MEASURING OF OPERATIONAL USABILITY WITHIN THE GRIPEN E DEVELOPMENT

Jonas Jeppsson
Operations Analyst

SCOPE

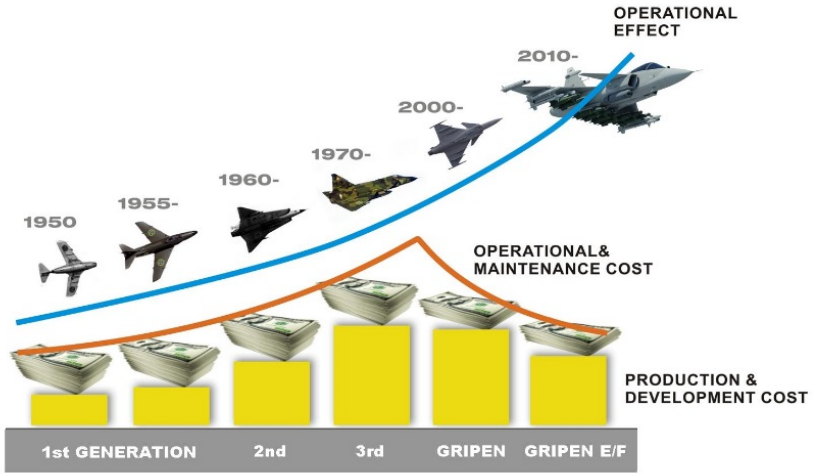
- Background
- Validation strategy
- Operational usability
- Test stations
- Measurement

WHAT WE DO

- Responsible for validating the operational usability
- Continuously validating Gripen E during the whole development process against stated scenarios
- Assessing the operational usability in full scale scenarios as manned simulations, desktop simulations and round table discussions
- Joint venture with the FMV and the SwAF

BACKGROUND

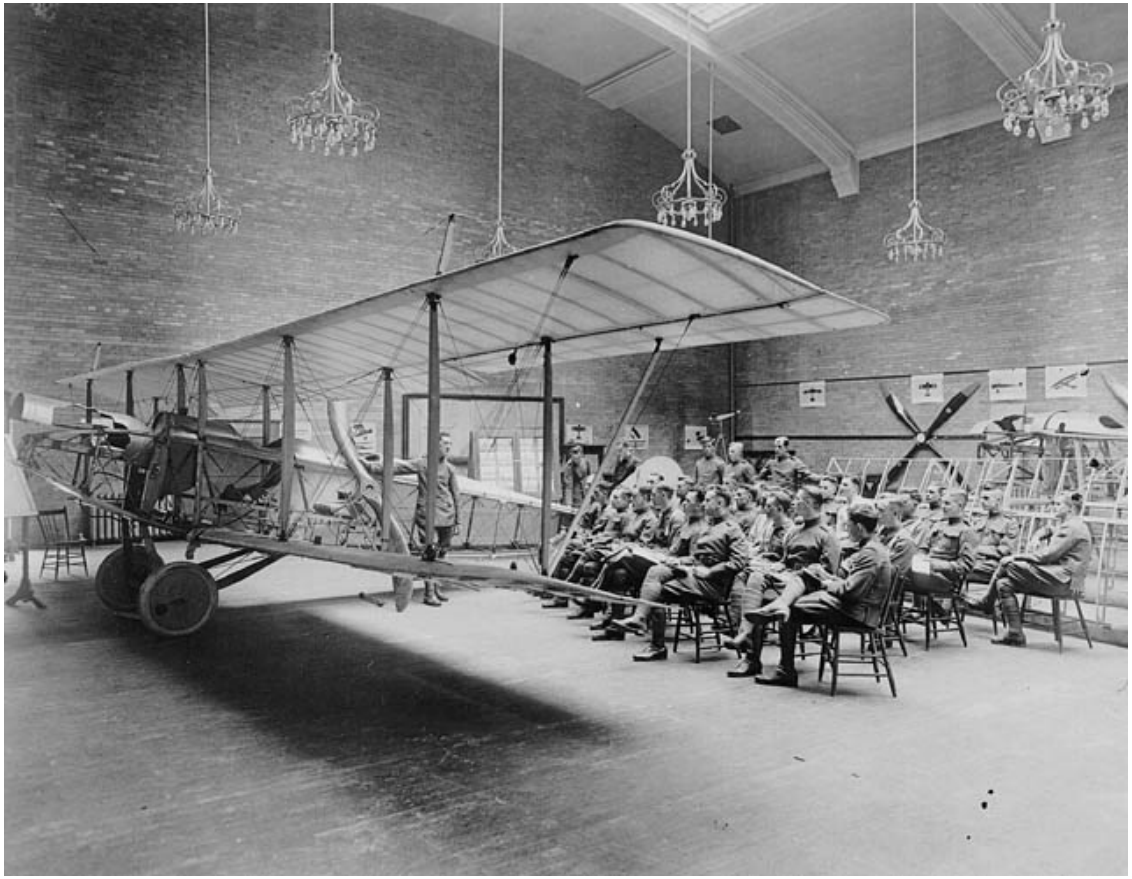
- Reduce cost/time and improve capability
- During early study phase for the Gripen E, some improvements were identified that could:
  - A) minimize retakes in design
  - B) deliver the desired operational capability to the SwAF
- Early validation against relevant scenarios was one key factor



