

# New Air Combat Capability

---



University Briefing  
June 2006

## Joint Strike Fighter (JSF) Project Brief

GPCAPT Brian Walsh  
(Representing AIRCDRE John Harvey)  
**NEW AIR COMBAT CAPABILITY IPT**  
**AUSTRALIAN DEFENCE ORGANISATION**



# Introduction

---

**The JSF Project:** Represents a 40-year, ~US\$1 trillion dollar investment by nine partner nations producing, sustaining and developing the JSF Air System.

Research being conducted today will form the basis of changes to JSF relating to maintenance and development.

Australian institutions should be thinking about a JSF focus to support this long-term opportunity.

**Today s Objective:** To provide a briefing on the JSF Project and suggest a way forward to leverage research activities that may have application to JSF.

*Now , what is the JSF project... .. .*





# The JSF Project and a Way Forward

---

- The JSF Project
  - Australia s involvement with JSF
  - What is the JSF?
  - JSF Capabilities
- Way Forward
  - Australian Industry Participation
  - Opportunities for inserting new technology
  - Suggested coordination approach



# The JSF Project and a Way Forward

---

- The JSF Project
  - Australia s involvement with JSF
  - What is the JSF?
  - JSF Capabilities
- Way Forward
  - Australian Industry Participation
  - Opportunities for inserting new technology
  - Suggested coordination approach



# F-35 International Partners and Security Cooperation Participants



**Great Britain**



**Italy**



**Netherlands**



**Turkey**



**Australia**



**Canada**



**Denmark**



**Norway**



**Israel**



**Singapore**

# JSF Project

## Project comprises 3 Major Phases

1990

Concept Demonstration  
and Definition (**CDD**)

2000

Australia Joined SDD  
October 2002

Proposed  
Australia sign  
PSFD  
Dec 2006,  
signifying start  
of PSFD Phase

System Design and  
Development (**SDD**)

2010

Production, Sustainment &  
and Follow-On Development  
(**PSFD**)

2020

Bi-Annual Block Upgrades  
Sustainment

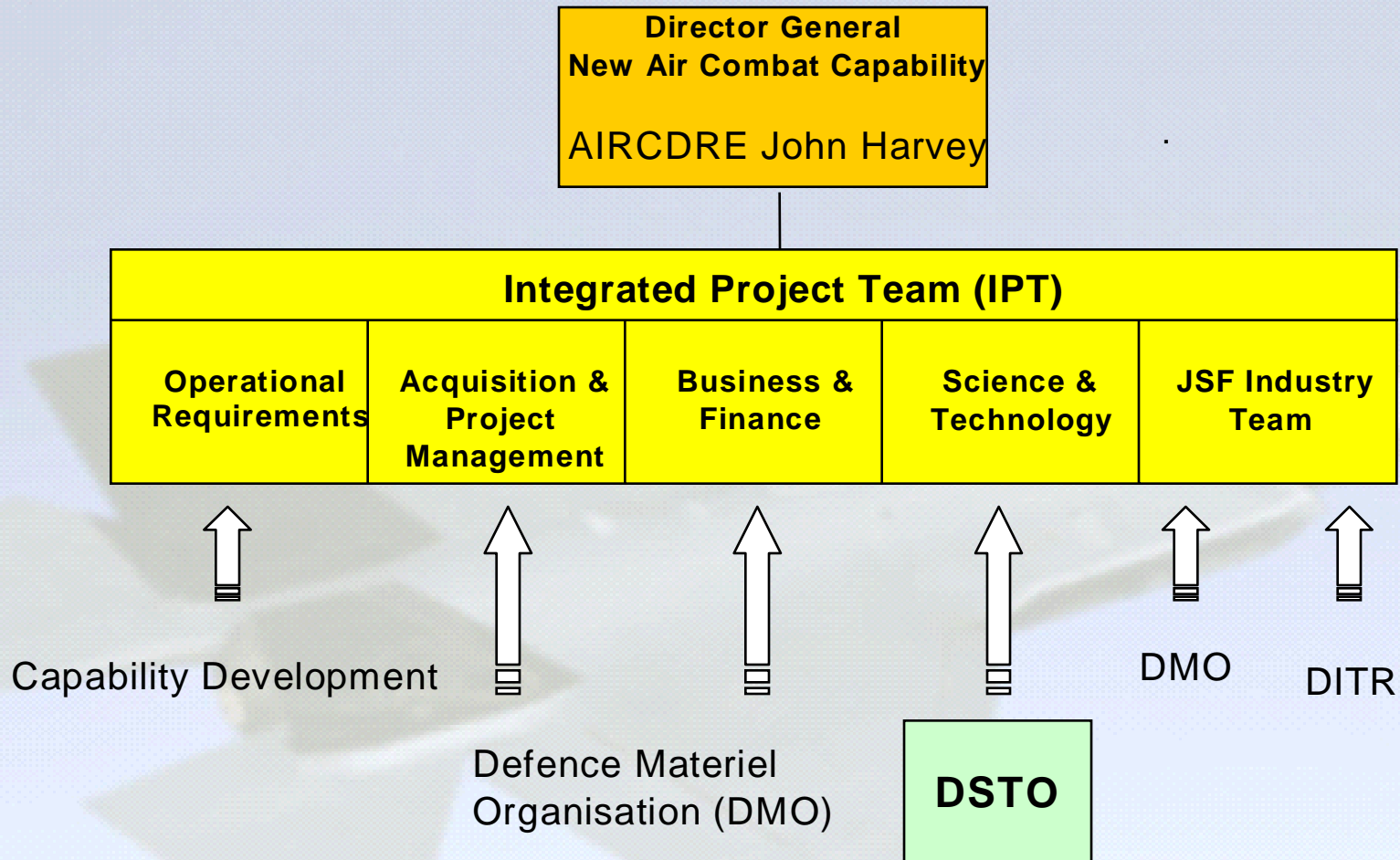
2030

2050

***New Air Combat Capability***



# NACC IPT Structure





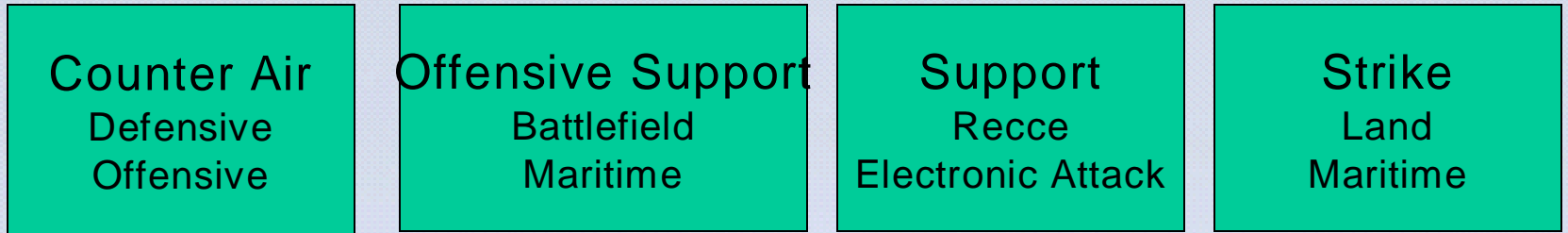
# Australian Objective

- Deliver a new air combat capability, commencing in the 2012-13 timeframe, to conduct the tasks currently carried out by the F-18 and F-111. This includes:
  - the Air Systems and their integration within the ADF
  - Support Systems and their integration within the ADF and Australian industry
- Achieve a good outcome for Australian industry.
  - maximise quality and quantity of work for Australia in Program
  - JSF Project differs from other Australian industry involvement
  - Whole of Government and industry approach; **joint effort between Defence and Department of Industry, Tourism & Resources**  
leverage off our R&D capability

