

# INTEROPERABLE AND AGILE MAINTENANCE PLANNING

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2016-10-05

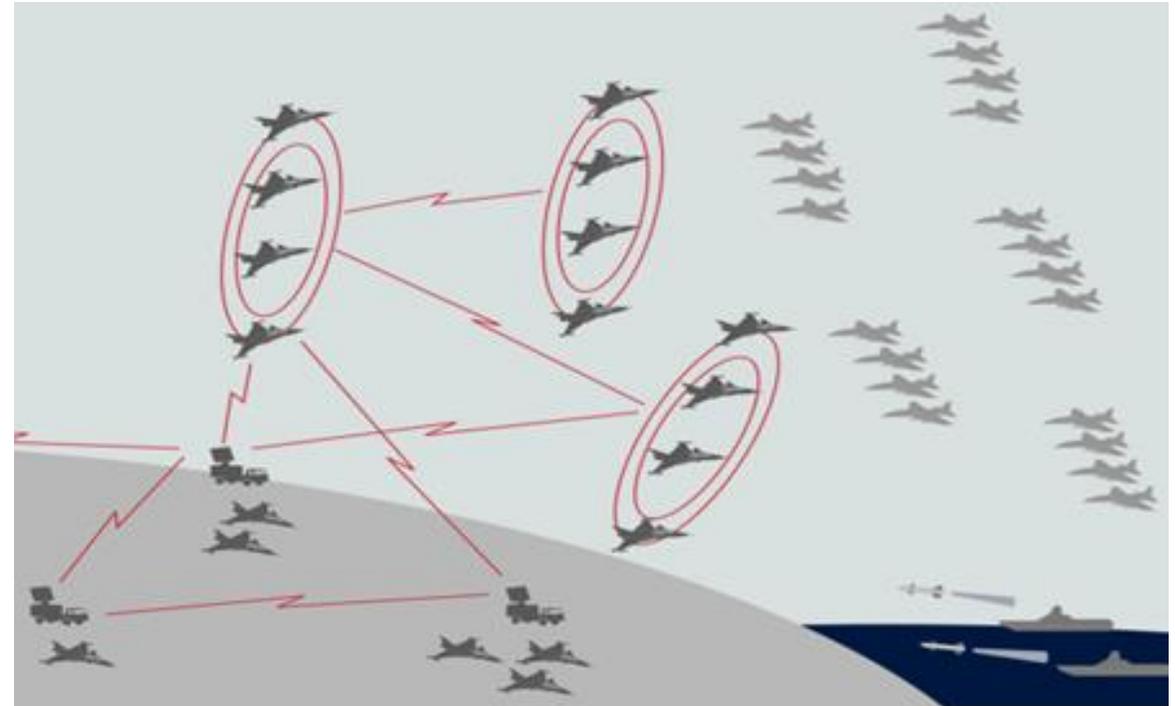


**SAAB**



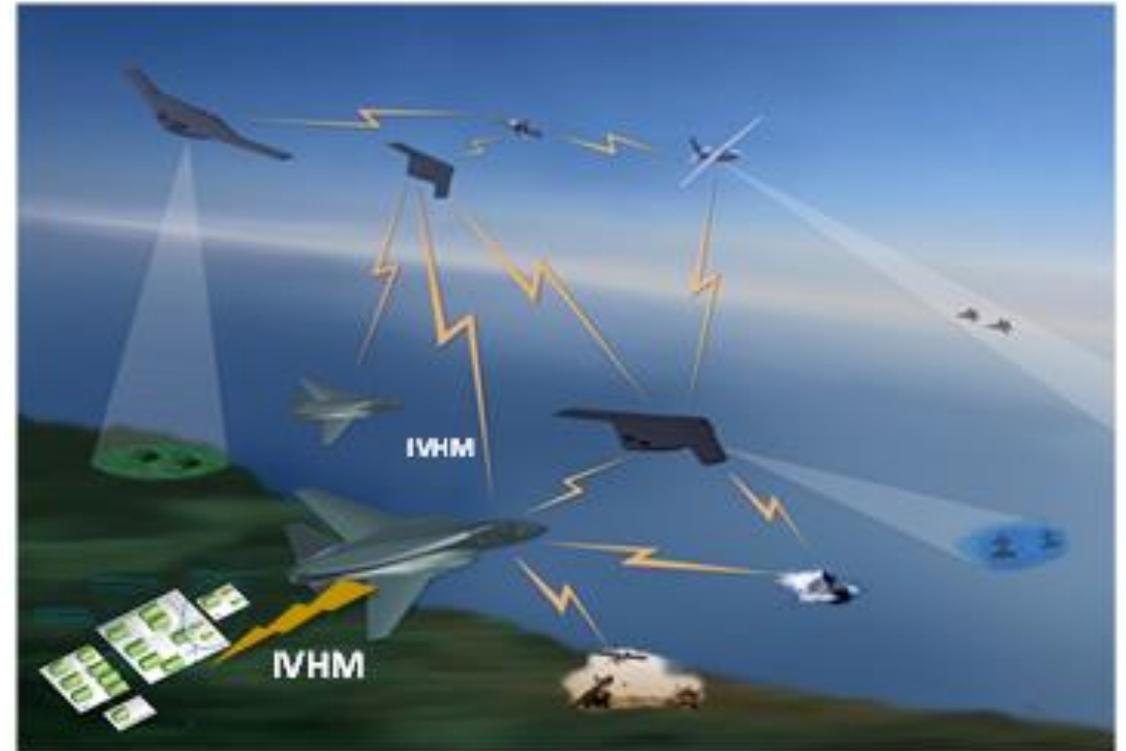
# FUTURE MILITARY FLIGHT OPERATIONS VISION

