



Enterprise Modeling for Dynamic Matching of Tactical Needs and Aircraft Maintenance Capabilities

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Dynamic support and maintenance capabilities - a key to successful missions

- Aircrew equipment
- Mission and maintenance planning
- Maintenance support
- Ground support equipment
- Spares and storage
- Weapon maintenance
- Wheel and brake maintenance
- High dynamic, all is in constantly changing



Getting aircraft ready for a mission

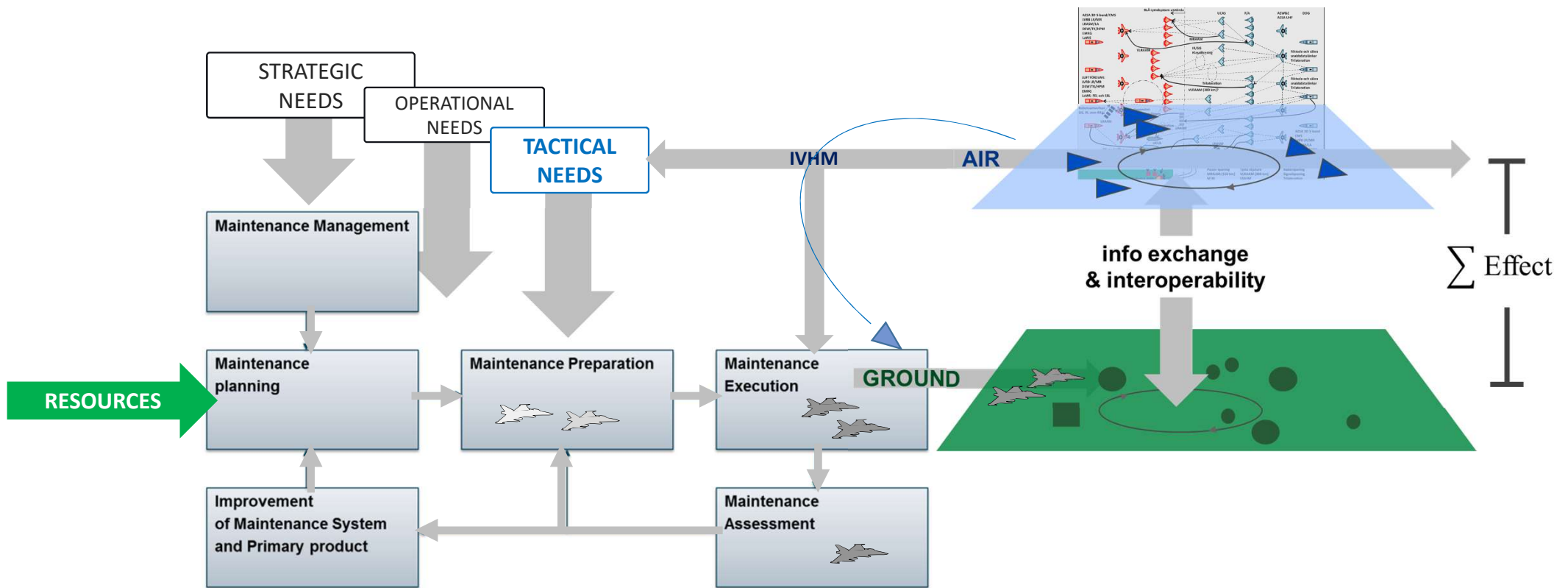


Challenges and why we do what we do..

- All data in the cloud
- Enabling artificial intelligence (AI) on all levels
- Creating ontology for the domain (existing command lines may not be optimal for digitalisation and AI)
- Hybrid AI system for decision support
- Enabling learning and experience reuse
- Digitalisation and speeding up all lines of commands