WHERE ARE WE NOW?

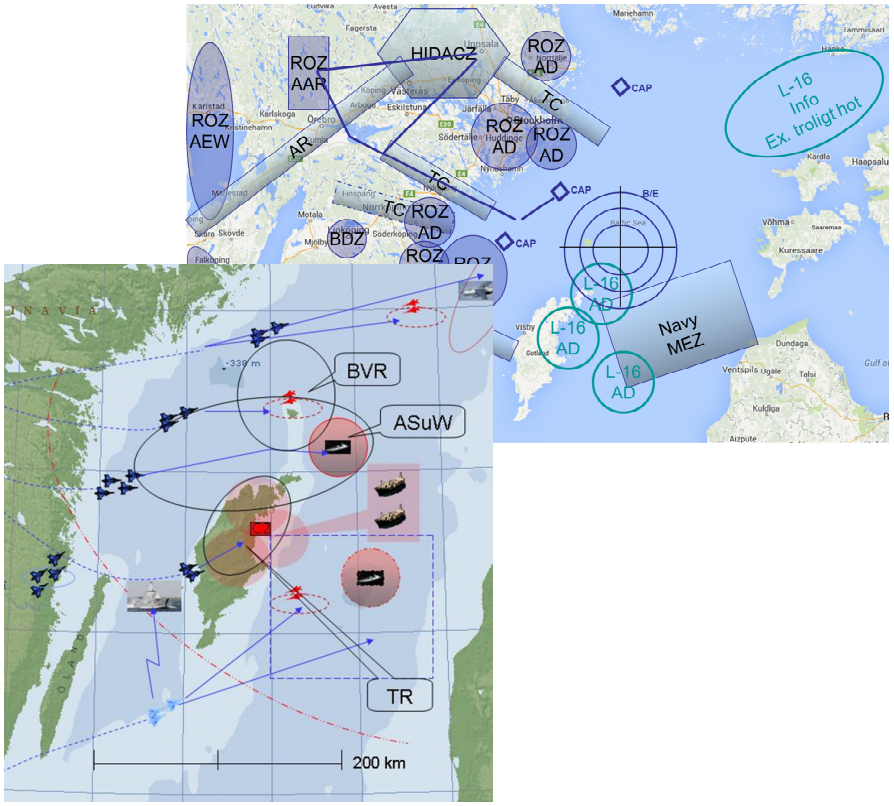
- Rollout of first test aircraft
- Concept/design development and validation ongoing
- IOC 2019 and FOC 2023

VALIDATION STRATEGY



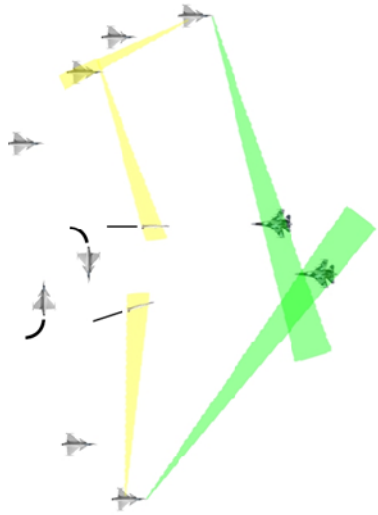
SCENARIOS AND CONOPS STATES THE USER NEEDS

- The scenario defines the challenge – and what to be achieved
- The Concept of Operations (CONOPS) defines the technical and tactical solution of the scenario
- They can be used as a ”map” and reference to:
  - Requirements specification when designing
  - Validation



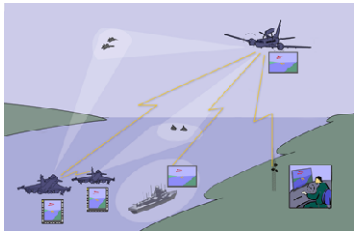
PRODUCING A TEST PLAN

- Scenarios and CONOPS are broken down into specific mission situations, needs are identified
- Capability needs are broken down into technical needs
  - Critical Operational Issue (COI):
    - ”*Perform air-to-air engagement against a cruise missile”*
  - Measurement Of Effectiveness (MOE):
    - *”The target acquisition system can produce target data for air-to-air missiles against cruise missiles”*
  - Measurement Of Performance (MOP):
    - *”The pilot subjective rating of target acquisition exceeds TLR 4”*
- Will lead up to test plans