A new way of Industry Participation in a major defence project.  
Ability to compete on „value for money“ basis for whole JSF Program



# Spectrum Of Roles



*Current Force Structure*

F/A-18

F/RF-111

F-35

*The NACC Project will provide systems for the full spectrum of roles*

**New Air Combat Capability**



# Australia and JSF

---

- World s largest defence project  
>US\$250bn
- Huge development budget  
>US\$ 45bn
- Australia s largest defence project  
A\$ 12bn for acqusition
  - Australia part of the development effort
  - All work must be won on a „best value basis



# The JSF Project and a Way Forward

---

- The JSF Project
  - Australia s involvement with JSF
  - What is the JSF?
  - JSF Capabilities
- Way Forward
  - Australian Industry Participation
  - Opportunities for inserting new technology
  - Suggested coordination approach

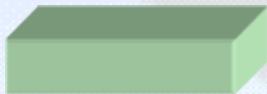


# JSF is a 5<sup>th</sup> Generation Fighter

**1**  
1945-1955



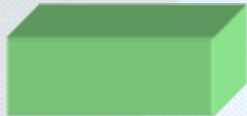
- 1<sup>st</sup> Jets
- Subsonic
- Guns
- Bombs
- Rockets



**2**  
1955-1960



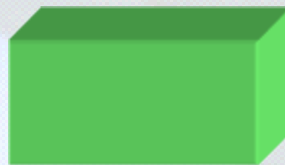
- Supersonic
- 1<sup>st</sup> Radar
- Missiles
- Guns



**3**  
1960-1970



- Multirole
- Supersonic
- Radar
- Missiles



**4**  
1970-2000



- Multirole
- Adv. Avionics
- Adv. Weapons
- Agility VS Speed

**5**  
2000- ?

- Stealth (LO)
- Fighter Performance
- Sustainable
- Deployable
- Info Fusion
- Info Sharing

Lethality, Supportability, and Affordability Advancements

***New Air Combat Capability***



# What is JSF?

## The next (5<sup>th</sup>) generation “family” of strike fighters

F-16/F/A-18C “like” aero performance

Stealth signature and advanced countermeasures

Advanced avionics, data links and adverse weather precision targeting

Increased range with internal fuel and weapons

Highly supportable, state of the art prognostics and health management



**Lethal    Survivable    Supportable    Affordable**

**New Air Combat Capability**

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.



# Key Performance Parameters

USMC/UK 

USN 

Joint 









KPP

USMC

USAF

USN

UK

 Radio Frequency Signature	Very Low Observable			
 Combat Radius	450 nm USMC Profile	590 nm USAF Profile	600 nm USN Profile	450 nm UK Profile
 Sortie Generation	4 Surg / 3 Sust	3 Surg / 2 Sust	3 Surg / 2 Sust	3 Surg / 2 Sust
 Logistics Footprint	< 8 C-17 equivalent loads (20 PAA)	< 8 C-17 equivalent loads (24 PAA)	< 46,000 cu ft 243 ST	< 21,000 cu ft 102 ST
 Mission Reliability	95%	93%	95%	95%
 Interoperability	Meet 100% of critical, top-level Information Exchange Requirements Secure Voice and Data			
 STOVL Mission Performance		N/A	N/A	
Short Take-Off Distance	550'			450' ski-jump
Vertical Lift Bring Back	2 x 1K JDAM, 2 x AIM-120 With Reserve Fuel			2 x 1K JDAM, 2 x AIM-120 With Reserve Fuel
 Maximum Approach Speed	N/A	N/A	145 knots	N/A

**New Air Combat Capability**

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.



# JSF Family Of Aircraft

One Program -- Three Variants

Conventional  
Take-Off and  
Landing  
(CTOL)

Carrier  
Variant  
(CV)

Larger Wing and  
Horizontal Tail Area

In-Flight Refueling  
Door (Boom)

Internal  
25mm 4-Barrel  
Gatling Gun

Strengthened  
Landing Gear  
and Tailhook

Wingfold and  
Ailerons Added

Centerline  
Gun Pod  
with 25mm Gun

Short Take-Off and  
Vertical Landing  
(STOVL)

3-Bearing  
Swivel Nozzle

Lift Fan

Roll Posts

All variants

- 1.6 Max Mach (Limit)
- 450-600 nm Range
- Stealthy
- Same Weapons
- Similar Avionics
- Similar Flight Envelope
- Same Basic Engines

**New Air Combat Capability**







# JSF Spiral Development Strategy

**Block 0.1 – Support First Flight / Flight Test Objectives**  
**Basic functions to Get the Aircraft Flying**

= **“Block 0”**

**Block 0.5 – Initial MS Architecture & Sensor Infrastructure**  
**Mission systems infrastructure Build supporting sensor and architecture development**

**Block 1 – Initial Warfighting Capability**

**Flight qualified, baseline air-to-air and air-to-ground weapons qualified. Pilot and maintenance training can commence.**

**Block 2 – Close Air Support and Interdiction**

**Qualifies additional air-to-air and air-to-ground weapons. Services can start planning deployments and staffing operational units.**

**Block 3 – Suppression of Enemy Air Defenses**

**Qualifies additional a/a & a/g weapons for use. Service Initial Operational Capabilities are achievable.**

**Spiral Development Process**

Supports 7 Flight Performance Aircraft

Initial MS Tactical Sensors Integration “Avionics FF(A3)”  
Initial Weapons Testing