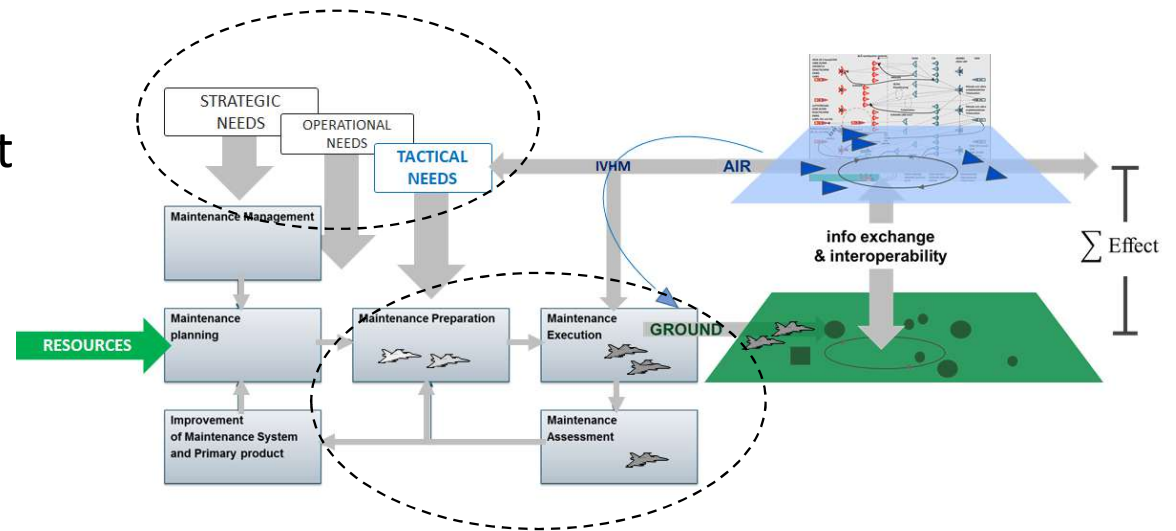


Military Aviation Rationale



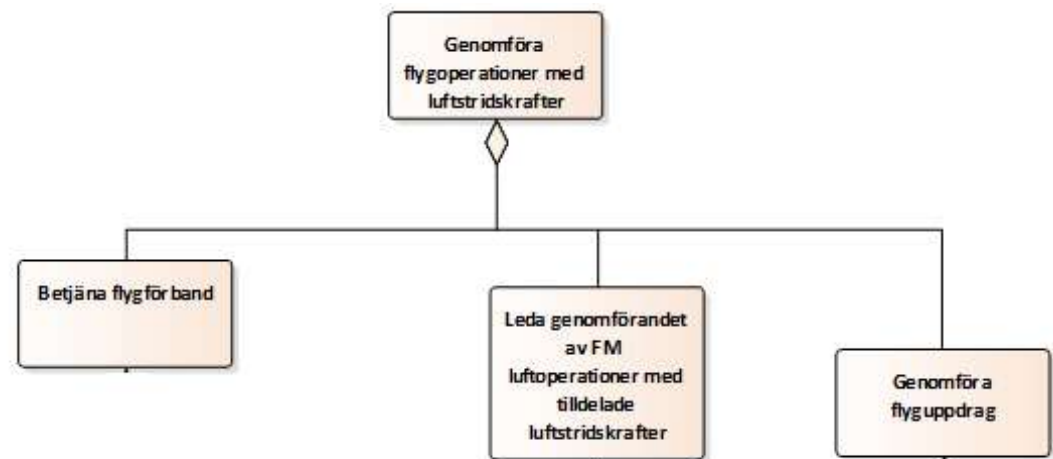
Enterprise Modeling of Air and Maintenance Operations

- Requirement Views
 - CV-2 Capability Taxonomy
 - OV-1 High Level Operational Concept Description
 - OV-2 Operational Node Connectivity Description
 - OV-5 High Level Dynamic View(s)
- Solution Views
 - SV-1 System View(s)
 - SV-4 System Functions



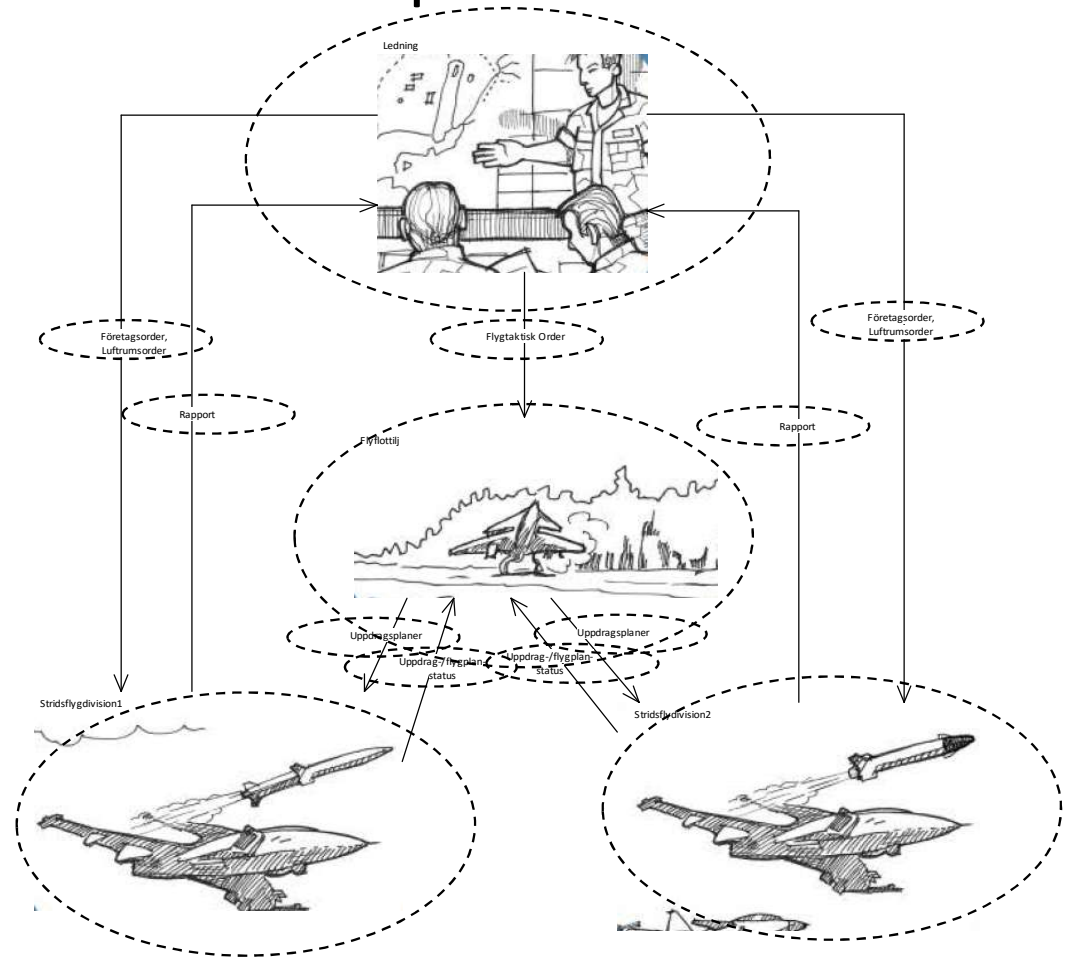
Top-down approach – Air and Maintenance Operations from a Tactical Perspective

