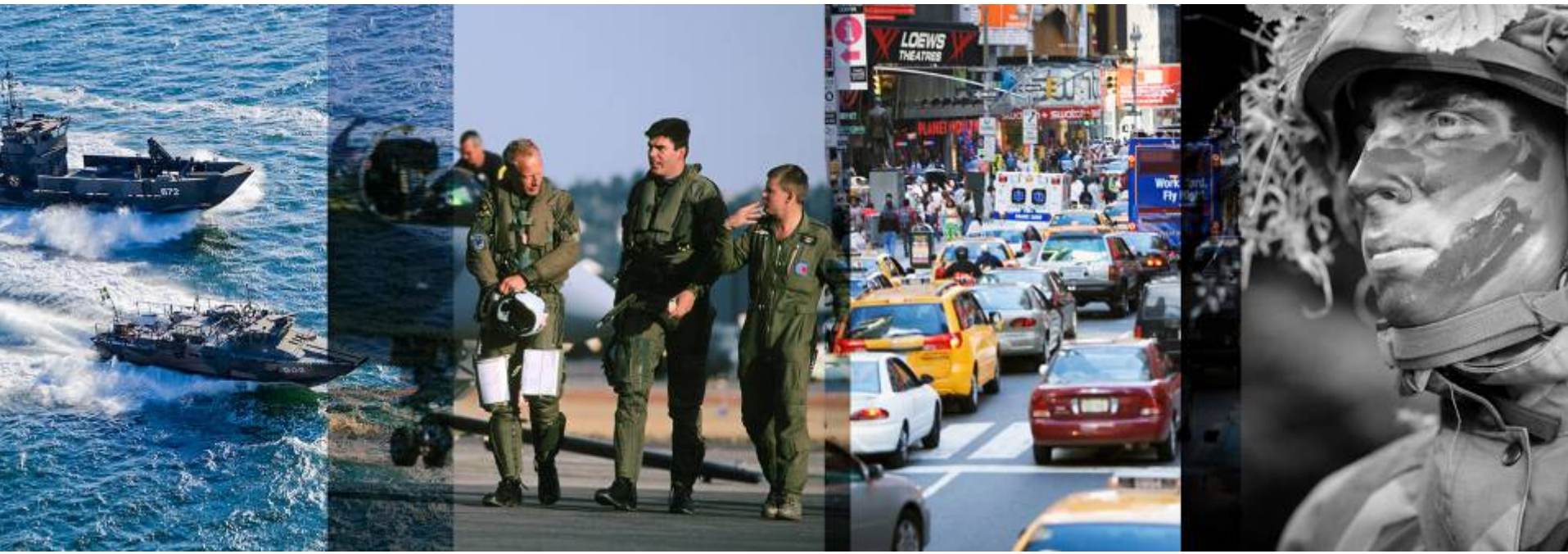
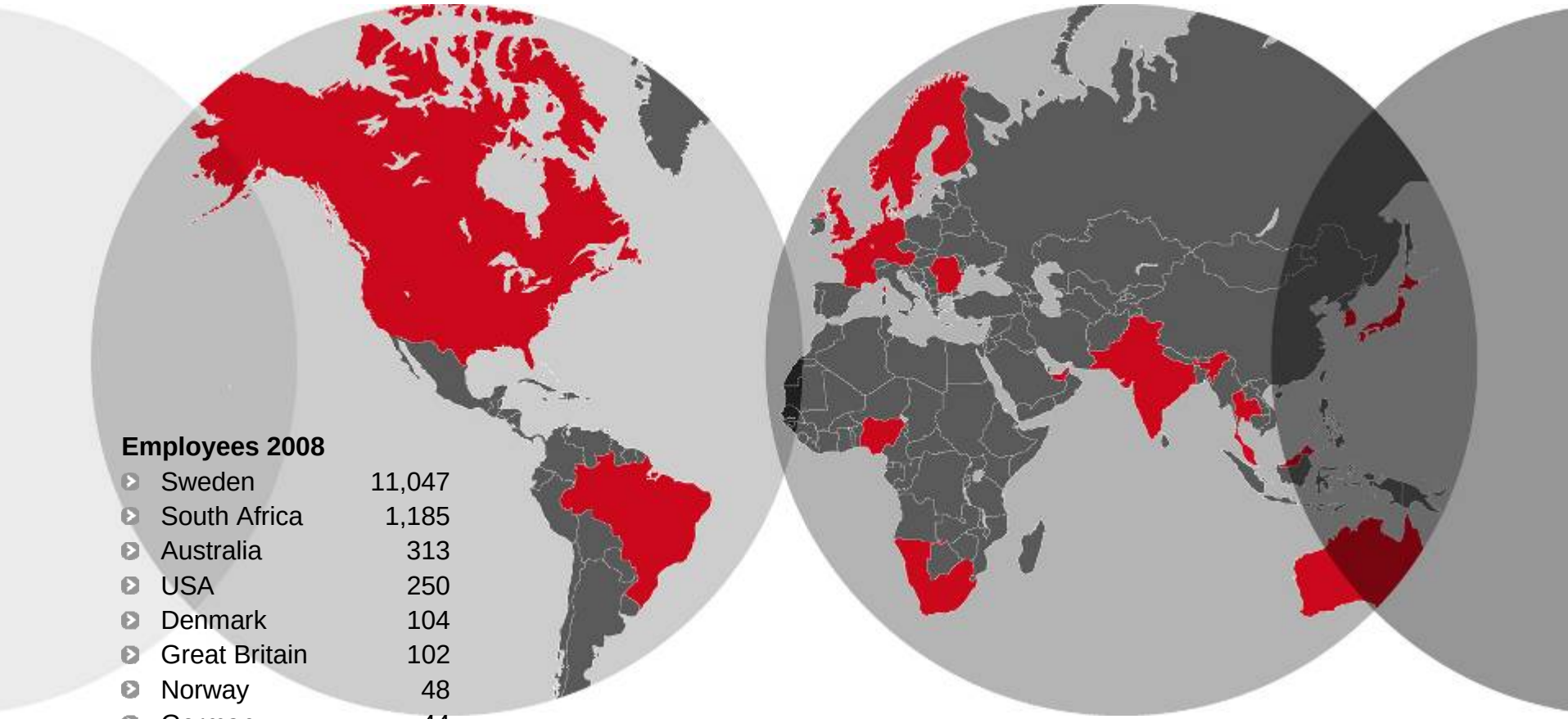
Lean Integration
AoC Pretoria 2009