Bulk of MS Hardware on Board

Primarily Software Updates with Added Weapons

**New Air Combat Capability**



# JSF Contractor Team

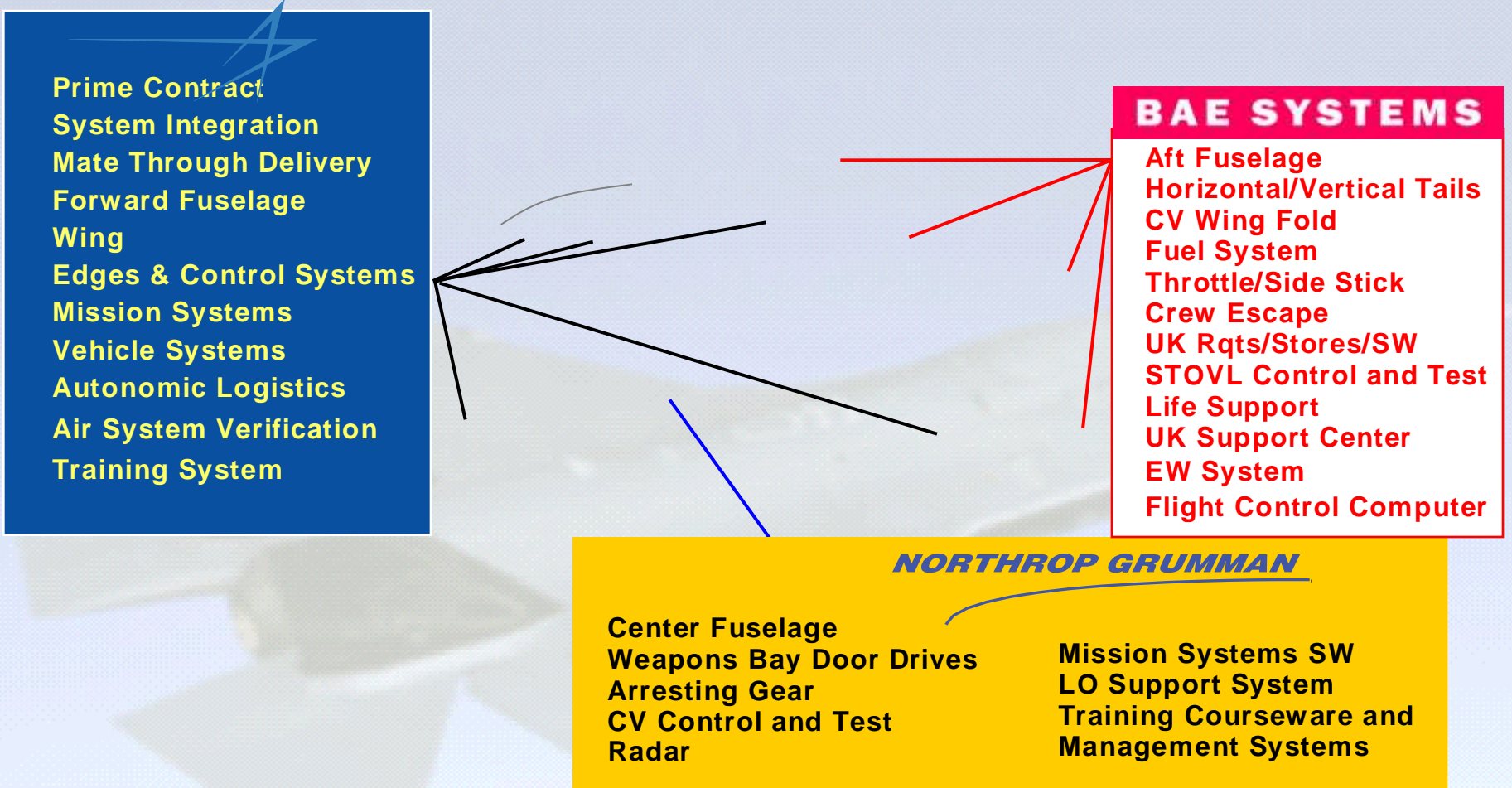


**New Air Combat Capability**

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.



# JSF Industry Team Primes



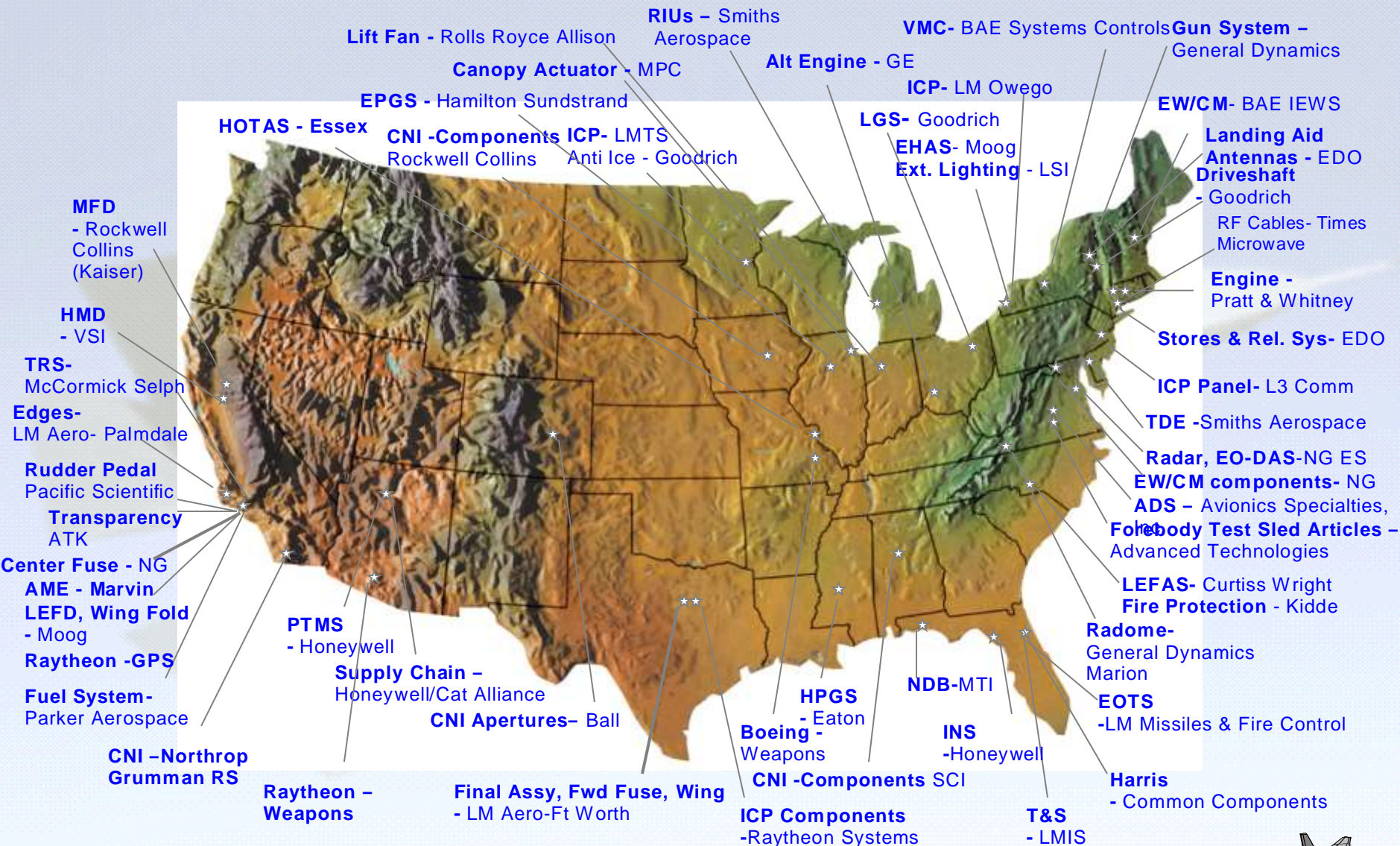
**An Integrated Team Harnessing the Strengths**

*of 3/4 of the Aerospace Industry in the*

**New Air Combat Capability**



# JSF Extended Team – U.S.



**New Air Combat Capability**



# JSF Extended Team–International

## United Kingdom

Smiths Aerospace  
 ARM  
 HB Modules  
 Pall Int'l  
 Honeywell/Normalair  
 Garrett LTD  
 Alpha Data  
 Ultra  
 RE Thompson  
 Dynex Semiconductors  
 Helmut Integrated Sys.