- CV-2 – Capability View
 - Captures the main capabilities from a tactical air operations perspective



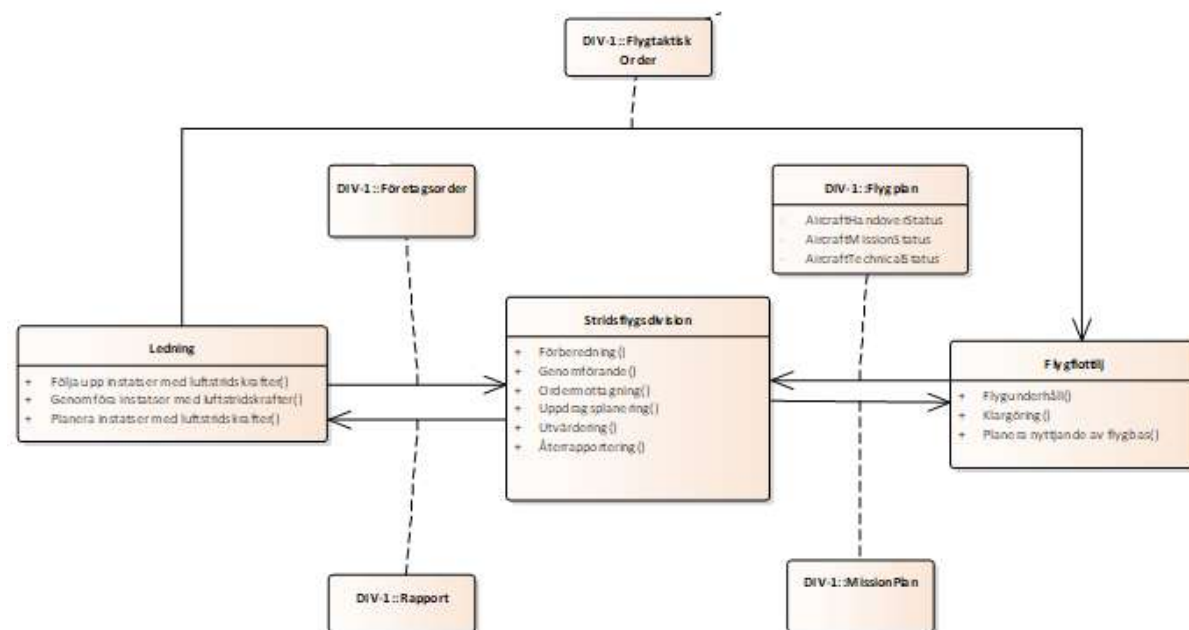
Top-down approach – Air and Maintenance Operations from a Tactical Perspective

- OV-1 – High-level operational concept description
 - Captures high level air and maintenance operations
 - Operational nodes
 - Management
 - Wing
 - Aircraft division
 - Needlines
 - Tactical order
 - Tasking order
 - Rapport
 - Mission
 - Mission report
 - Mission and aircraft status



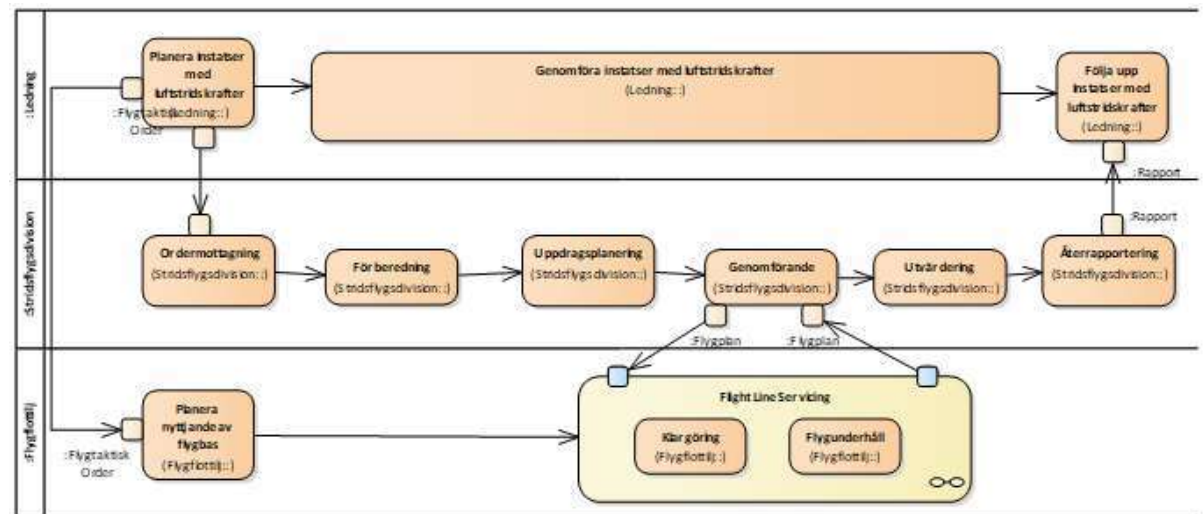
Air and Maintenance Operations from a Tactical Perspective