- 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

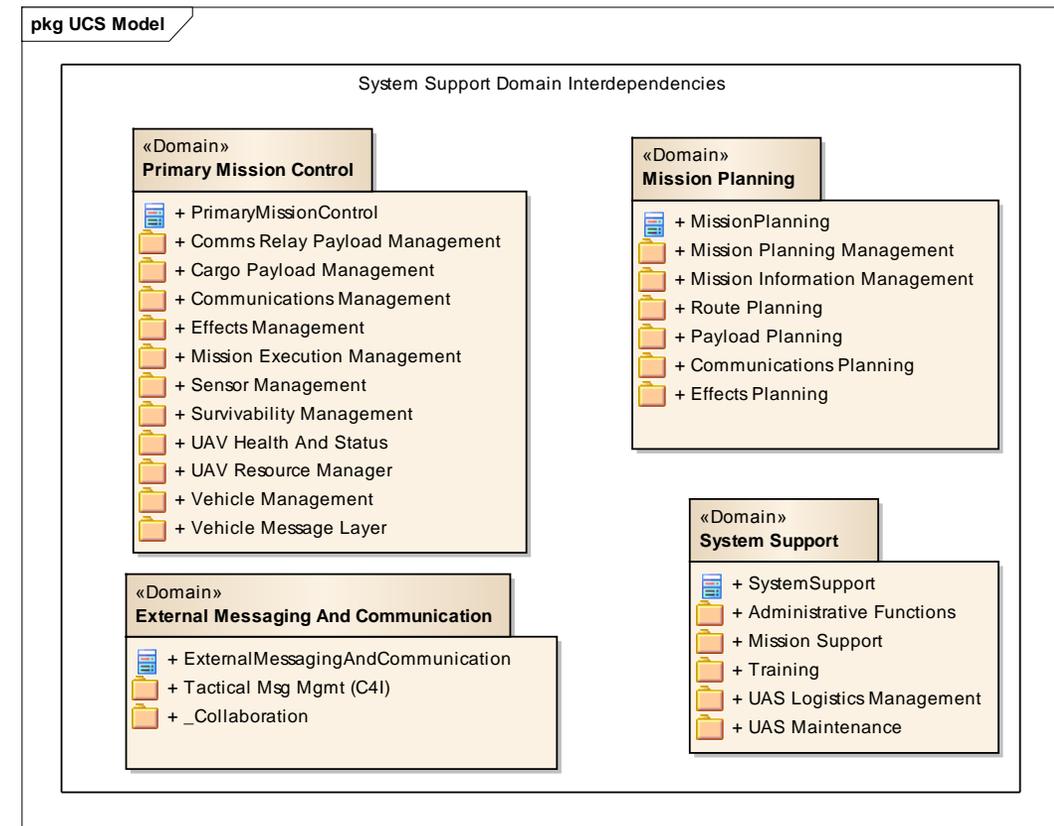
- Interoperable and Agile Maintenance Planning envisioned to be required
  - To be more responsive to changed situational analysis/awareness
  - to exploit on-board aircraft Integrated Vehicle Health Management systems (IVHM)
  - for monitoring status and availability of maintenance and support resources
  - 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*