BAE SYSTEMS  
 Goodrich  
 Hamble Structures  
 AL Tech Services - BAE  
 BAE SYSTEMS  
 Martin Baker  
 Penney and Giles  
 Beaufort

## Denmark

Systematic Software Engineering  
 Terma  
 Maersk  
 Corena  
 IFAD  
 Printca/GPV

## Norway

Metronor  
 Techni  
 Nera  
 Kongsberg

## Canada

Noranco  
 Spartan Electronics  
 Aero Machining  
 Circuit World  
 Handling Specilities  
 Nova Crystals  
 Ontario Die  
 Herou Devtek  
 Chicopee  
 Canada Centra  
 ACT  
 Mindready  
 BNH  
 Virtek  
 Amphenol  
 APS  
 Howmet

## Turkey

Kalekalip  
 Ayesas  
 TAI

## The Netherlands

Perot Systems  
 Dutch Space  
 DPCC  
 JTAG  
 Gasmodule  
 Rexroth  
 Hydrazine  
 NLR  
 Dapo Design

FCS  
 ESSCO  
 DESSO  
 TNO  
 Bellast  
 Needham  
 Phillips  
 SP Aerospace  
 ATS  
 Kleizen, Hi Q  
 Wise A.S.  
 Fokker-Aerostructure  
 Thales

## Australia

Thales Simulation  
 BAE Australia  
 Micro  
 GKN  
 Production Parts

Calytrix  
 Ferra  
 Lovitt  
 Marand  
 Hawker de Havilland

~ 20 Oz Companies with contracts in SDD

**New Air Combat Capability**





# The JSF Project and a Way Forward

---

- The JSF Project
  - Australia s involvement with JSF
  - What is the JSF?
  - JSF Capabilities
- Way Forward
  - Australian Industry Participation
  - Opportunities for inserting new technology
  - Suggested coordination approach

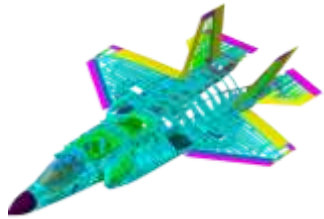




# JSF Air System



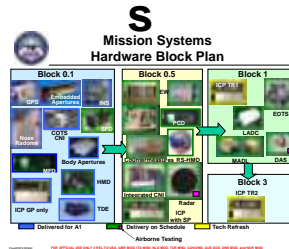
**Air Vehicle**



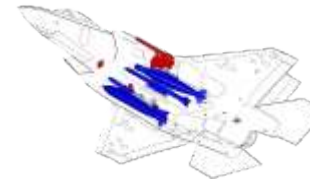
**Propulsion**



**Mission System**



**Weapons**



**Logistics**



**Highly Common Software**

**New Air Combat Capability**

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.



# Air Vehicle Design Complexity

Non-Stealth

## Legacy

### External:

- Fuel
- Weapons
- EOTS
- Countermeasures
- ECM Electronics
- Tailhook

## Resultant Issues

- Weight
- Drag
- Airframe Space
- Design iteration

Stealth

## F-35

### Internal:

- Fuel
- Weapons
- EOTS
- Countermeasures
- ECM Electronics
- Tailhook



- Distributed Aperture System
- Integrated ECM Apertures
- Signature Integration
- Integrated Subsystems

*New Air Combat Capability*



# The F-35 Air Vehicle Highlights

## Low-Sweep Wing/Tail Configuration

- Good Cruise and Maneuver Characteristics
- Good Handling Qualities W/Wo External Stores

## Revolutionary Shaft-Driven Lift Fan (STOVL)

- Vertical Thrust Multiplier
- Structurally-Integrated nozzle

## Fighter-Optimized Engine Cycle

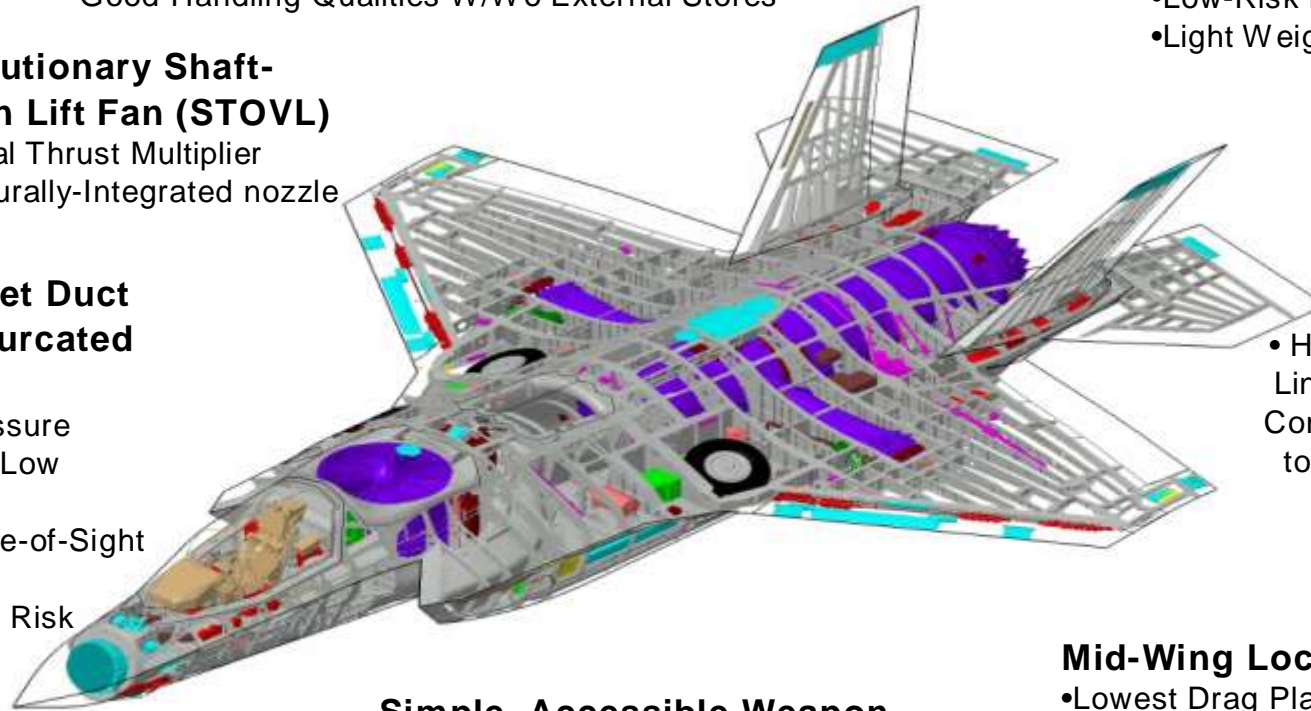
- Low-Risk F119/F120 Derivative Engine
- Light Weight Axisymmetric Nozzles

## Long Inlet Duct With Bifurcated Inlet

- High Pressure Recovery/Low Distortion
- 100% Line-of-Sight Blockage
- Low FOD Risk

## Electro-Hydrostatic Actuators

- Hydraulically Self Contained Linear Output Actuators That Convert Electrical Input Power to Hydro-Mechanical Power



## Simple, Accessible Weapon Bay and Carriage

- Lowest Weight
- Fastest Ejection Time Lines
- Pneumatic Ejectors Improve Safety and Logistics