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

Electronic Warfare

Weapon Systems

Command and Control

Underwater Systems

Sensor Systems

Simulation and Training

Signature Management

Communication

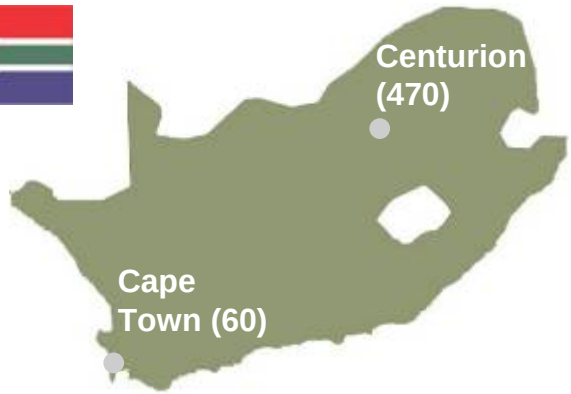
Civil Security

SAAB

Saab Avitronics, 1 300 employees in two countries

Sweden

South Africa



Saab Avitronics

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?

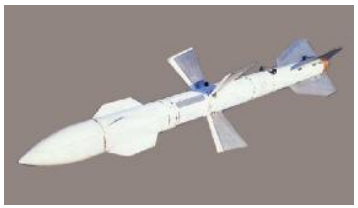
- Transport
- CAS
- Fighter
- Ground/attack
- Command / early warning
- Escort
- CAP