- OV-2 – Operational node connectivity description
- Operational nodes
 - Management
 - Plan air operations
 - Performs air operations
 - Follow-up air operations
 - Wing
 - Order
 - Preparations
 - Mission planning
 - Mission execution
 - Mission evaluation
 - Mission reporting
 - Aircraft division
 - Pre/post flight clearing
 - Aircraft Maintenance
 - Plan usage of air base

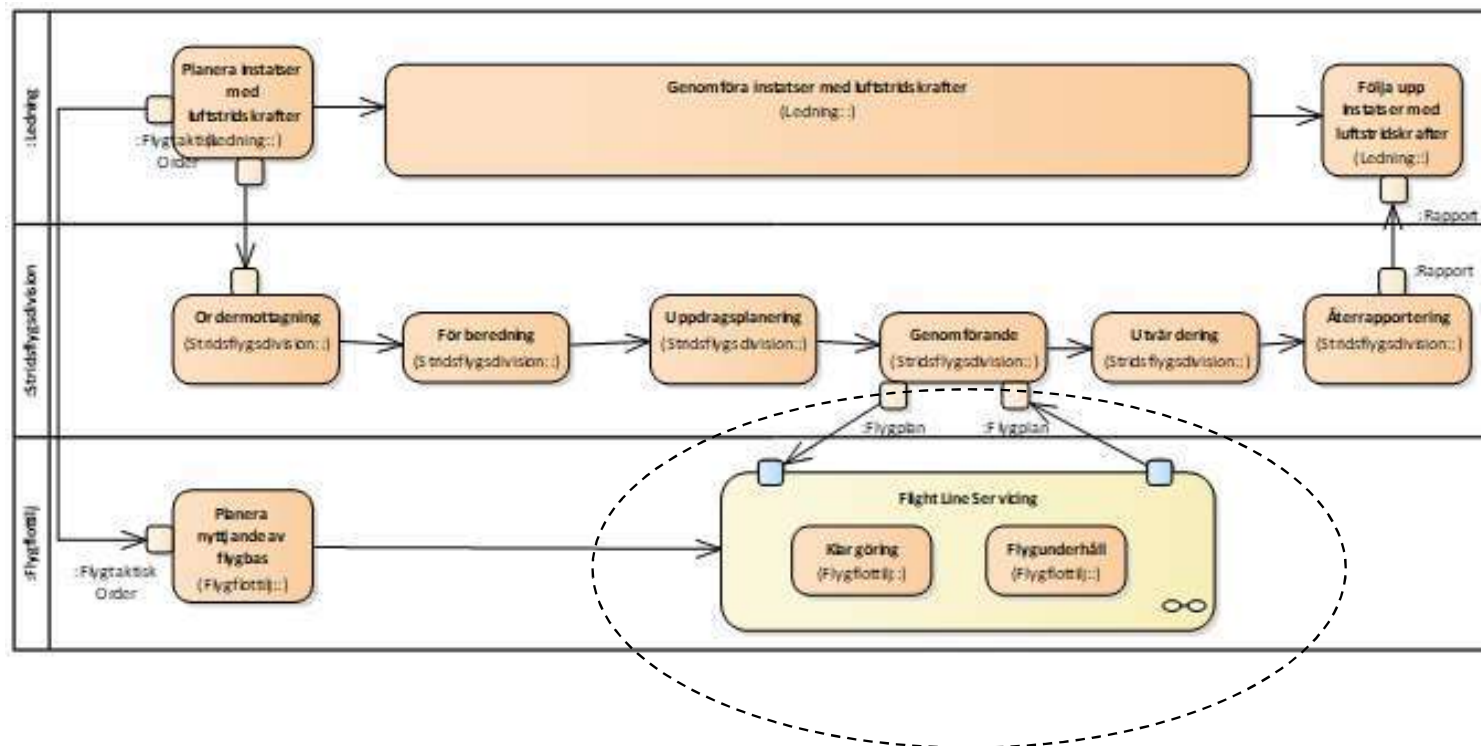


Air and Maintenance Operations from a Tactical Perspective

- OV-5 – The high level dynamics of air and maintenance operations
- Operational nodes in swimlanes and their activities