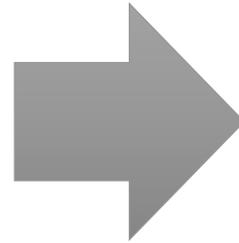


# PROBLEM STATEMENT

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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

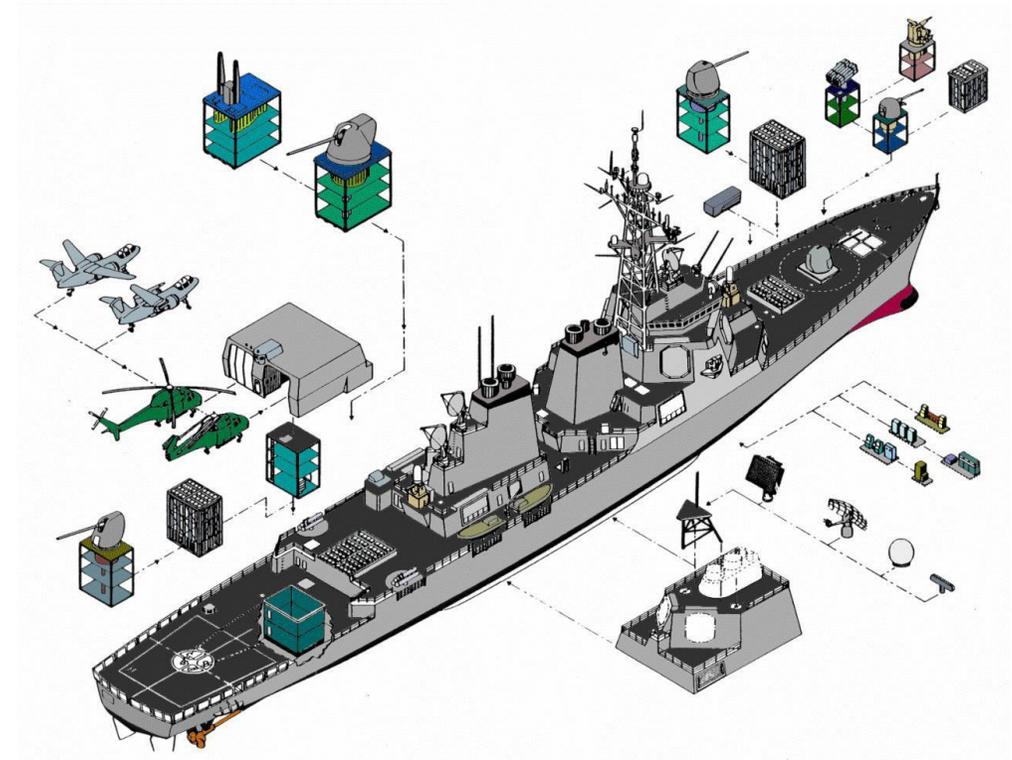


**Threatening to result in:**

- 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