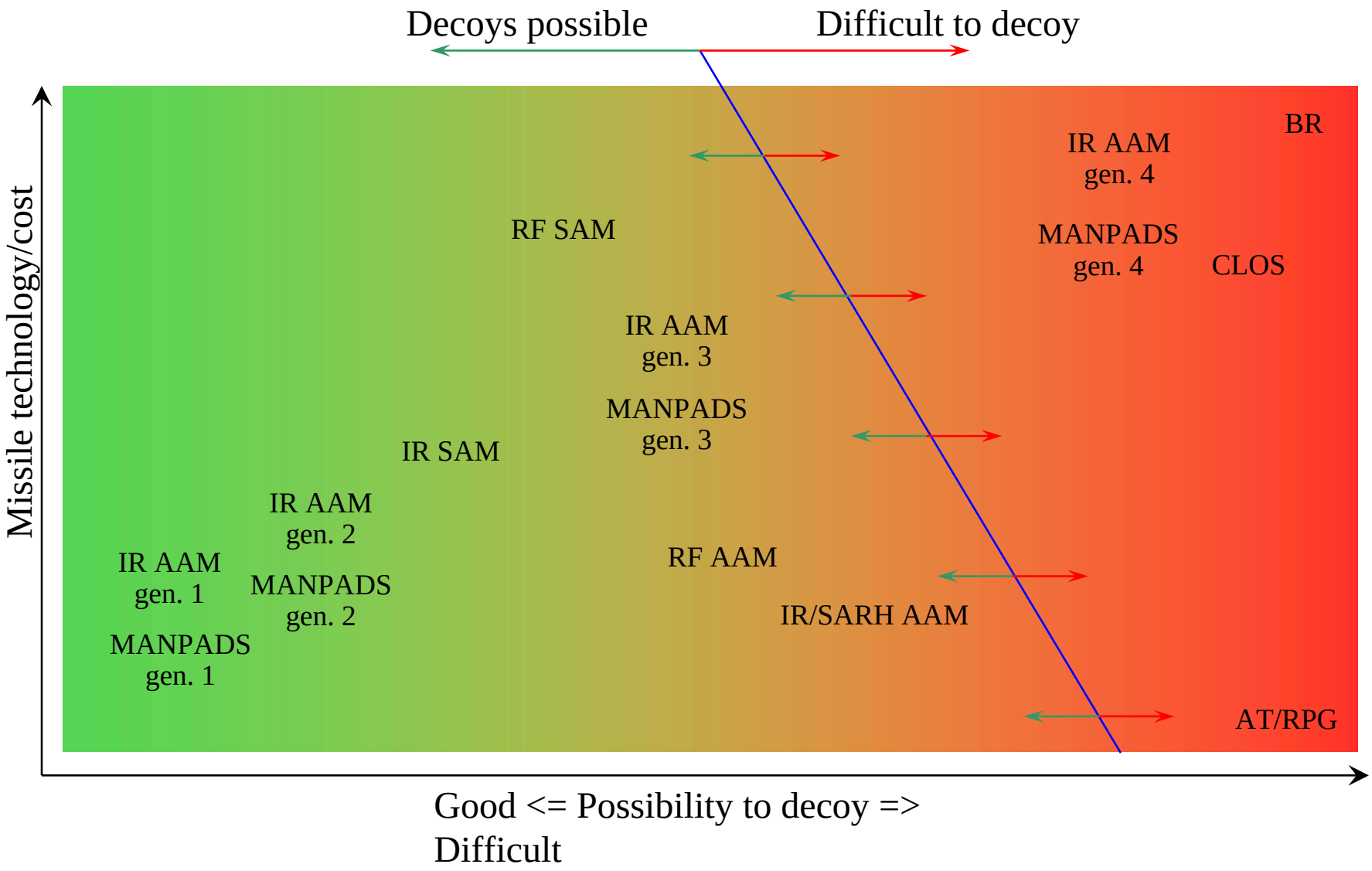
Type of threats





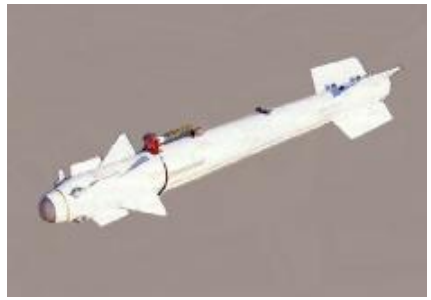
- MANPADS (SA-7, SA-14, SA-16, SA-18, HN-5, FN-6)
- IR AAM (AA-8, AA-11)
- IR SAM (SA-9, SA-13)
- RF AAM (AA-9, AA-12)
- RF SAM (Command type, SA-2, SA-3, SA-4, SA-5, SA-6, SA-8, SA-10, SA-15)
- IR/RF AAM (also IR/SARH Semi Active Radar Homing, AA-2, AA-6, AA-7, AA-10)
- CLOS (LLTV, Wire, Radar, Radio)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