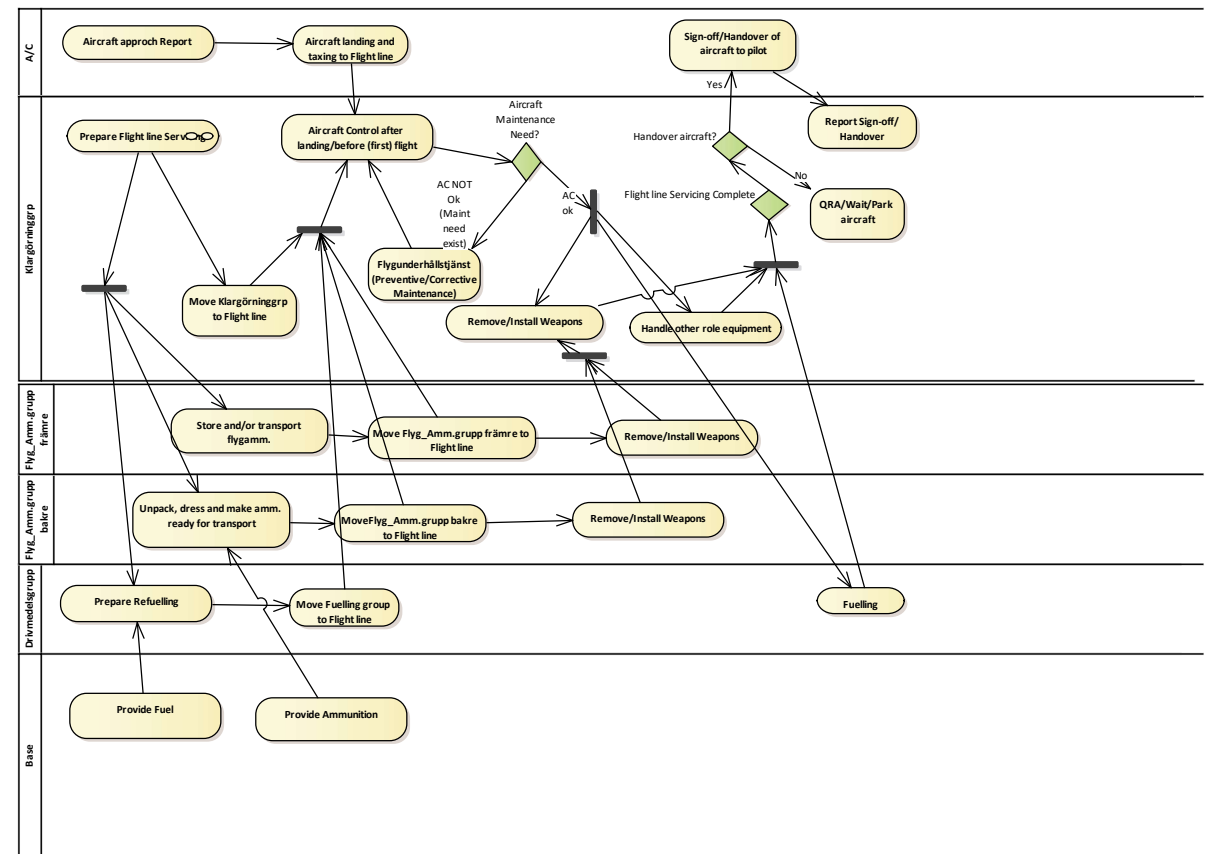
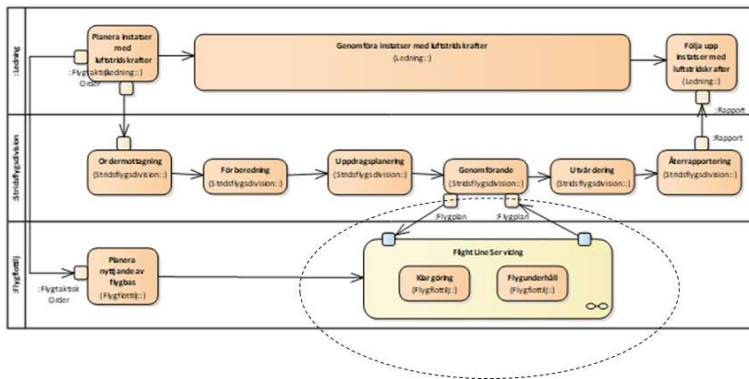


