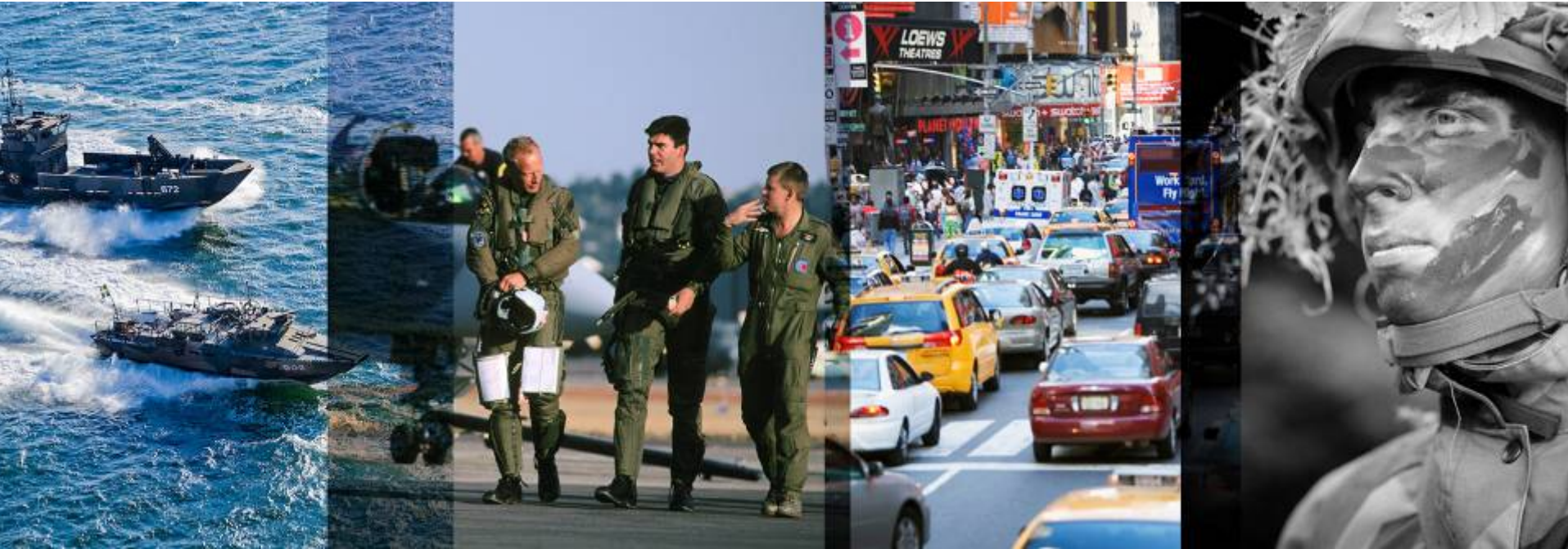


# Lean Integration

## AoC Pretoria 2009



**NAME** Arne Mattsson

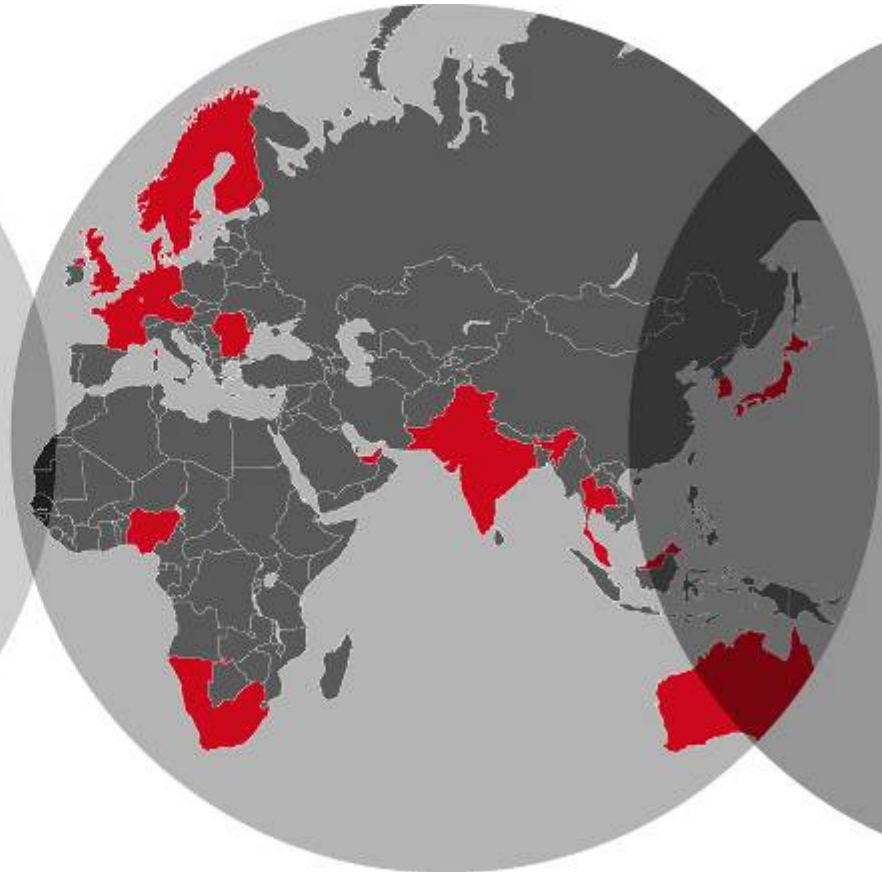
**DATE** Aug 26 2009

**TITLE** Lean Integration











# SAAB WORLDWIDE

## Employees 2008

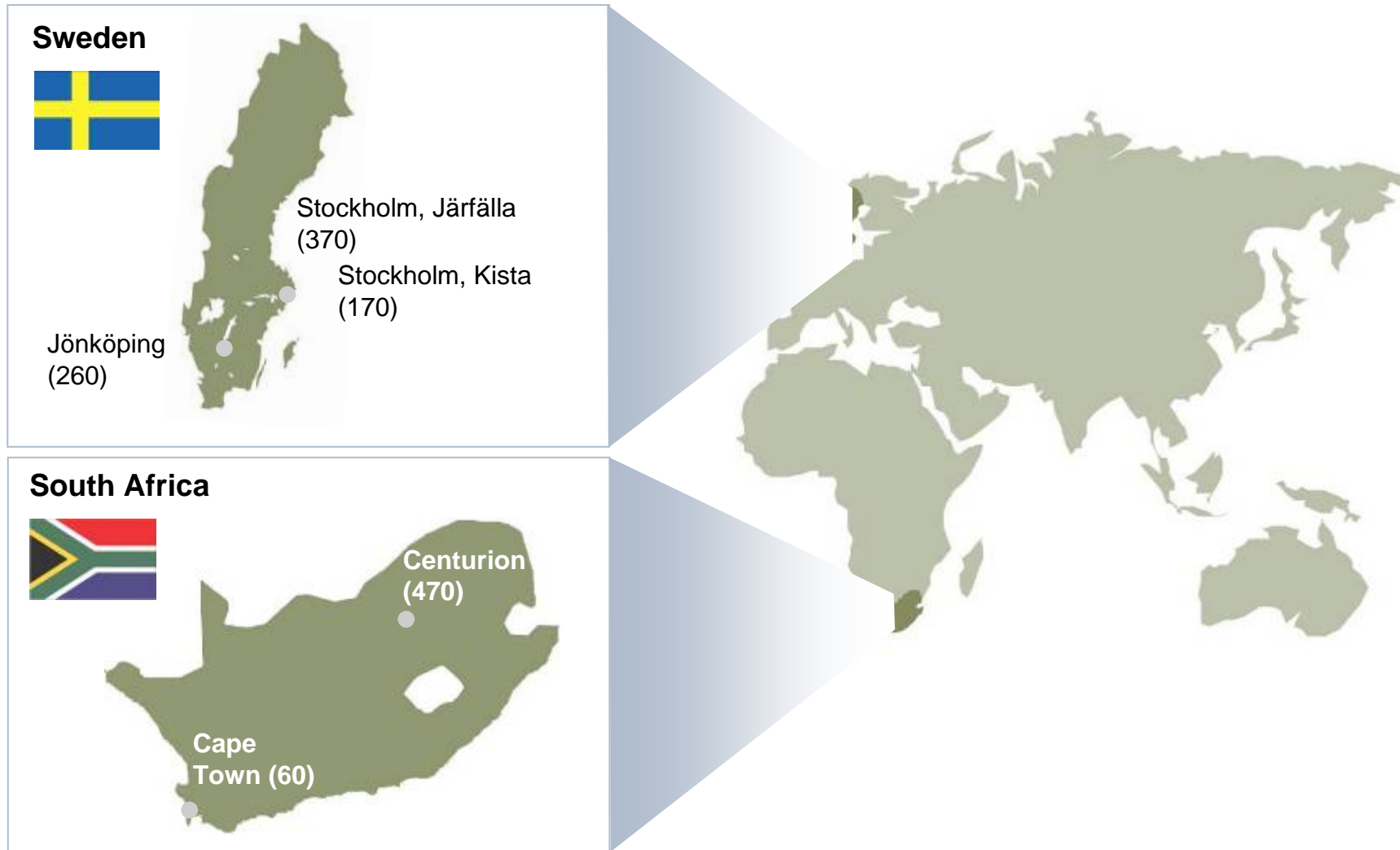
➤ Sweden	11,047
➤ South Africa	1,185
➤ Australia	313
➤ USA	250
➤ Denmark	104
➤ Great Britain	102
➤ Norway	48
➤ Germany	44
➤ Switzerland	34
➤ Other	77



# SAAB'S CAPABILITIES

Support Solutions		Aviation		Sensor Systems
		Electronic Warfare		Simulation and Training
		Weapon Systems		Signature Management
		Command and Control		Communication
		Underwater Systems		Civil Security

# Saab Avitronics, 1 300 employees in two countries



## Saab Avionics

The defence electronics partner since 1941

More than half a century of development and manufacturing of avionics systems, starting with a bomb sight for the B17 in 1941.

Almost 50 years of experience within Electronic Warfare starting 1959 when we delivered the world's first Radar Warner for a fighter, Saab J29.