Decoys possible
Difficult to decoy
Missile technology/cost
BR
IR AAM
gen. 4
RF SAM
MANPADS
gen. 4
CLOS
IR AAM
gen. 3
MANPADS
gen. 3
IR SAM
IR AAM
gen. 2
IR AAM
gen. 1
RF AAM
MANPADS
gen. 2
IR/SARH AAM
MANPADS
gen. 1
AT/RPG
Good <= Possibility to decoy =>
Difficult

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



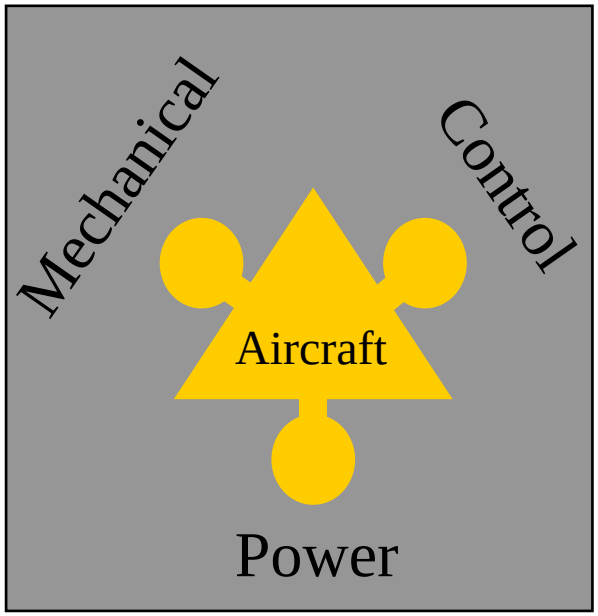
Aircrafts receiving new or enhanced equipment

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

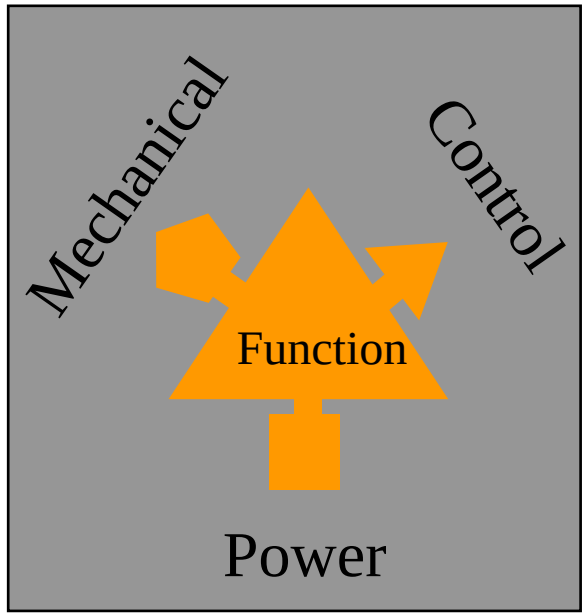
Integration

- Dictionary: ”*Combining components into an ovarall 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

Generic product data:
- Specification
- Verifications
- Maintenance
- Spares
- ILS data
- Repair
- Education