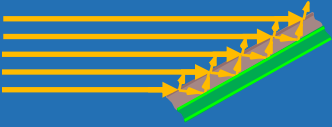





## Mid-Wing Location

- Lowest Drag Placement for Shaped Fuselage
- Reduces Wing-Mounted Gear Length
- Good Height for External Stores Loading

***New Air Combat Capability***



# Methods for Reducing Radar Signature

Impact	Issue	Technique	Designed for Stealth	Enhanced 4 <sup>th</sup> Gen
1	Shape	 <p>PLANFORM ALIGNMENT REFLECTS RADAR ENERGY AWAY FROM RADAR</p>		
2	External Stores	 <p>INTERNAL STORES</p>		
3	Inlets	 <p>RADAR ABSORBING STRUCTURE (RAS) LINE-OF-SIGHT BLOCKAGE</p>		
4	Apertures	 <p>RADAR ABSORBANT MATERIAL (RAM) ABSORBS RADAR ENERGY</p>		
5	Edges	 <p>RAS / RAM</p>		



**Applicable**



**Somewhat Applicable**



**Not Applicable**

**Only Aircraft Which are "Designed for Stealth"  
Can Achieve Desired Results**

**New Air Combat Capability**

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

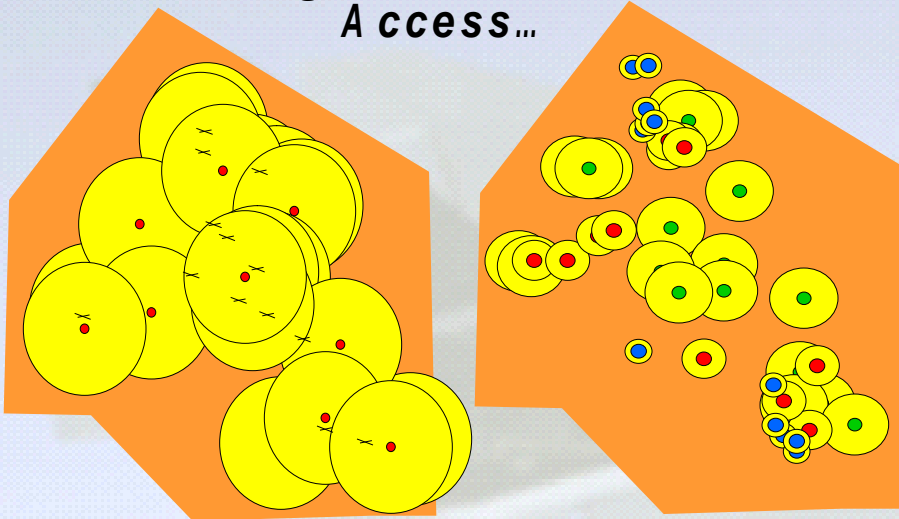


# STEALTH - SURVIVABLE & LETHAL

**JSF--Built from the Ground-up to be Low Observable**

- **Internal Carriage of Weapons & Mission Fuel**

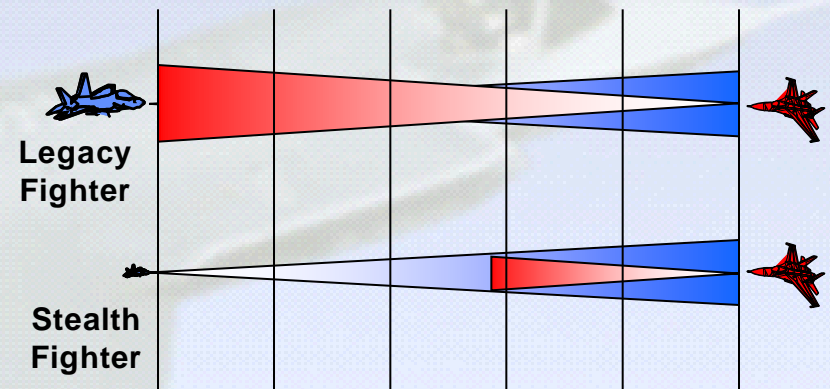
**JSF Brings Survivable Theater Access...**



Legacy TACAIR

Stealthy TACAIR

**... but, Stealth isn't just about Survivability**



Inherent Air-to-Air Capability

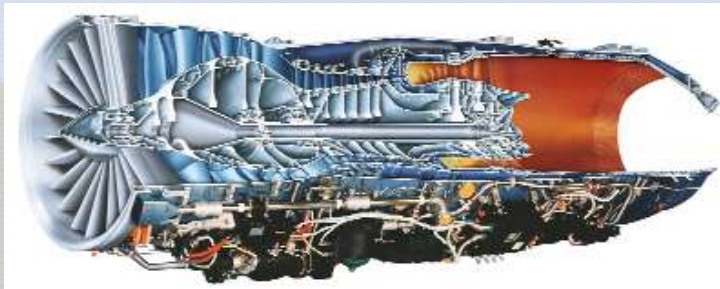
**LO Combined with Advanced Weapons and Avionics Provides Enhanced Lethality**

**New Air Combat Capability**



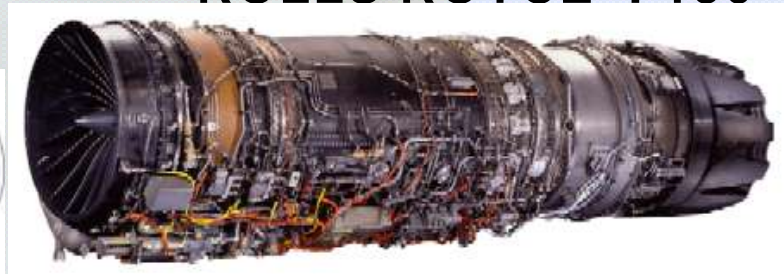
# JSF Engine Interchangeability

- **Physically** and **Functionally** Interchangeable
- Any Aircraft Able to Use Any Engine
- Common JSF Autonomic Logistics System Interfaces