# Content, a contractor perspective

- For what roles are protection asked for?
- Type of threats
- What type of capabilities are asked for?
- Aircrafts receiving new or enhanced equipment
- “Lean integration”, what is it?
- Lean integration - Examples

# For what roles are protection asked for?

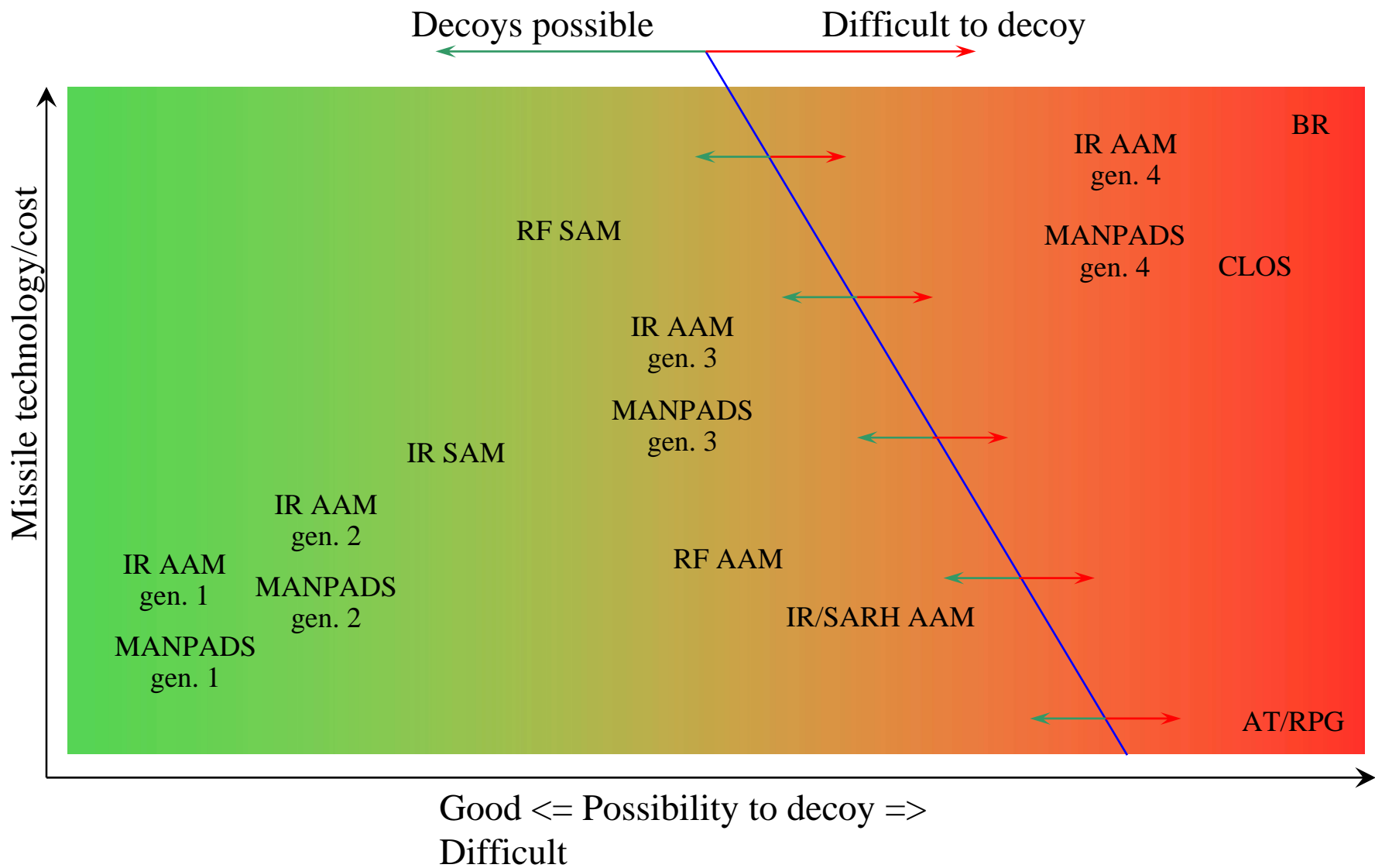
- Transport
- CAS
- Fighter
- Ground/attack
- Command / early warning
- Escort
- CAP

# Type of threats



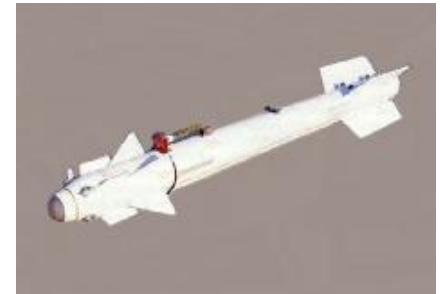
- MANPADS (SA-7, SA-14, SA-16, SA-18, HN-5, FN-6)
- IR AAM (AA-8, AA-11)
- IR SAM (SA-9, SA-13)
- RF AAM (AA-9, AA-12)
- RF SAM (Command type, SA-2, SA-3, SA-4, SA-5, SA-6, SA-8, SA-10, SA-15)
- IR/RF AAM (also IR/SARH Semi Active Radar Homing, AA-2, AA-6, AA-7, AA-10)
- CLOS (LLTV, Wire, Radar, Radio)
- Beam riders
- AT/RPG (RPG-7)





# What type of capabilities are asked for?

- RF protection
  - Corridor
  - Self protection
    - Pre-emptive
    - Reactive
- IR protection
  - Pre-emptive (rail keeper)
  - Reactive
- Beam riders
- CLOS
- RPG/AT