Maintenance Operations from Flight Line Perspective



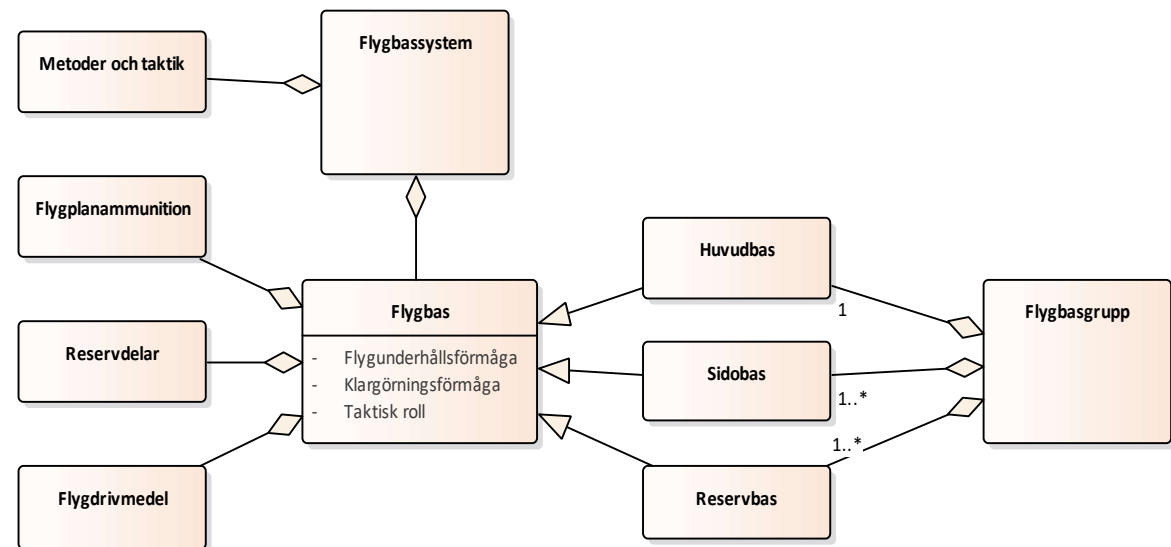
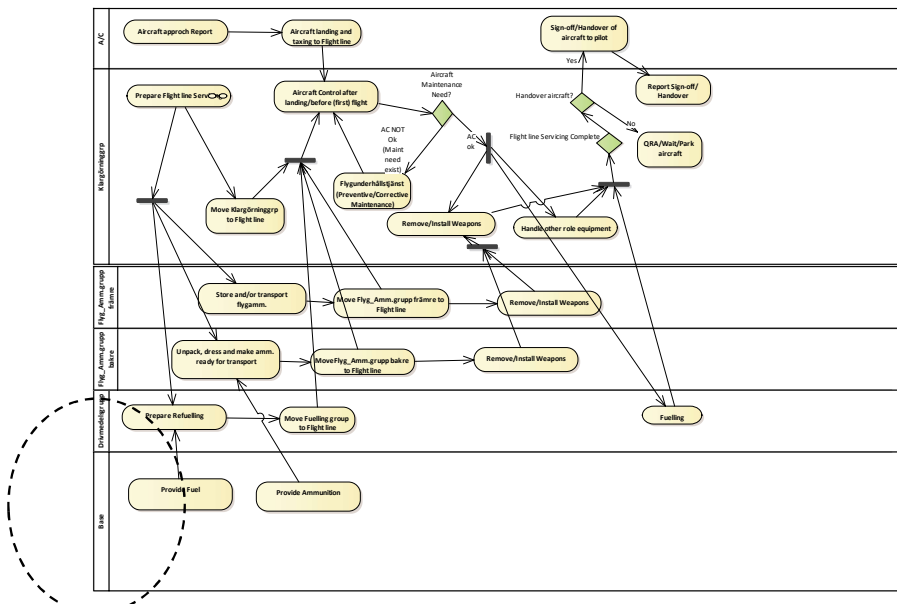
Maintenance Operations from a Flight Line Perspective

- OV-5 – Flight line servicing
 - Flight line functions allocated to systems and organizational entities (swimlanes)



Air and Maintenance Operations from a System Perspective

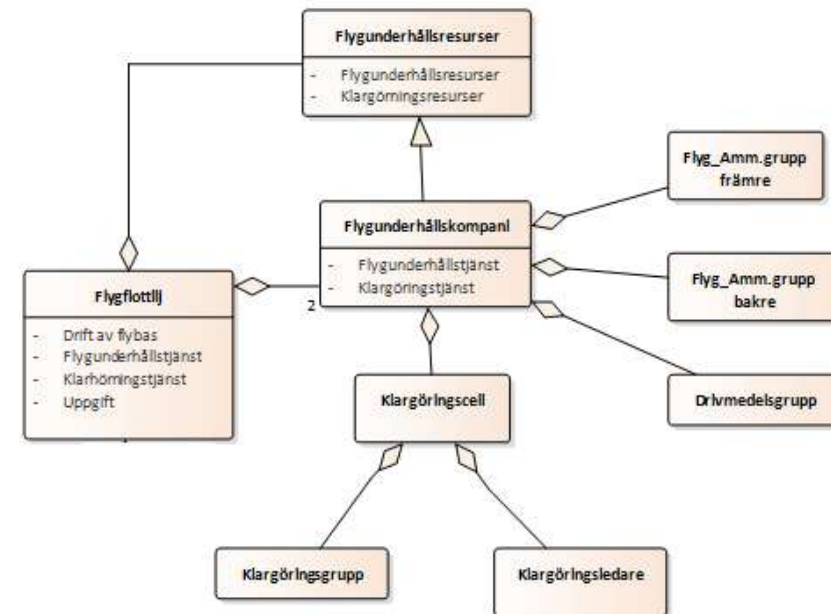
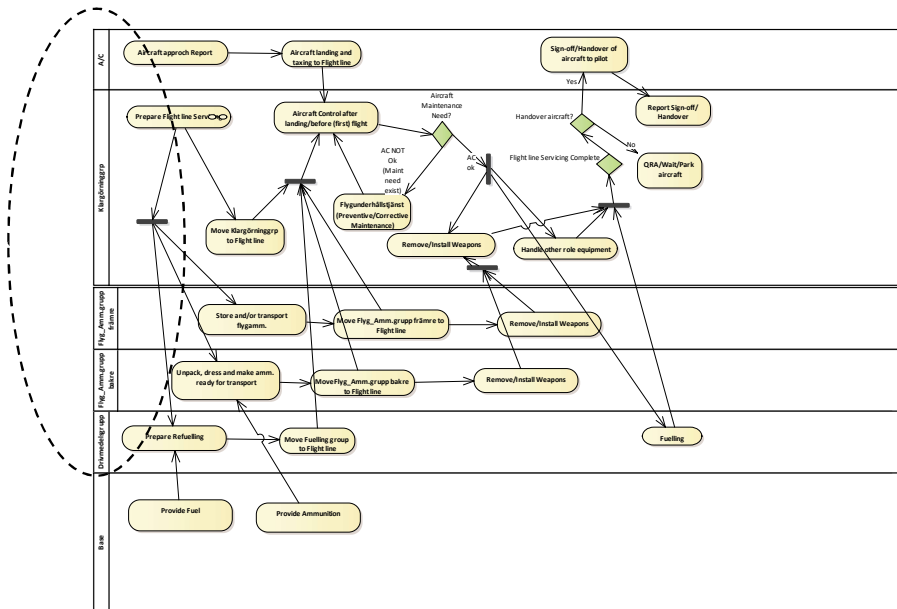
- SV-1 – Systems that realizes the operational viewpoints
 - Flygbassystemet