Generic module data:
- Production documentation
- Spares
- ILS data
- Repair

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

Lean Integration
Method of installation

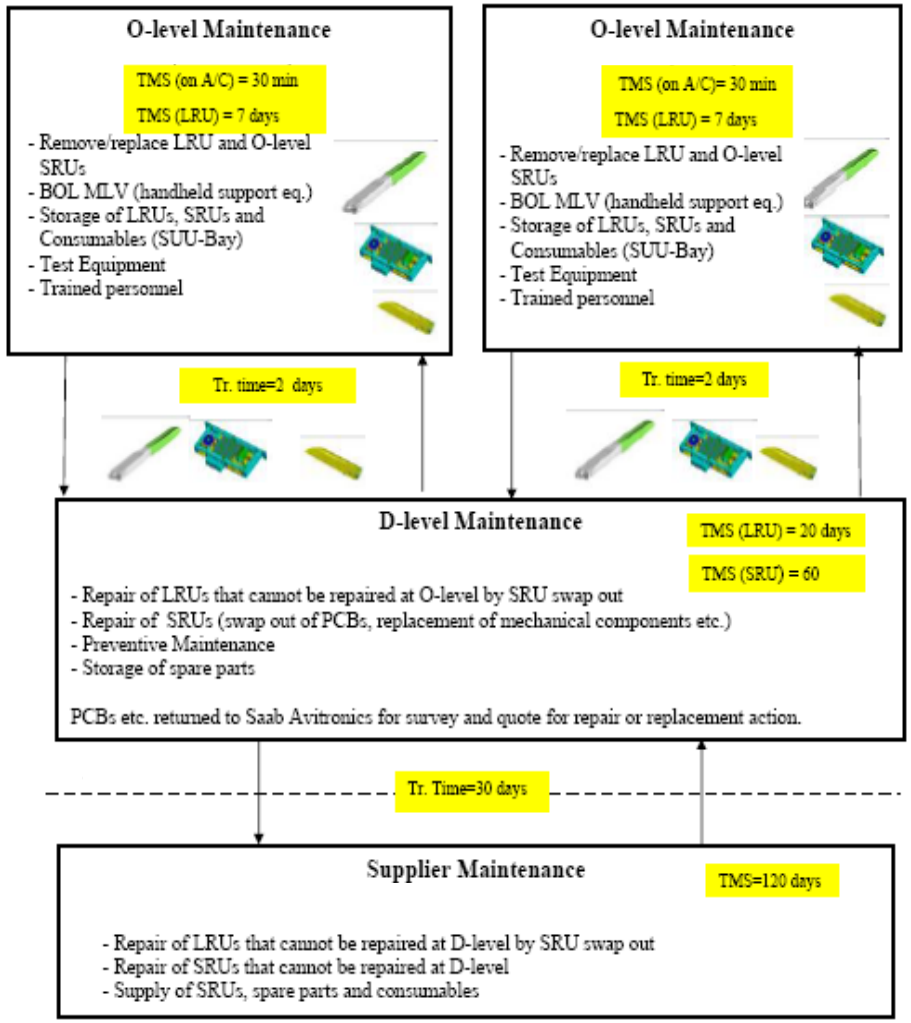
- Investigate possibility to reuse existing interfaces
  - HW
    - Launchers
    - Pods
  - Power
    - Use of existing power
  - Control
    - Data links
    - Discrete lines
    - Wireless
    - Master – slave concept (simultaneous BC capability while acting as RT)