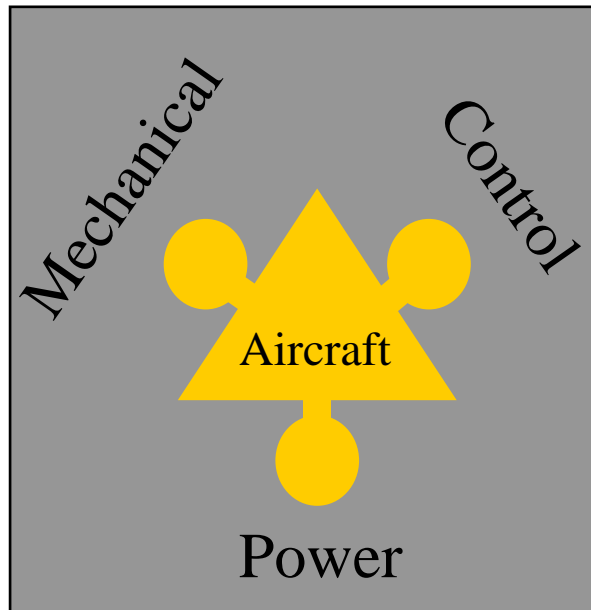
# Aircrafts receiving new or enhanced equipment

- Transport aircraft
- Ground role aircraft
- Fighters
- Forward air control role aircraft
- Cost Guard / patrol aircraft
- Command / early warning aircraft
- VIP
- HoS
- Helicopter

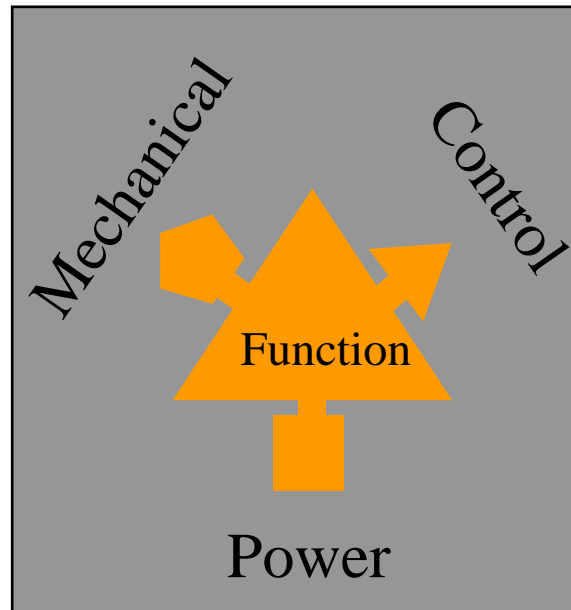
# Integration

- Dictionary: "*Combining components into an overall system*"  
(© 1993-2007 Denis Howe)
- Integrating the function
  - Getting the function onto the aircraft
- Integration of the capability also has to include
  - Education and Training
  - Operational Support
  - Test Equipment
  - Maintenance
  - Repairs and spair parts
  - Product maintenance (Contractors obligation)

# A piece of the puzzle



Interfaces  
to Aircraft



Function  
interfaces

= High integration  
cost

# **“Lean integration”**

## **what is it?**

- In general, a cost effective method for achieving and maintaining EW capability
  - Cost effective Verification, Qualification and Documentation
  - Method of installation
  - Method to maintain and support
  - Process of procuring new/enhanced equipment or capabilities
- Method to reduce project time, cost and risk
- Maintain CONOPS

# Lean Integration

## Cost effective verification qualification and documentation

### Generic System data:

- Specification
- Verifications
- Maintenance
- Spares
- ILS data
- Repair
- Education
- Test equipment
- Ground support equipment



CAMPS on  
Embraer 120

Any aircraft that  
can carry an  
ASRAAM,  
AMRAAM;  
Sidewinder or  
IRIS-T



BOL on  
Typhoon



BOL on  
gripen



BOL on  
F-18



BOL on  
F-15

### Generic product data:

- Specification
- Verifications
- Maintenance
- Spares
- ILS data
- Repair
- Education



### Generic module data:

- Production documentation
- Spares
- ILS data
- Repair



# Lean Integration

## Method of installation

- Investigate possibility to reuse existing interfaces
  - HW
    - Launchers
    - Pods
  - Power
    - Use of existing power
  - Control
    - Data links
    - Discrete lines
    - Wireless
    - Master – slave concept (simultaneous BC capability while acting as RT)



# Lean Integration

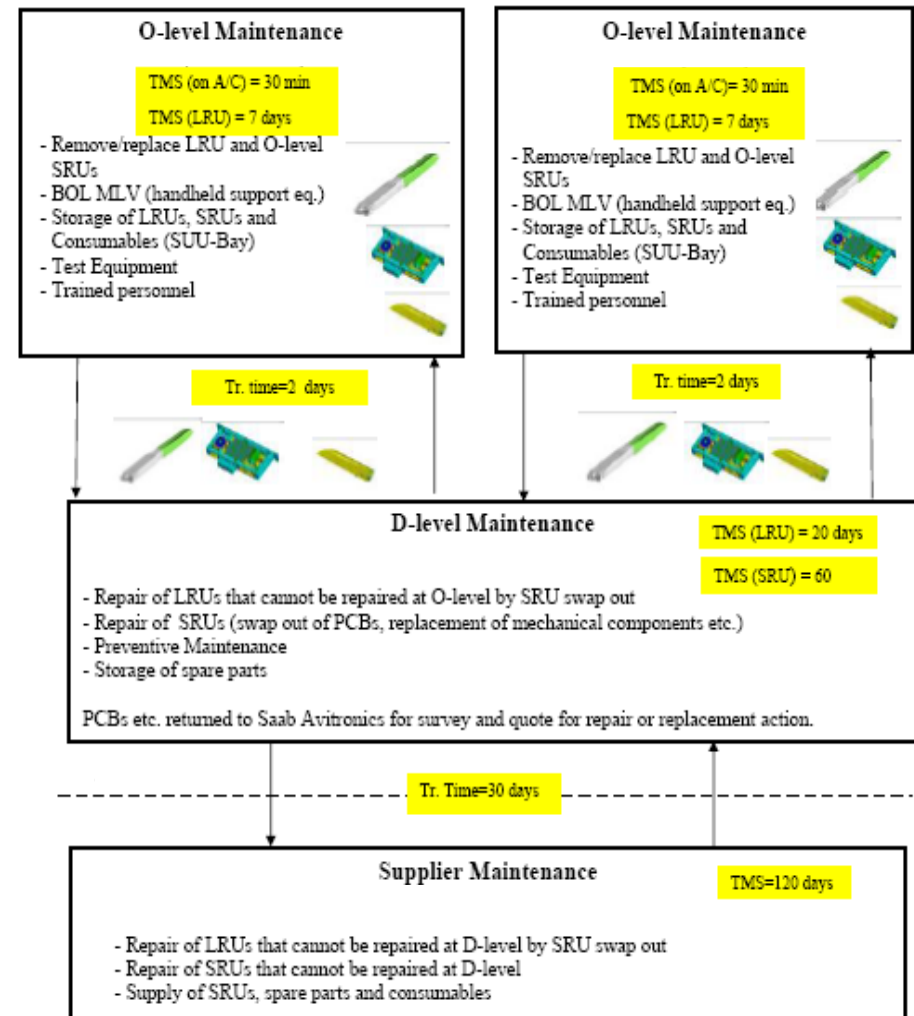
## Method to reduce project time and risk