PRATT & WHITNEY F135

GE AIRCRAFT ENGINES/  
ROLLS ROYCE F136



***JSF Engines - - Common Core for Aircraft Variants,  
Competition in Production***



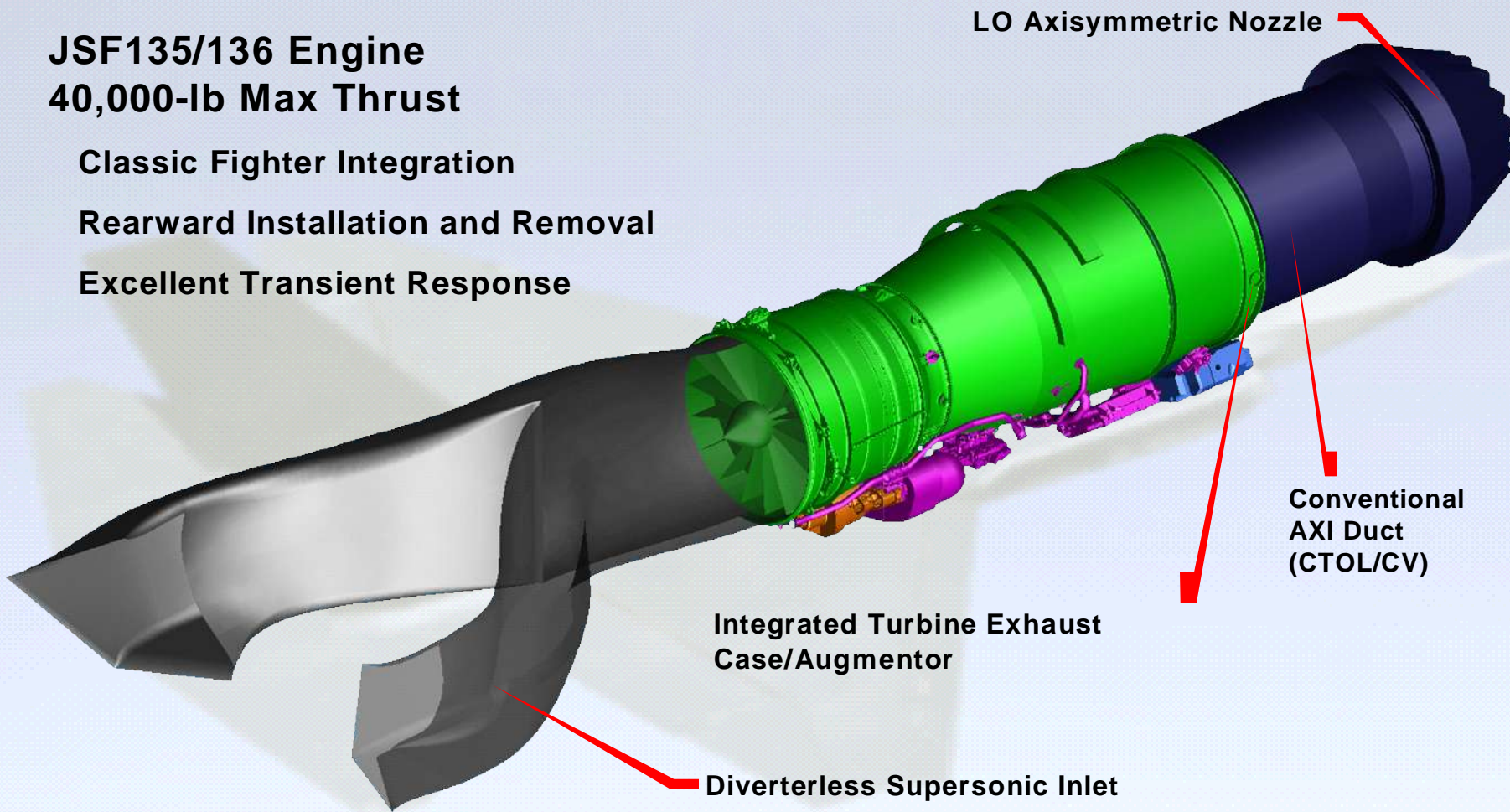
# JSF CTOL/CV Propulsion

**JSF135/136 Engine**  
**40,000-lb Max Thrust**

**Classic Fighter Integration**

**Rearward Installation and Removal**

**Excellent Transient Response**



LO Axisymmetric Nozzle

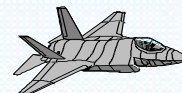
Conventional  
AXI Duct  
(CTOL/CV)

Integrated Turbine Exhaust  
Case/Augmentor

Diverterless Supersonic Inlet

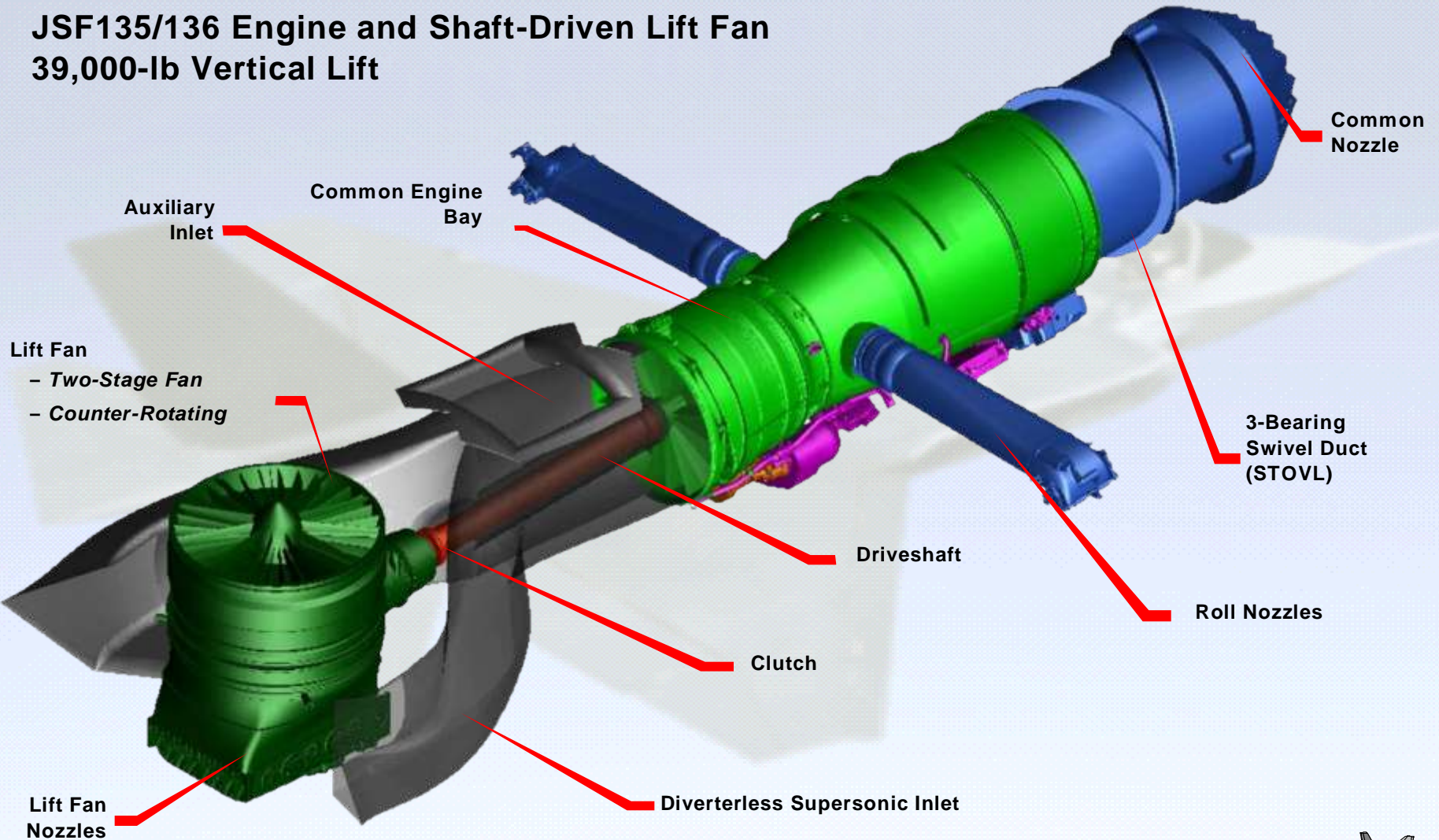
***New Air Combat Capability***

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.