Air and Maintenance Operations from a System Perspective

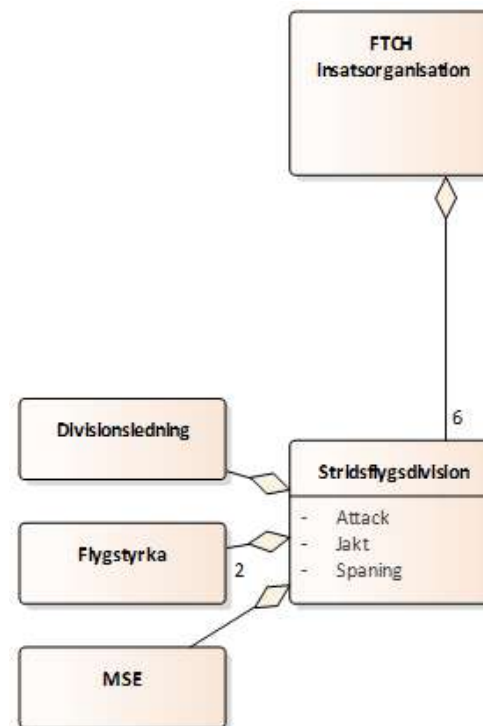
- SV-1 – Systems that realizes the operational viewpoints

- Flygflotiljen (Wing)



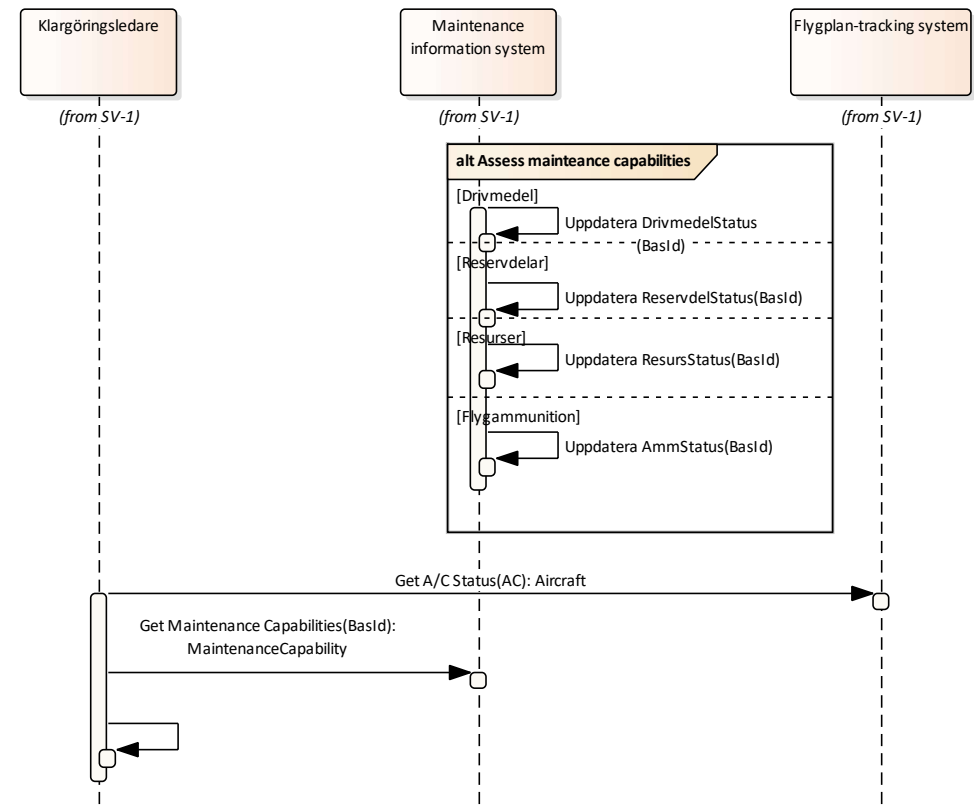
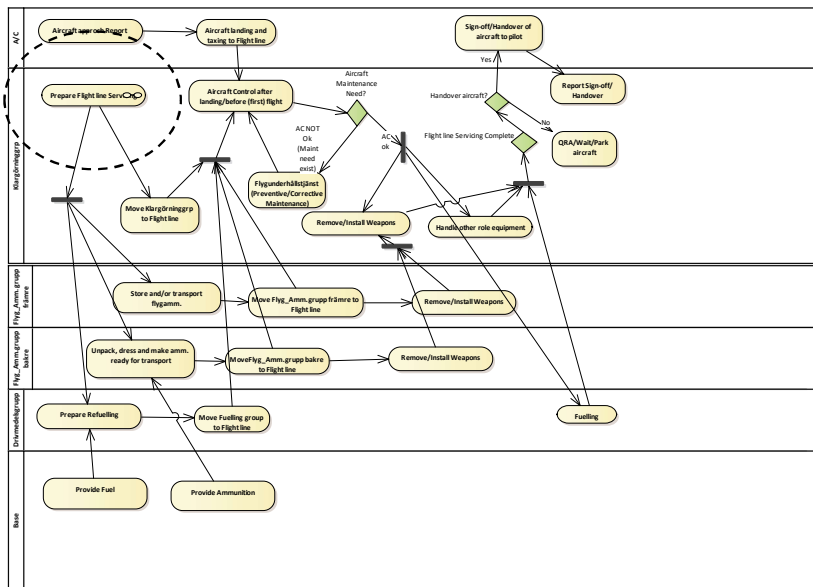
Air and Maintenance Operations from a System Perspective