- Mitigate risk by early testing (ground and flight)
- Delta analysis and qualification
- Reuse proven interfaces
- Ensure growth potential
- “don’t fix it if it’s not broken”

# Lean Integration

## Method to maintain and support

- Mature products
- Support analysis
  - Reliability
  - Availability
  - Support equipment need
  - Time to Repair
  - Time to Make Serviceable (TMS)
  - Training Needs Analysis (TNA)



# Lean integration

## Process of procuring new/enhanced equipment or capabilities

- Reuse industry product specifications
- Use COTS products or modules
- Team approach
- Define what is “shall” and “should”
- Delta analysis and qualification
- Do not reinvent
- Define logistics
- Analyse need for level of integration

# Lean integration

## Preparation for Lean integration

- What can the industry do?
  - Product strategies
  - Building blocks / modular design
  - Reuse x % of existing building blocks
  - Products Integration concepts
    - Mechanical
    - Electrical
    - Control
  - Allow reuse of tactics
  - Generic verification that can be reused
  - Generic documentation that can be reused

# Lean integration

## Preparation for Lean integration

- What can the Purchaser do?
  - Clear functional requirements
  - Strive for standardized Interfaces
    - Electrical
    - Power
    - Links
    - Open protocol for basic functionality
  - Allow for using generic document formats or standardized formats
  - Put requirements on industry to standardize

# Lean integration

## Examples

### BOL on F7A-18 Hornet

- Seamless control
- Team approach
- Reuse of industry specifications
- Reuse of previous qualification results
- Delta analysis and qualification