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

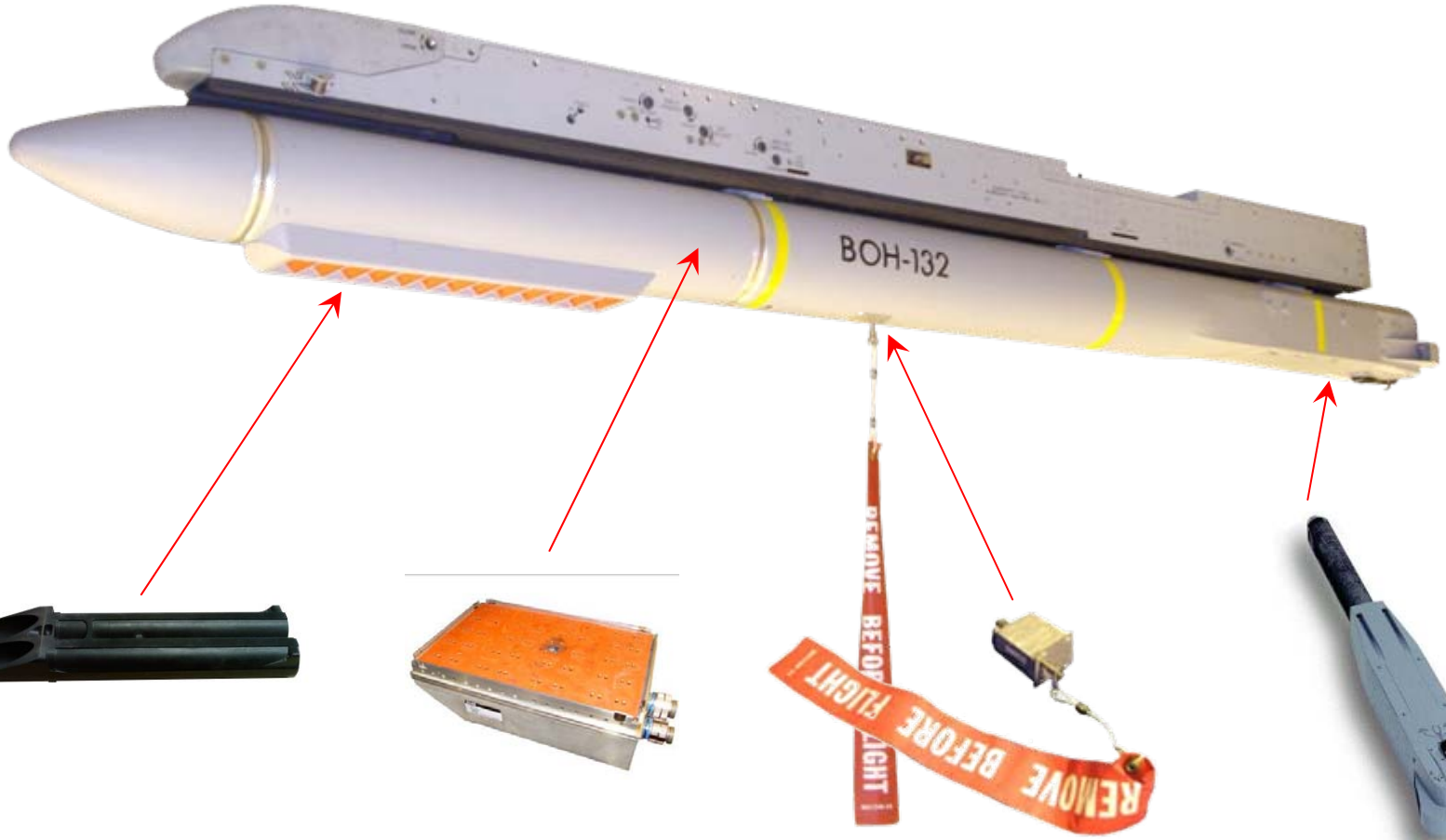
RAAF photo

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



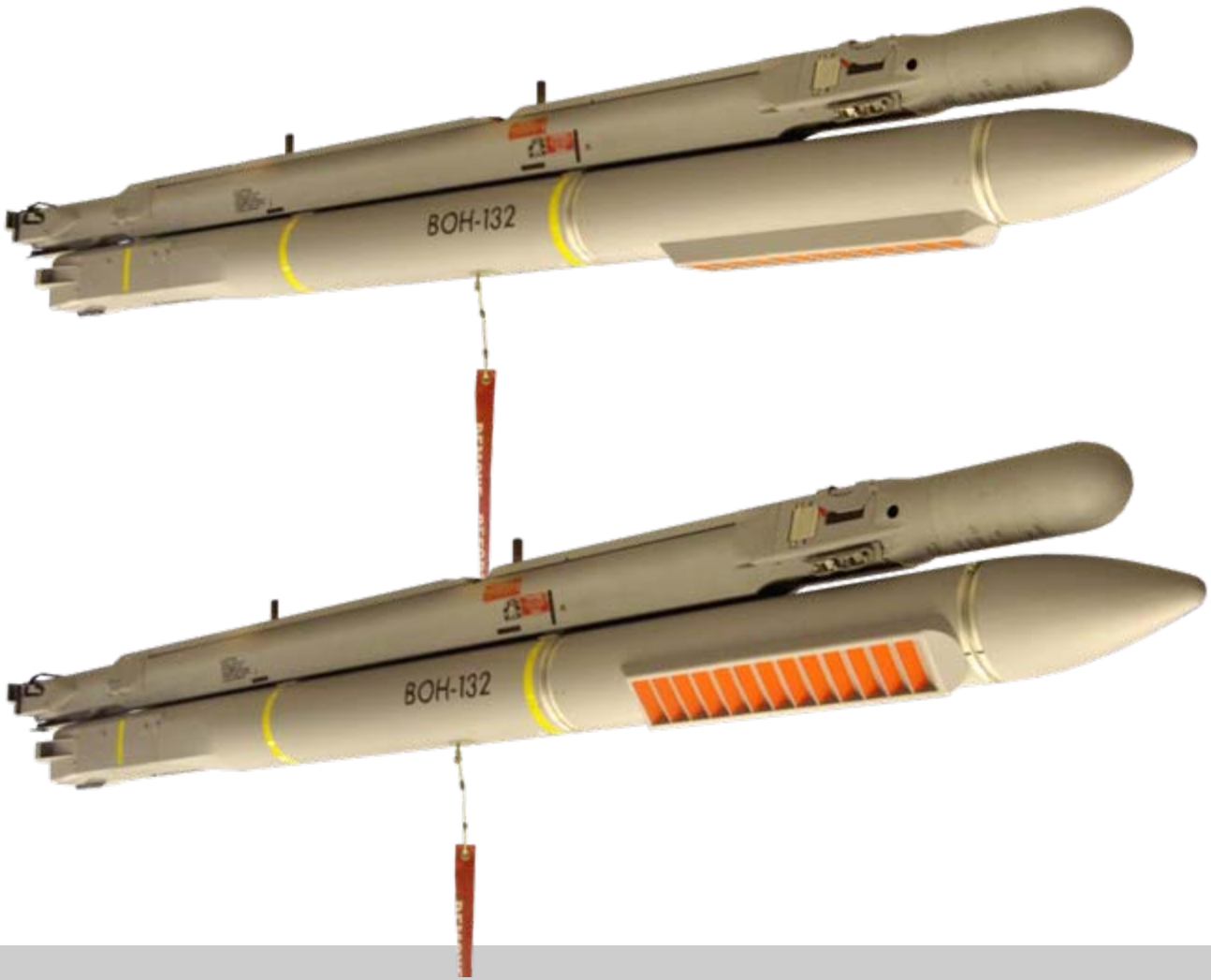
Magazine