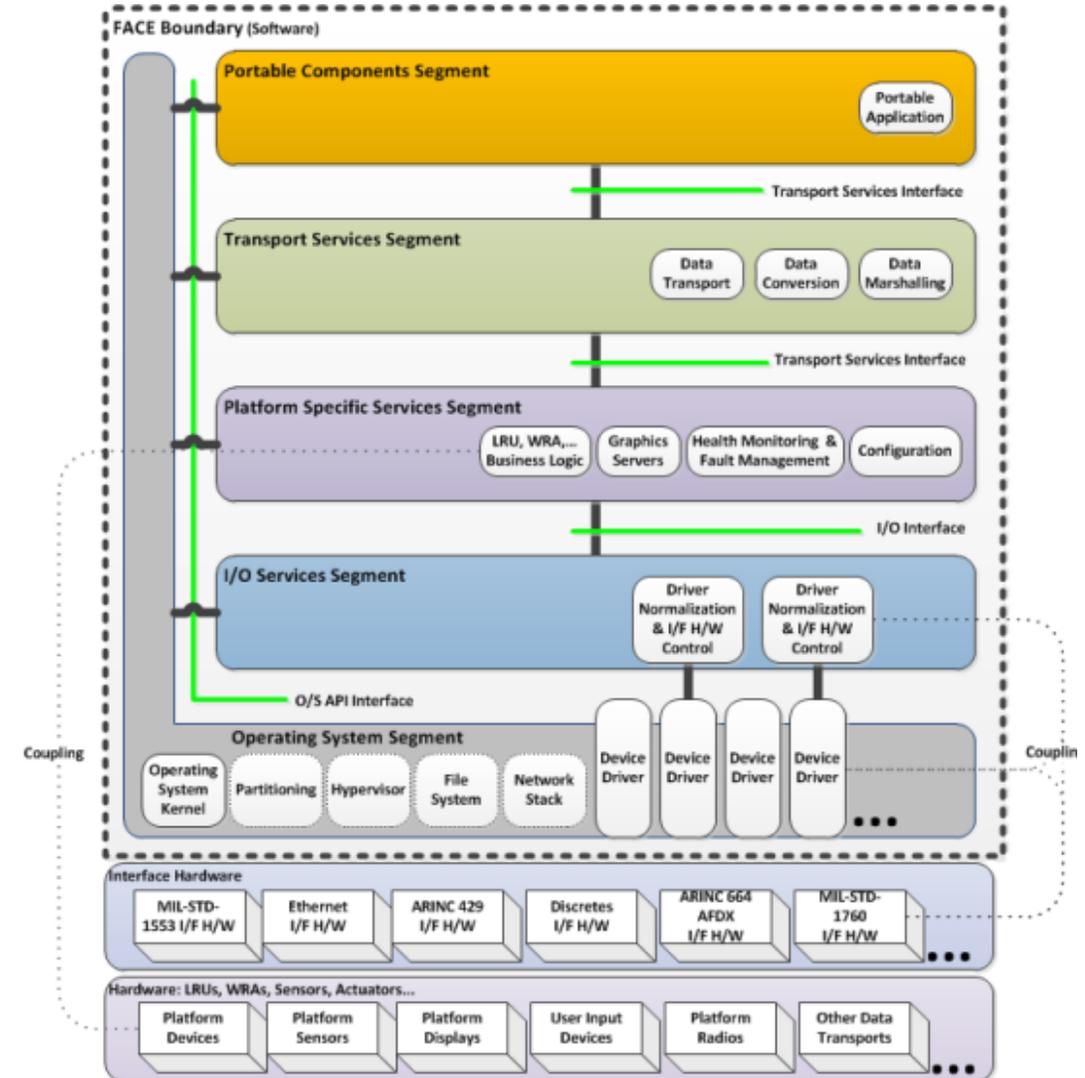


*“if you’re not open architecture, you’re not relevant”*

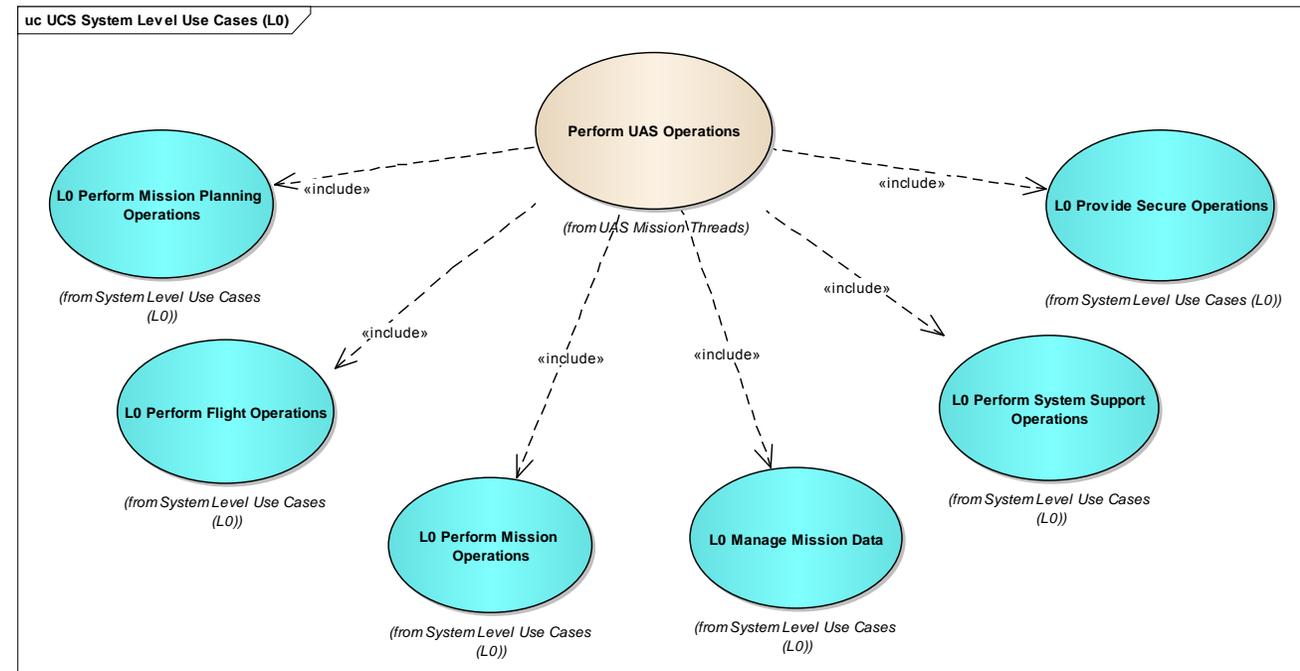
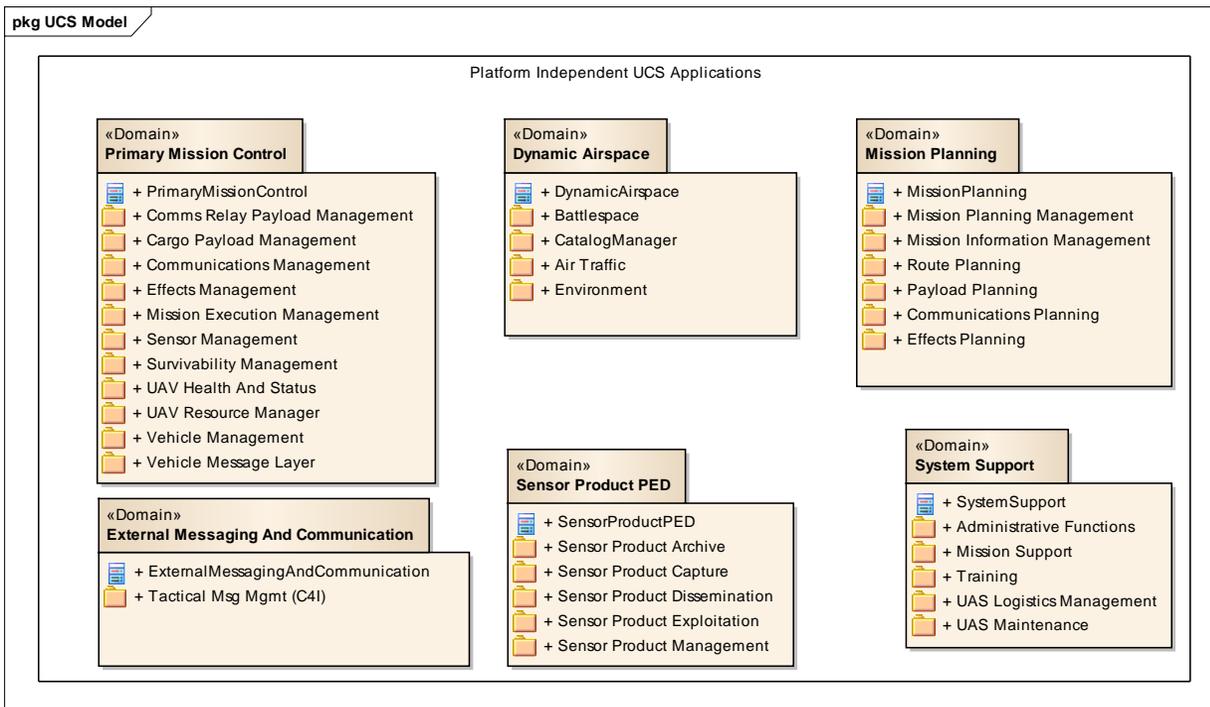
Vice Adm. Robert Thomas, speaking at the Navy League’s Sea-Air-Space 2016 Exposition.  
U.S. Naval Institute’s online news <https://news.usni.org/2016/05/16/navy-to-industry-if-youre-not-open-architecture-youre-not-relevant> . (Image OAC, <http://www.aocinc.net/capabilities/open-systems-architecture>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