RAAF photo

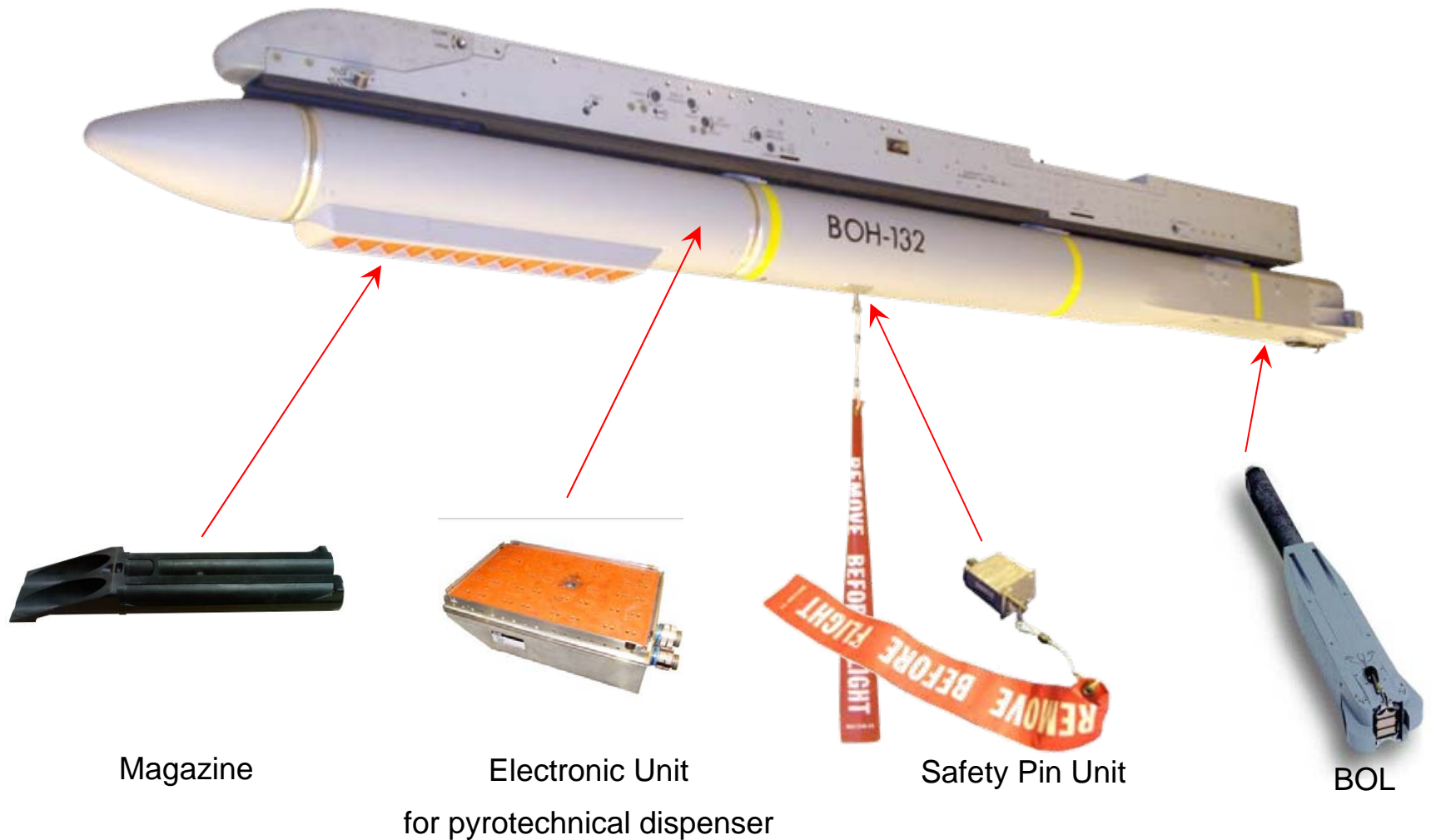
# Lean integration

## Examples

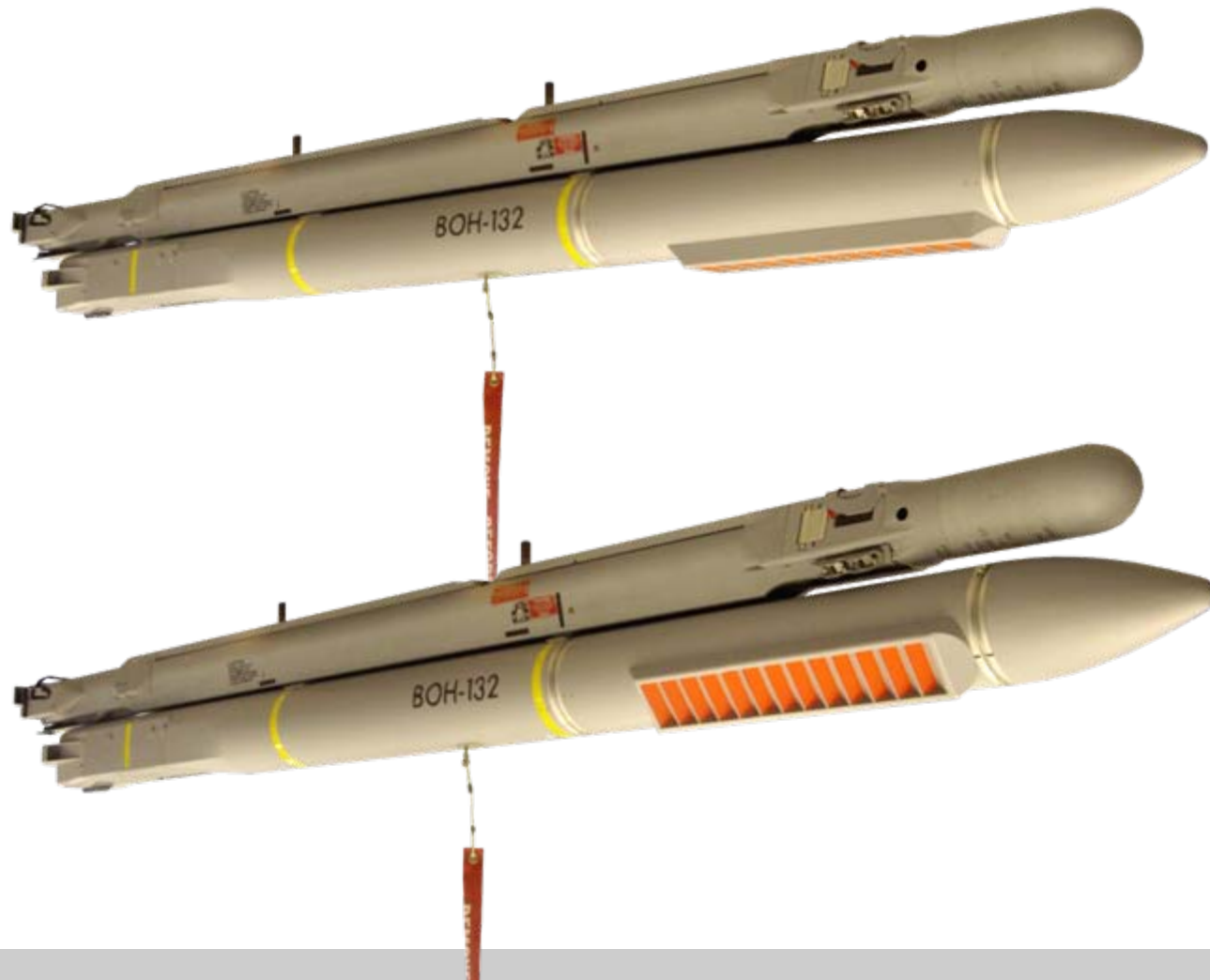
### BOH

- In the leanest possible way provide additional advanced countermeasures capability
- Use the same electrical and hardware interfaces as the AIM-9, AIM-9X, AIM-120, AIM-132 (ASRAAM) and IRIS-T missiles
- Shall fit LAU-7, LAU-127, LAU-128, LAU-129, MML, CRL etc.
- Incorporate forward firing capability (pyrotechnical)
- Incorporate BOL capability
- Reusing existing technology, products, modules and building blocks to minimize development cost/lead-time and risks