- SV-1 – Systems that realizes the operational viewpoints
 - Stridsflygdivisionen



Air and Maintenance Operations from a System Perspective

- SV-4 – System functions
 - Example realization of the Prepare Pre-Flight Clearing function



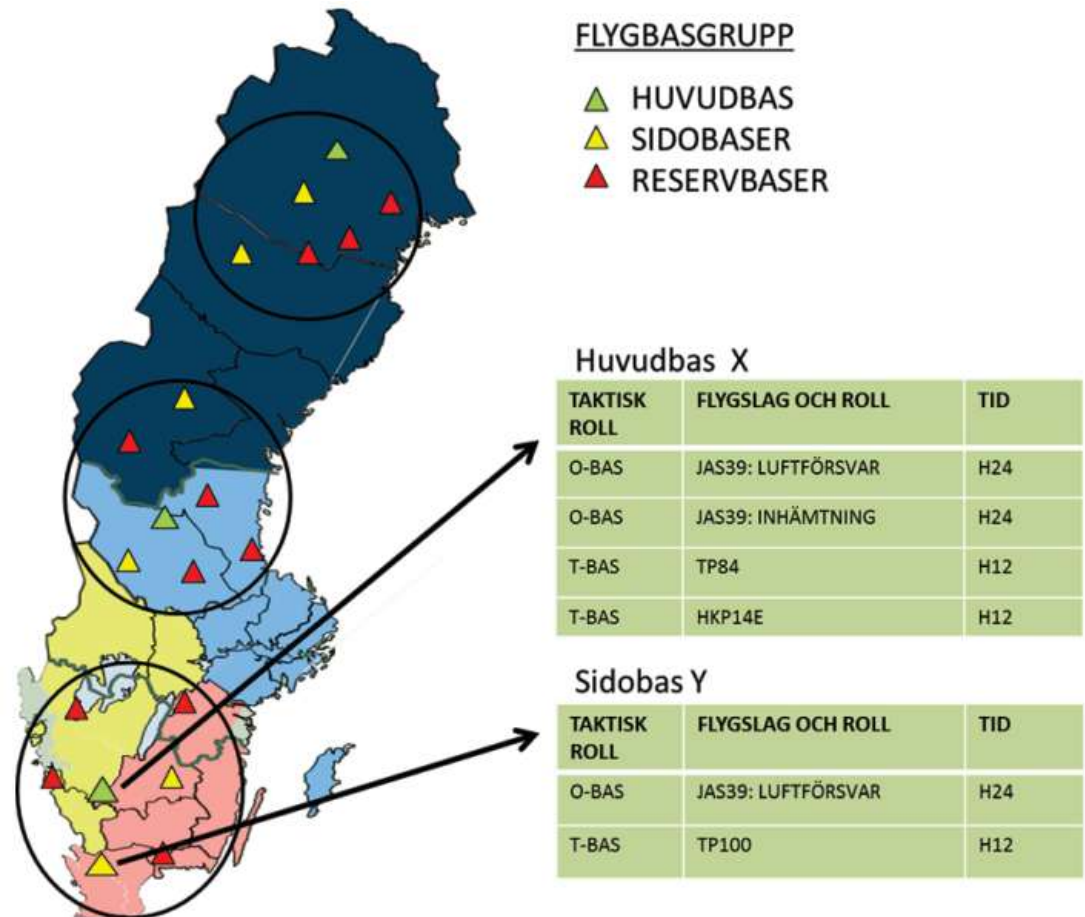
(OV-2) capturing operational nodes. The high level dynamics of maintenance operations (OV-5) describes the maintenance operations that are normally conducted in the course of achieving a tactical air mission.

The middle-out approach starts in the “middle” of an air operations maintenance context, pin-pointing the systems, units and services that realize the operational viewpoints described above. In this work we have identified a set of service and system views related to UAF and DoDAF namely the SV-1 and SOV-1 and their corresponding SV-4 and SOV-4. These viewpoints captures the systems and service taxonomies and their functions respectively. This modelling is loosely based on the Swedish regulations for air operations and the Regulation for the Swedish Air Base System. These layers will also accommodate decision support services based on big data stored from air and maintenance operations. A study of how to integrate machine learning for maintenance task to unit matching has been performed as a feasibility study.

The bottom-up approach is based on an in-depth study of a set of Gripen landing gear components and their relationship to tactical air operations. This approach will model the landing gear as a part of an aircraft Digital Twin that performs real time simulations and condition

Introduction

- Generic case study example for research purpose, based on open source information.
- Requirements
 - Capability Requirements
 - Operational Requirements
- Solution
 - Maintenance System
 - Maintenance functions



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