Electronic Unit
for pyrotechnical dispenser

Safety Pin Unit

BOL

BOH on UK BOL-304 Launcher



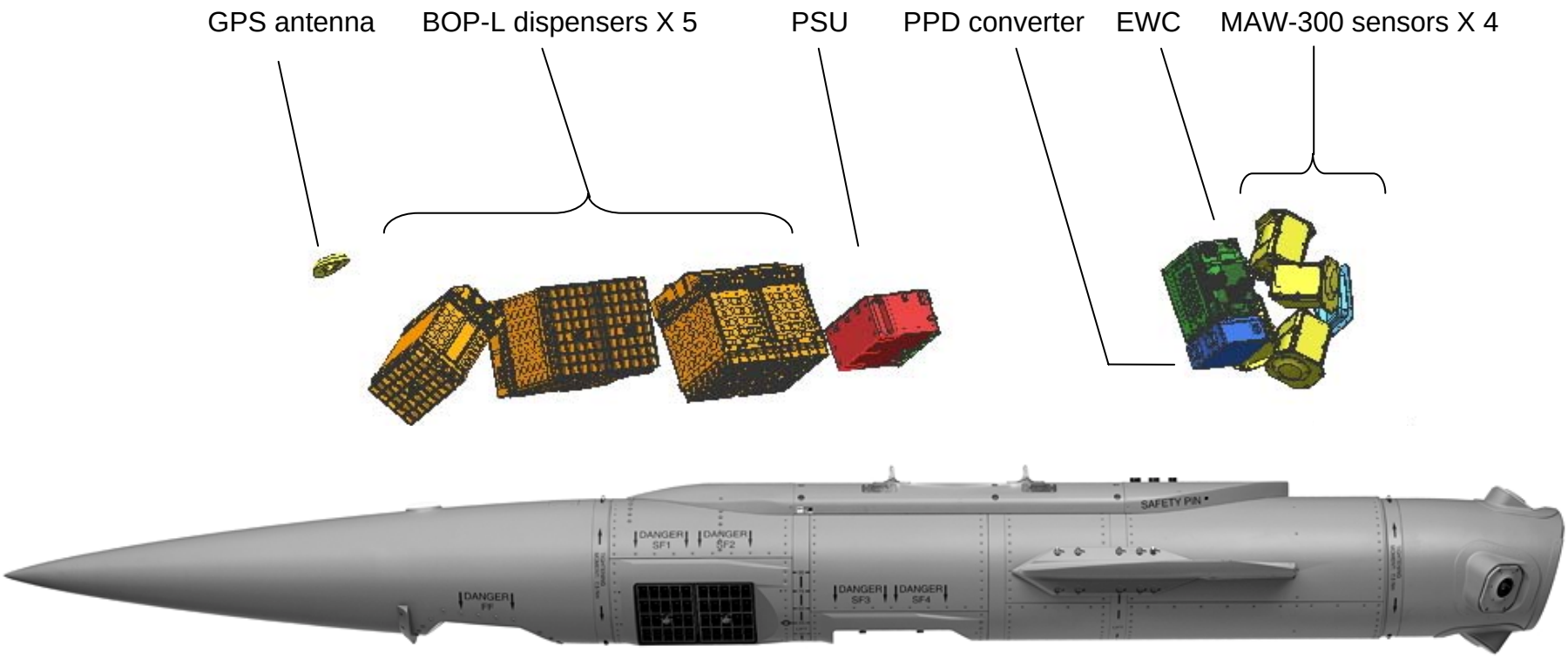
SAAB

BOH on USAF LAU-129 Launcher

Lean integration
Examples

