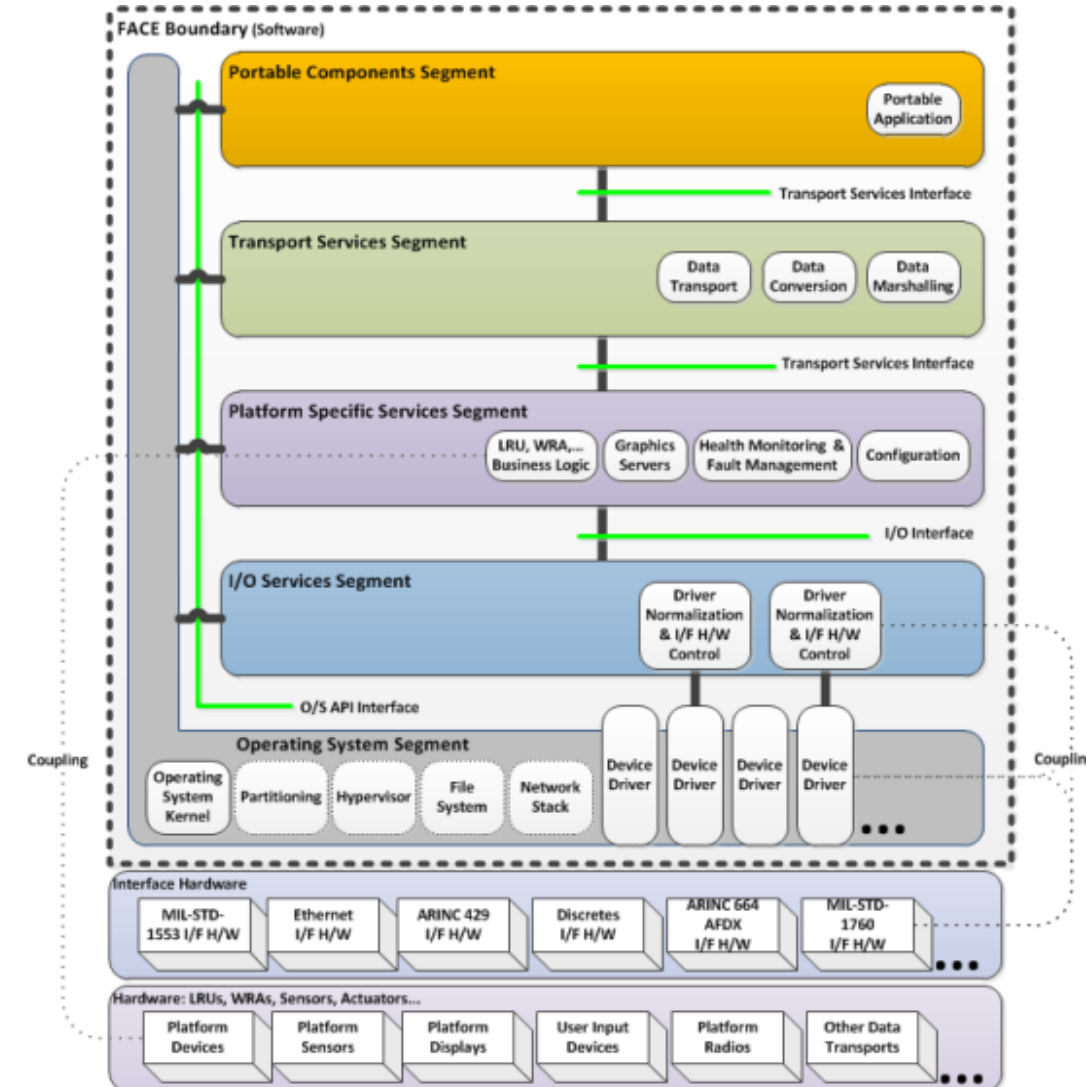


“if you’re not open architecture, you’re not relevant”