# JSF STOVL Propulsion

## JSF135/136 Engine and Shaft-Driven Lift Fan 39,000-lb Vertical Lift

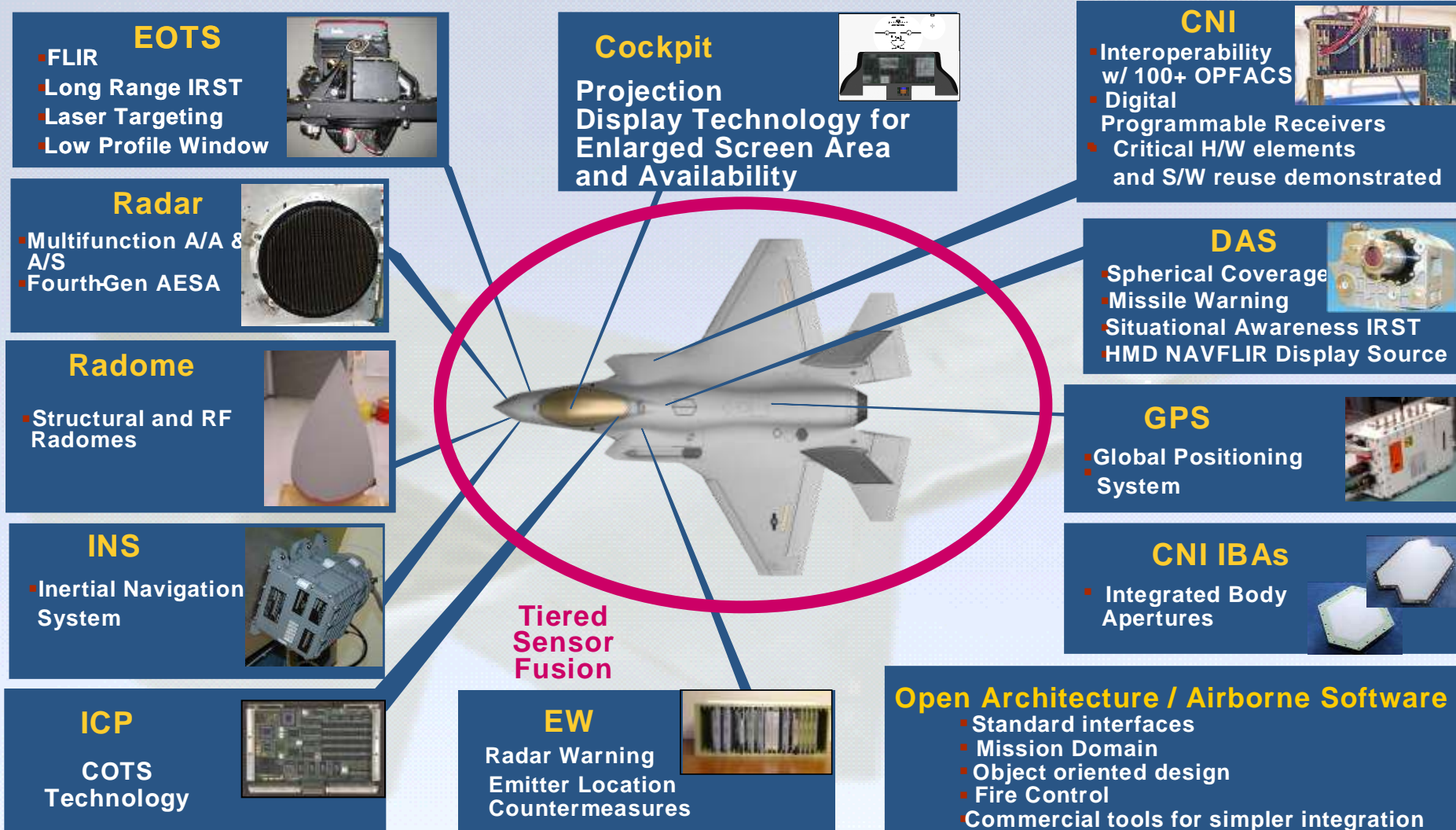


***New Air Combat Capability***





# JSF Mission Systems



**New Air Combat Capability**



# Integrated Avionics

Full Spherical Coverage by RWR & Distributed Aperture System (DAS)

360° Coverage

Electro-Optical Targeting System (EOTS)

Active Electronically Scanned Array (AESA)