# 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

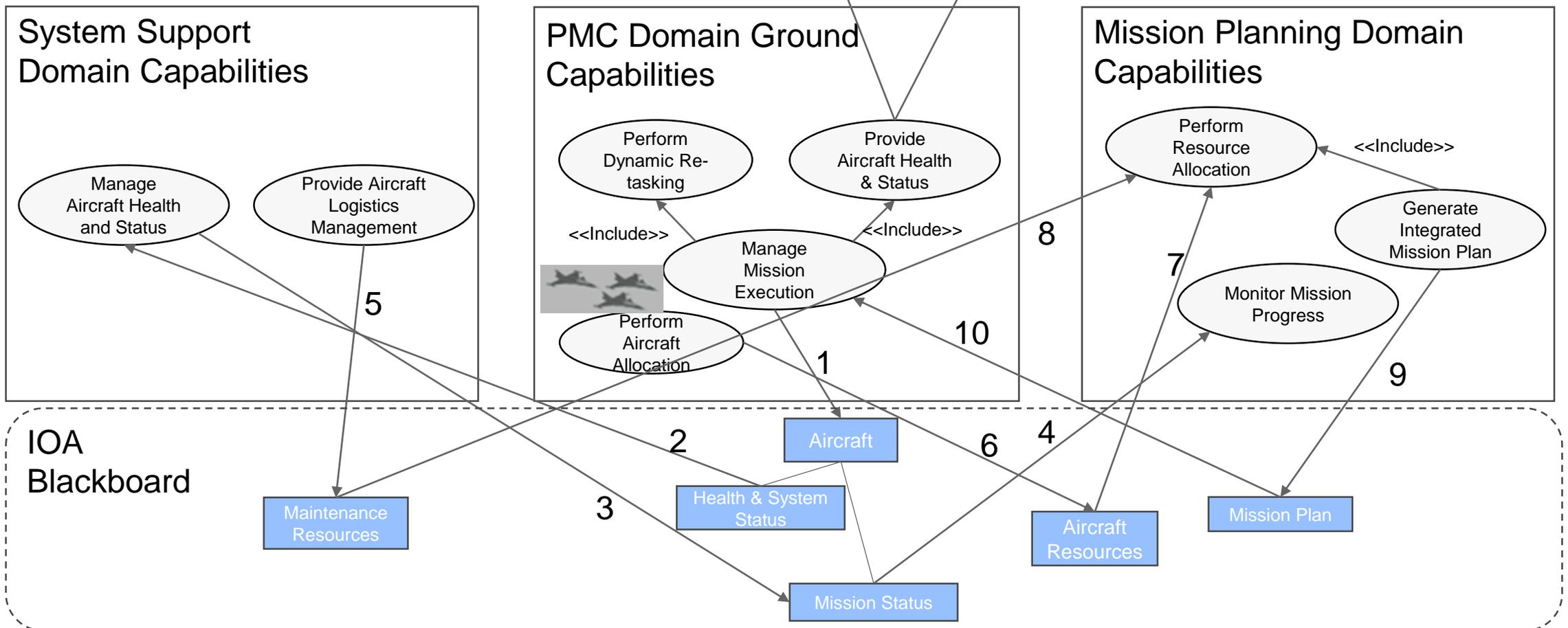
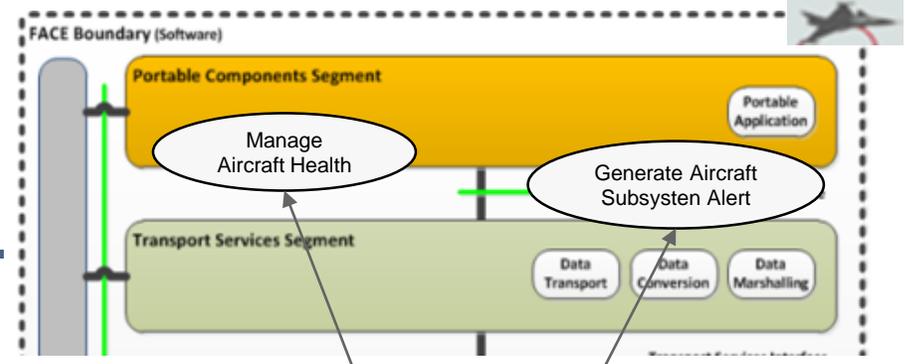


# UNMANNED CONTROL STATION ARCHITECTURE



# 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