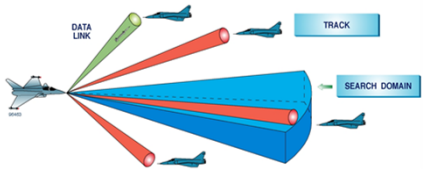
VALIDATION THROUGH THE WHOLE PROCESS

Multi-platform



Aircraft

Sub-system



General	Feedback of design			Requirements closure
with the end-user or its represent using the system	Phase 1 Requirements	Phase 2 Concept	Phase 3 Draft version	Phase 4 Delivery version
		Idea of tecnical solution		
	Environment	***Environment***	***Environment***	***Environment***
Validation Level 2	Round table discussion	Simulation / Round table discussion	Simulation with CONOPS in a scenario / T:edition in aircraft	Aircraft/ Mission support system/ ILS / Simulator etc
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Validation Level 4 functional chain	Round table discussion	Simulation with type situations from CONOPS (e.g. from CAP to a METEOR-engagement single taget	Simulation with type situations from CONOPS (e.g. from CAP to a METEOR-engagement single taget	Aircraft/ Simulator

Design phase

OPERATIONAL USABILITY

OPERATIONAL USABILITY

- There are technical prerequisites to manage the scenario
- The functional chains to manage the scenario are intact
  - E.g., Kill-chain / Live-chain

KILL-CHAIN

- Mission management
- Target search
- Target detection and location
- Target identification/classification
- Weapons employment
- Assessment

LIVE-CHAIN

- Mission management
- Detect threat
- Avoid detection
- Avoid tracking
- Avoid being shot at
- Avoid missile lock
- Avoid hit
- Durability

TEST STATIONS

ROUND TABLE DISCUSSIONS

- In all phases and levels
- To validate:
  - These are the needs (operators)
  - These are the requirements (customer and program management)
  - This is the concept, design, challenge, solution (engineers)

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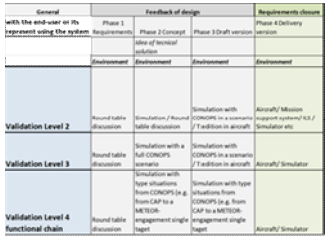
UNMANNED SIMULATIONS (FLAMES)

- In all phases and levels
- Statistic objective simulations
- To validate:
  - Sensor/weapon performance
  - Aircraft performance
- Indication of performance with basic models



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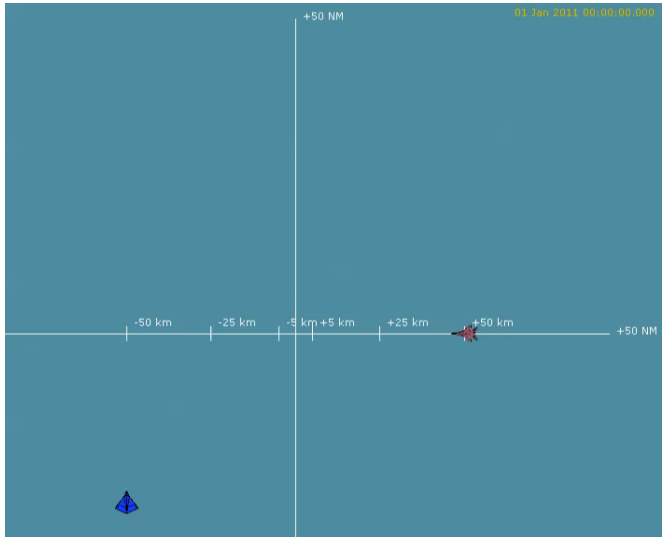
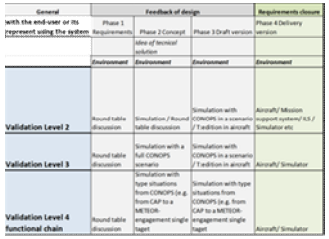


MANNED SIMULATIONS

- In all phases and levels
- Network simulation facility
  - 8 manned simulators
  - 2 GCI stations
- To validate:
  - Pilot in the loop