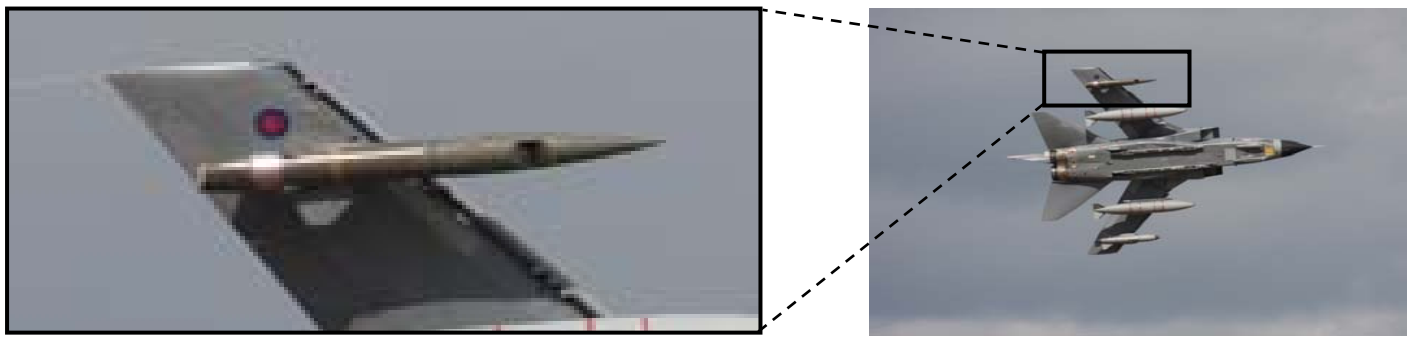
BOZ EC

SYSTEM OVERVIEW



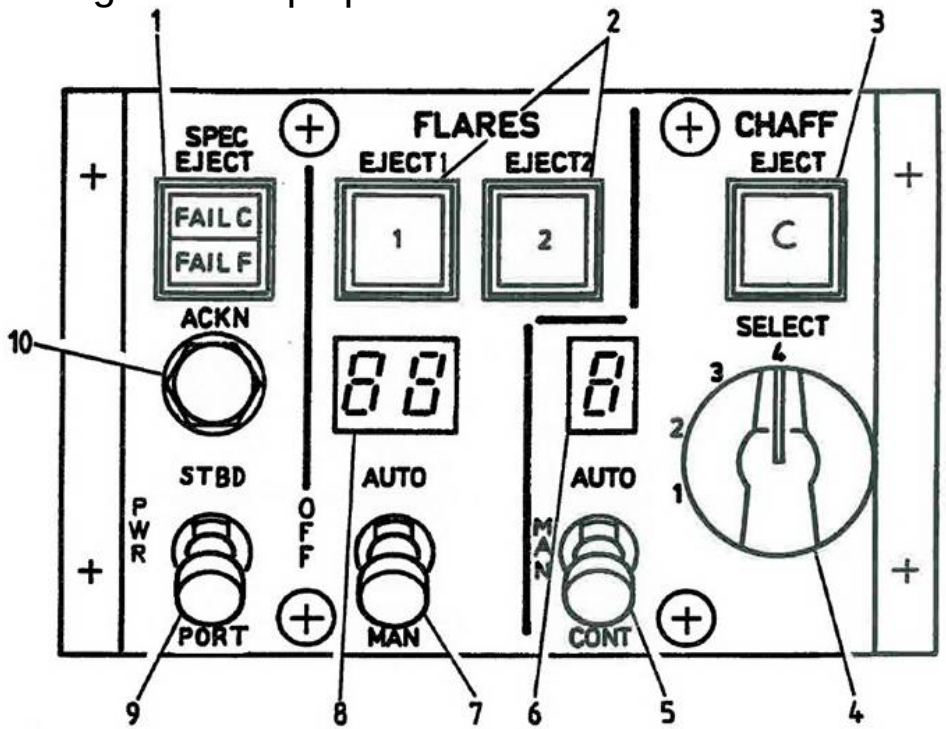
AIRCRAFT INTERFACE

- 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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