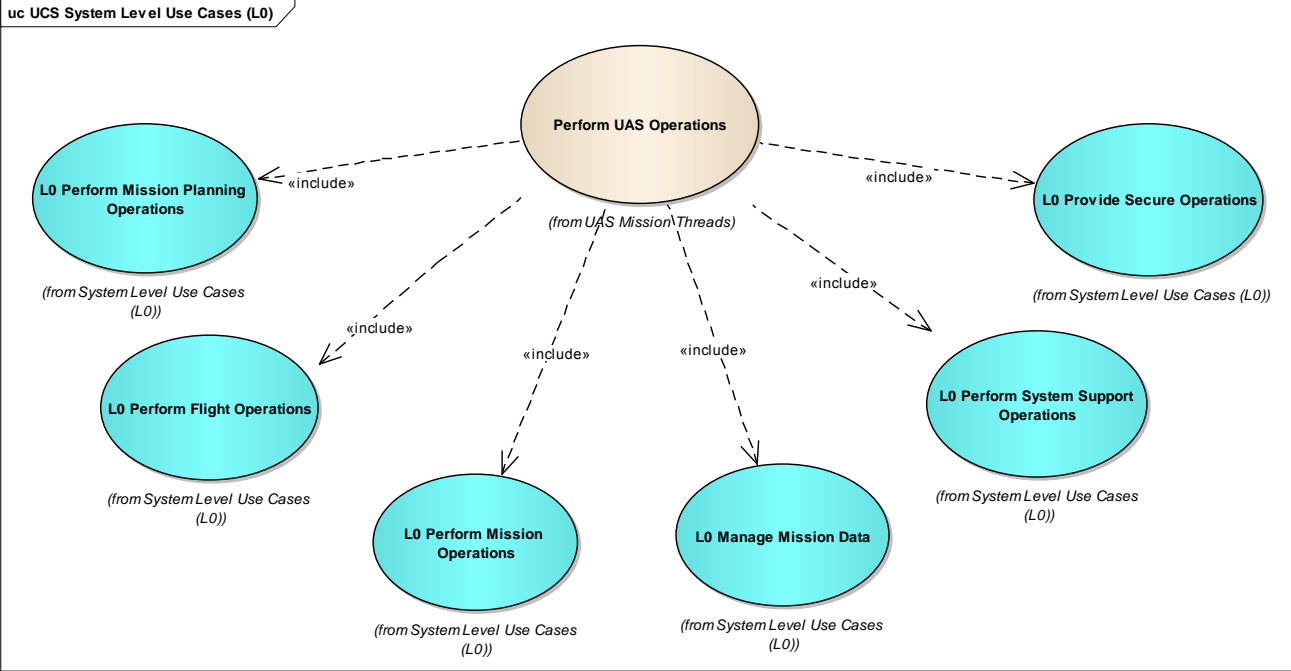
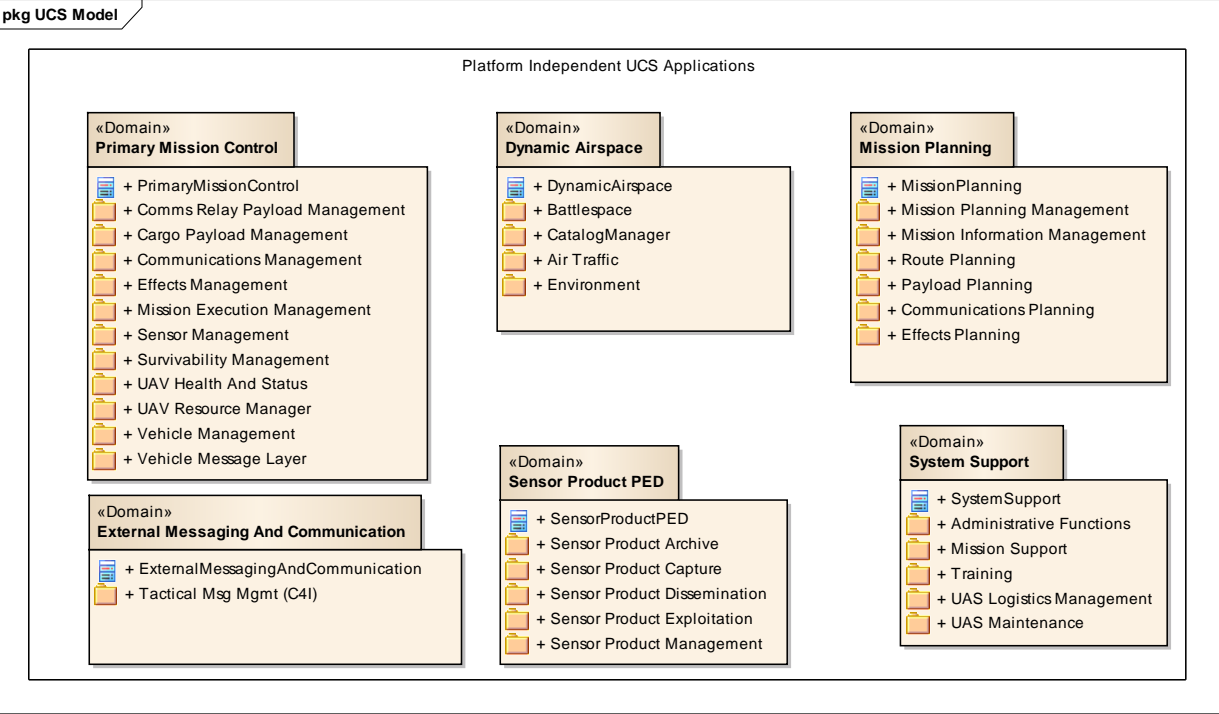
Vice Adm. Robert Thomas, speaking at the Navy League’s Sea-Air-Space 2016 Exposition.
U.S. Naval Institute’s online news <https://news.usni.org/2016/05/16/navy-to-industry-if-youre-not-open-architecture-youre-not-relevant> . (Image OAC, <http://www.aocinc.net/capabilities/open-systems-architecture>)