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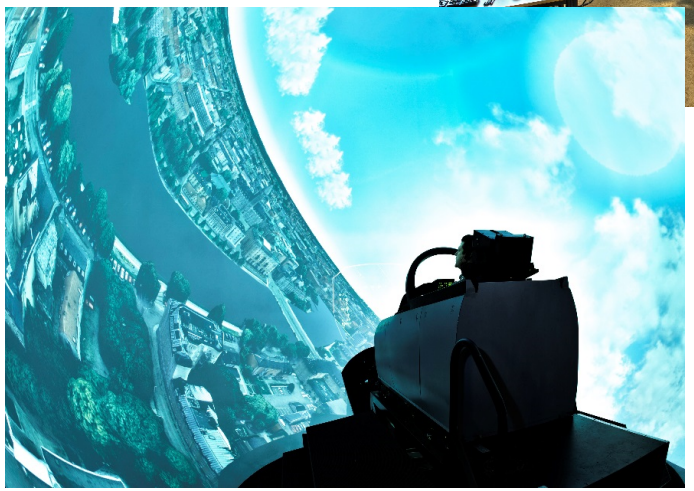

AIRCRAFT

- In phase 3 and 4, all levels
- To validate:
  - Full functional chains (e.g., QRA with turn around)
- Feed-back on models during early simulations

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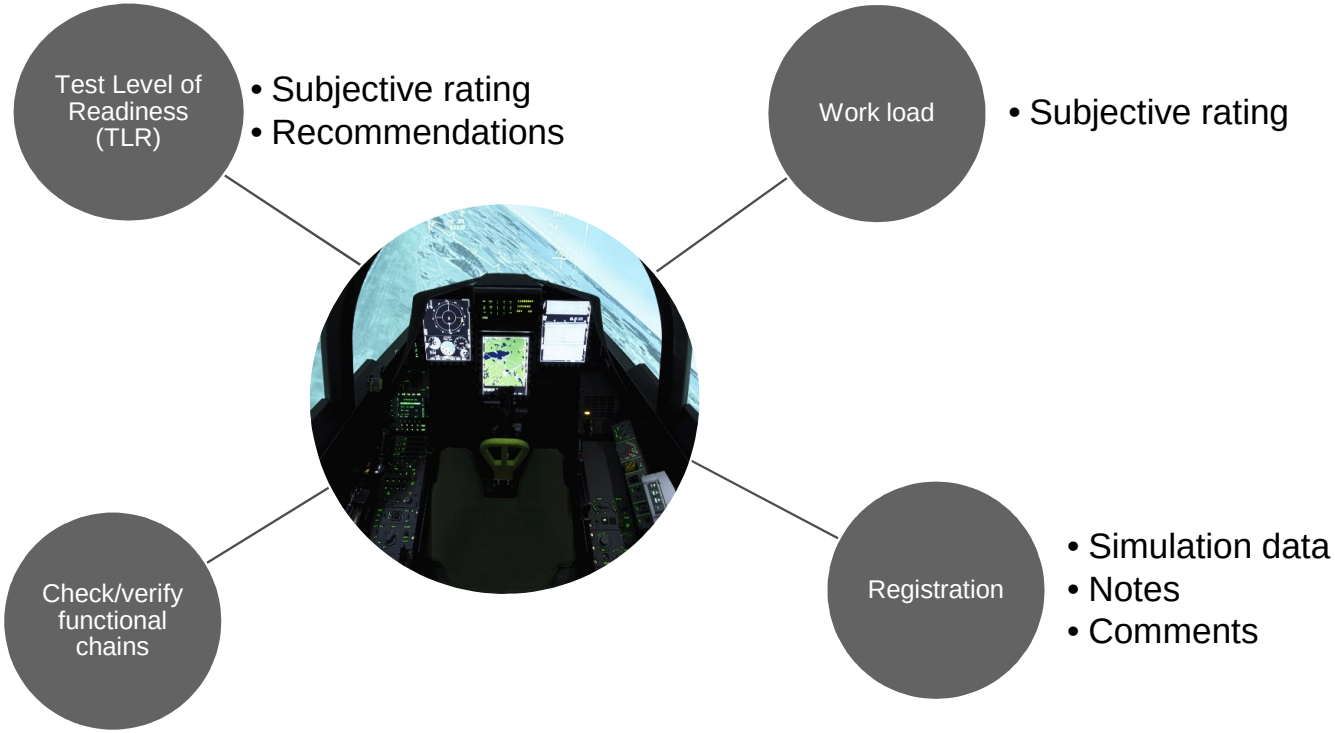
MEASURING OF OPERATIONAL USABILITY

METHODOLOGY



LESSONS LEARNED

- The subjective judgement does not always reflect the tactical result
- Limited number of resources
- It is complex to define and agree on definitions like ”operational usability” – what to measure?
- Simulations can be used as input for e.g., calculating operational profiles
- A mutual learning effect
- Has resulted in important findings!

THANK YOU!