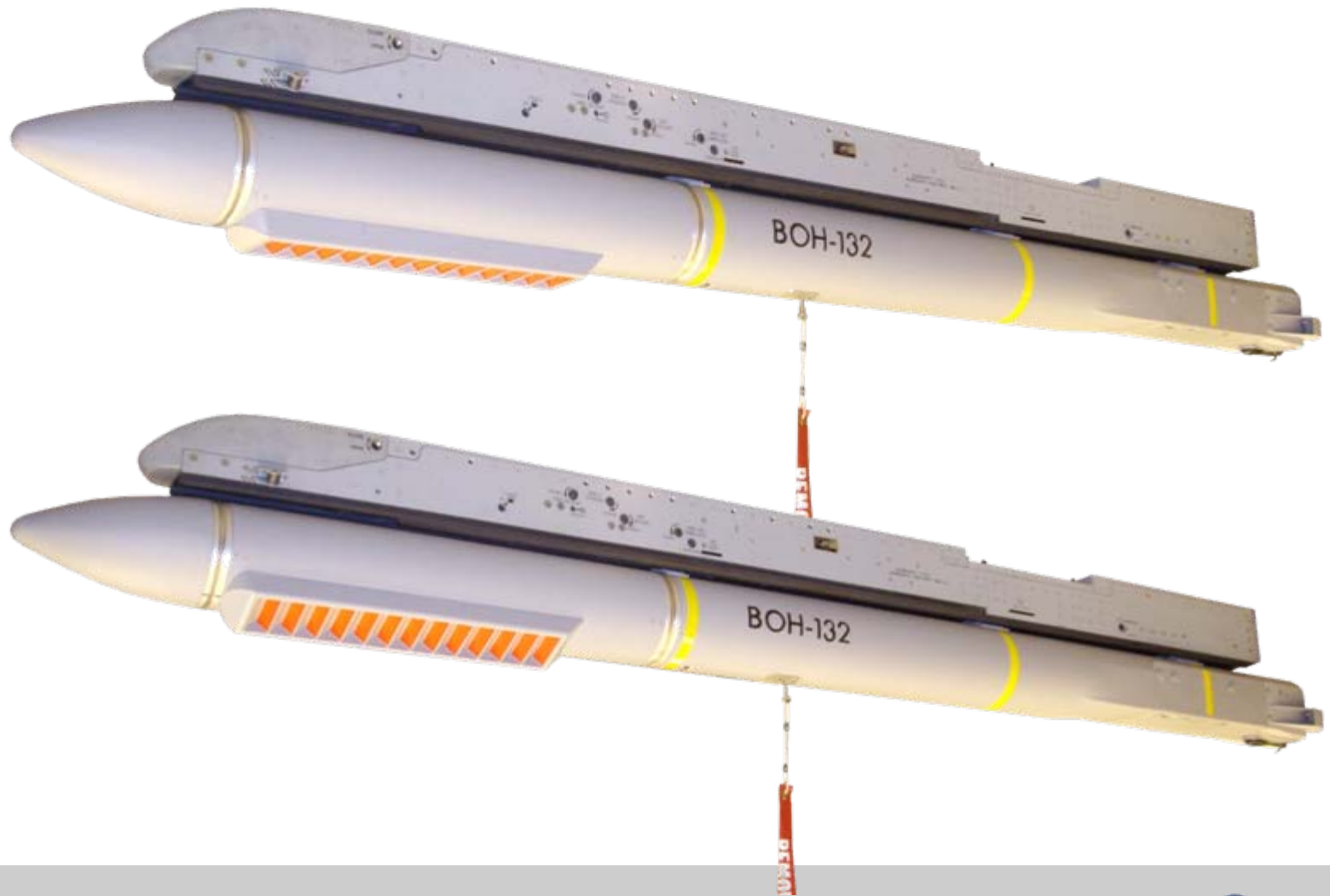
# BOH building blocks



# BOH on UK BOL-304 Launcher



# BOH on USAF LAU-129 Launcher

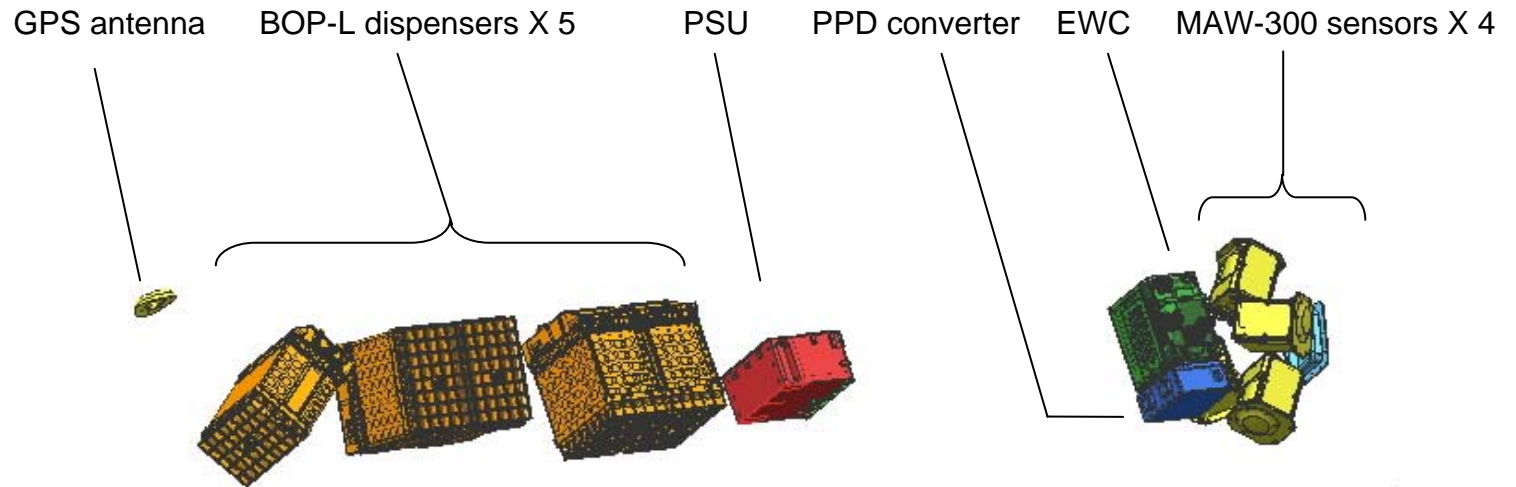


# Lean integration Examples

## BOZ EC

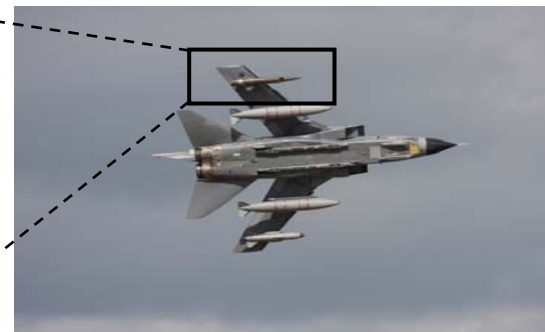


# SYSTEM OVERVIEW



# AIRCRAFT INTERFACE

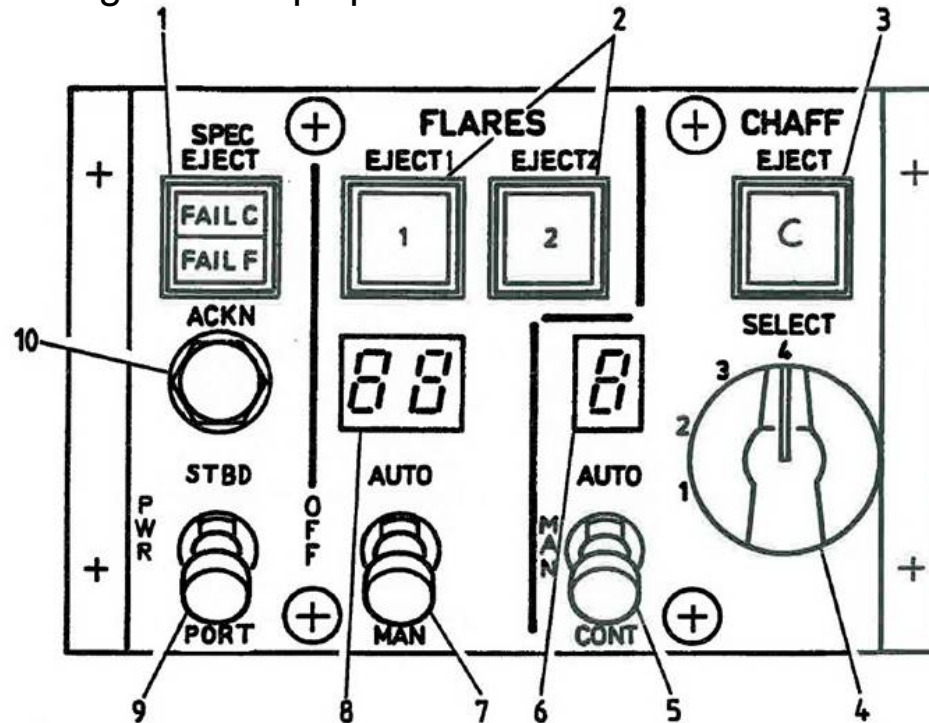
- Aircraft interface is plug-and-play
  - Electrical properties identical to original BOZ
  - Power properties within original specification
  - Aerodynamic properties similar to original BOZ
  - No change to aerodynamic loads
  - Wind tunnel tested w.r.t. induced acoustic noise
  - Mechanical and structural properties within original specification
  - Uses original BOZ test equipment



# AIRCRAFT INTERFACE

## ► Human Machine Interface (cockpit)

- Overview
  - Plug and play
  - No change to cockpit panel



# GROUND SUPPORT INTERFACE AND EQUIPMENT

- Ground Support Interface
  - Access
    - Readily accessible on the pod aft cone
    - Outside line of fire of all dispensers (“approachable”)



# GROUND SUPPORT INTERFACE AND EQUIPMENT

- Ground Support Equipment
  - Existing



# Lean Integration

## How to introduce new capability

- Industry to offer products and systems on a specification
- Purchaser and contractor can, if needed, compile a delta specification
- Reuse
  - Proven interfaces
  - Components – products – Systems
  - Specifications
  - Verifications
  - Test equipment
  - ILS-data
  - Manuals
- Resuse CONOPS, add capability!



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