FUTURE AIRBOURNE CAPABILITY ENVIRONMENT

- Application layer (capabilities)
- Transport layer
- Platform specific services
 - Abstraction of basic platform functions/abilities
- I/O service segment
 - Abstraction of I/O services

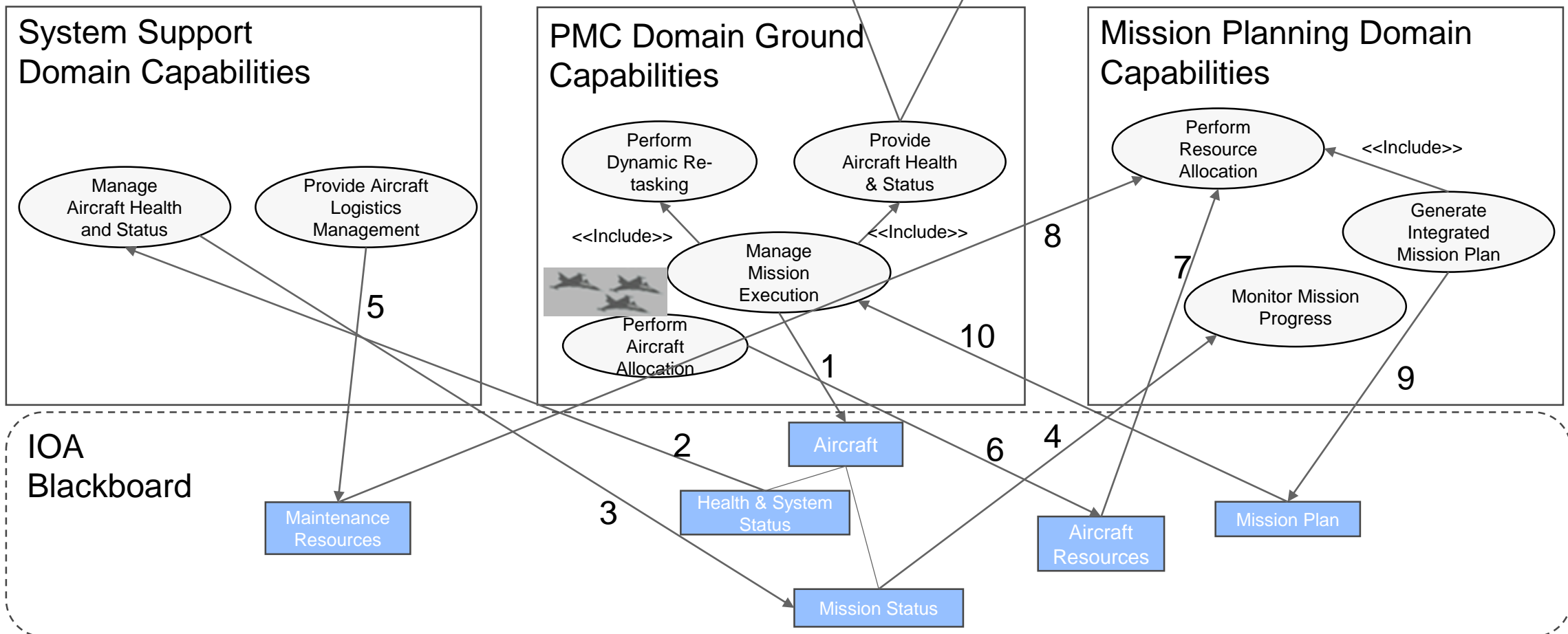
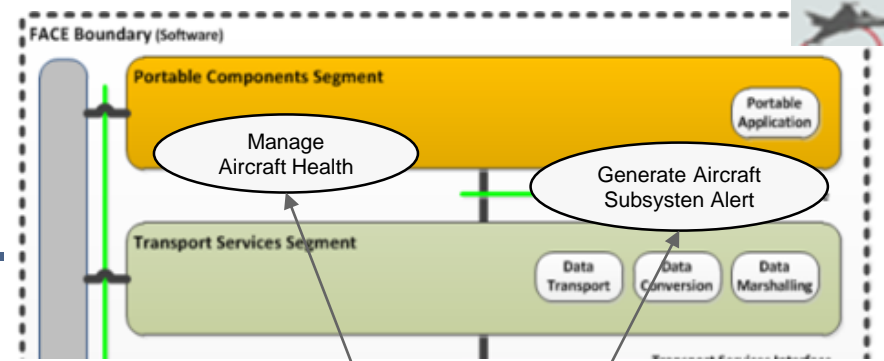


UNMANNED CONTROL STATION ARCHITECTURE



USE CASE EXAMPLE

PMC Air Capabilities (IVHM)



CONCLUSIONS

- In conjunction with UCS, FACE provides:
 - a natural extension to connect aircraft IVHM services
 - formal interfaces and services transports
- ... making IVHM services:
 - an integrated part of an interoperable network of SoS
 - providing a rapid response to environmental changes
 - effective planning and re-planning capabilities