RADAR

Electronic Support Measures

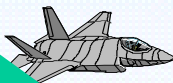
Emitter Locating  
IFF Interrogate

All Aspect Stealth - Low Observable

RWR\_Antennae

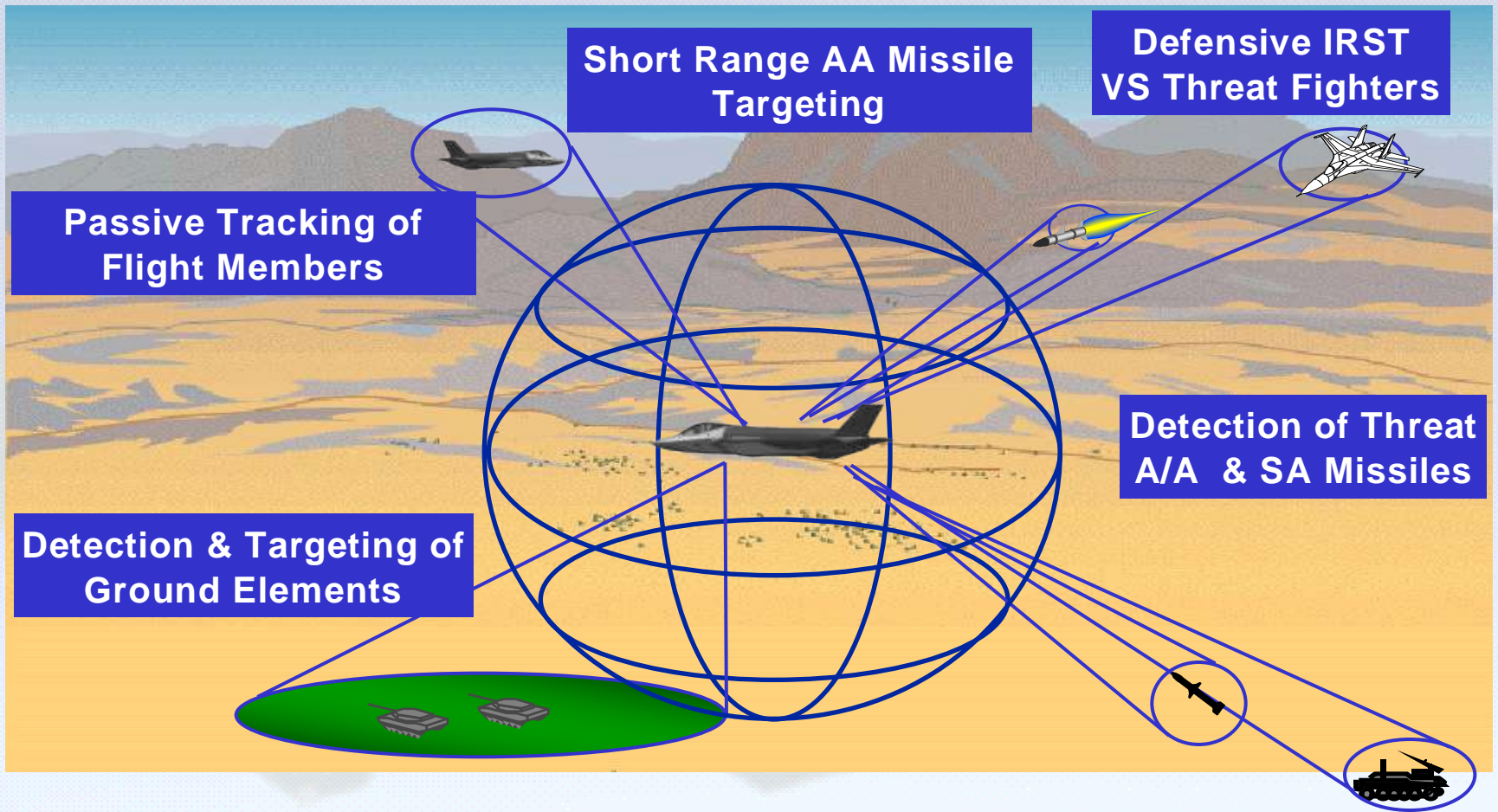
DAS Apertures

Network Connectivity  
SATCOM  
Link 16  
Data Links  
SINGARS  
Have Quick  
MADL



# Distributed Aperture System (DAS)

## Full Spherical Coverage



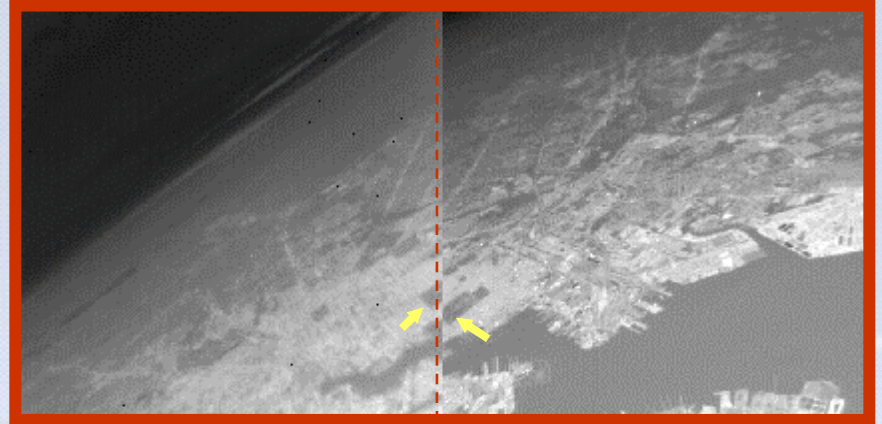
***New Air Combat Capability***

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.



# EO Distributed Apertures

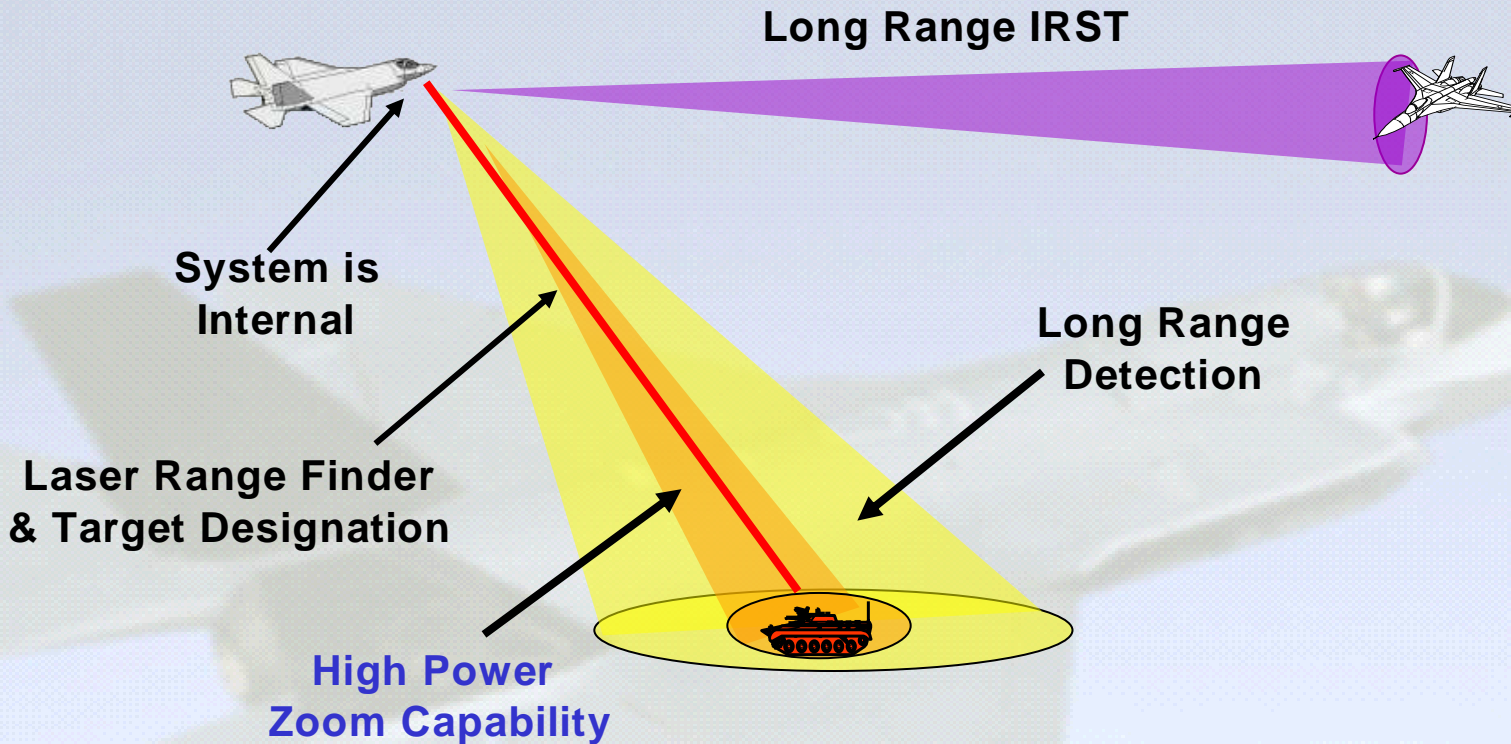
*JSF generates 6 continuous images...*



*... seamlessly stitched together for full 360 degree imaging capability!*



# Electro-Optical Targeting System (EOTS) & Infrared Search & Track (IRST)



**EOTS Provides Day & Night Passive, Classification, Identification, and Targeting Against Stationary and Moving Ground Targets in Visual Meteorological Conditions (VMC)**

IRST Provides offensive/defensive passive detection of air-to-air targets

***New Air Combat Capability***

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.



# EO Targeting System (EOTS)

---



**EO  
Targeting  
System**

- Internally Mounted
- Long Range,  
High Resolution
- NAVFLIR, Targeting  
FLIR,IRST Functions
- Digital Continuous Zoom



***New Air Combat Capability***

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.



# The JSF Radar Provides Multiple Interleaved Functions

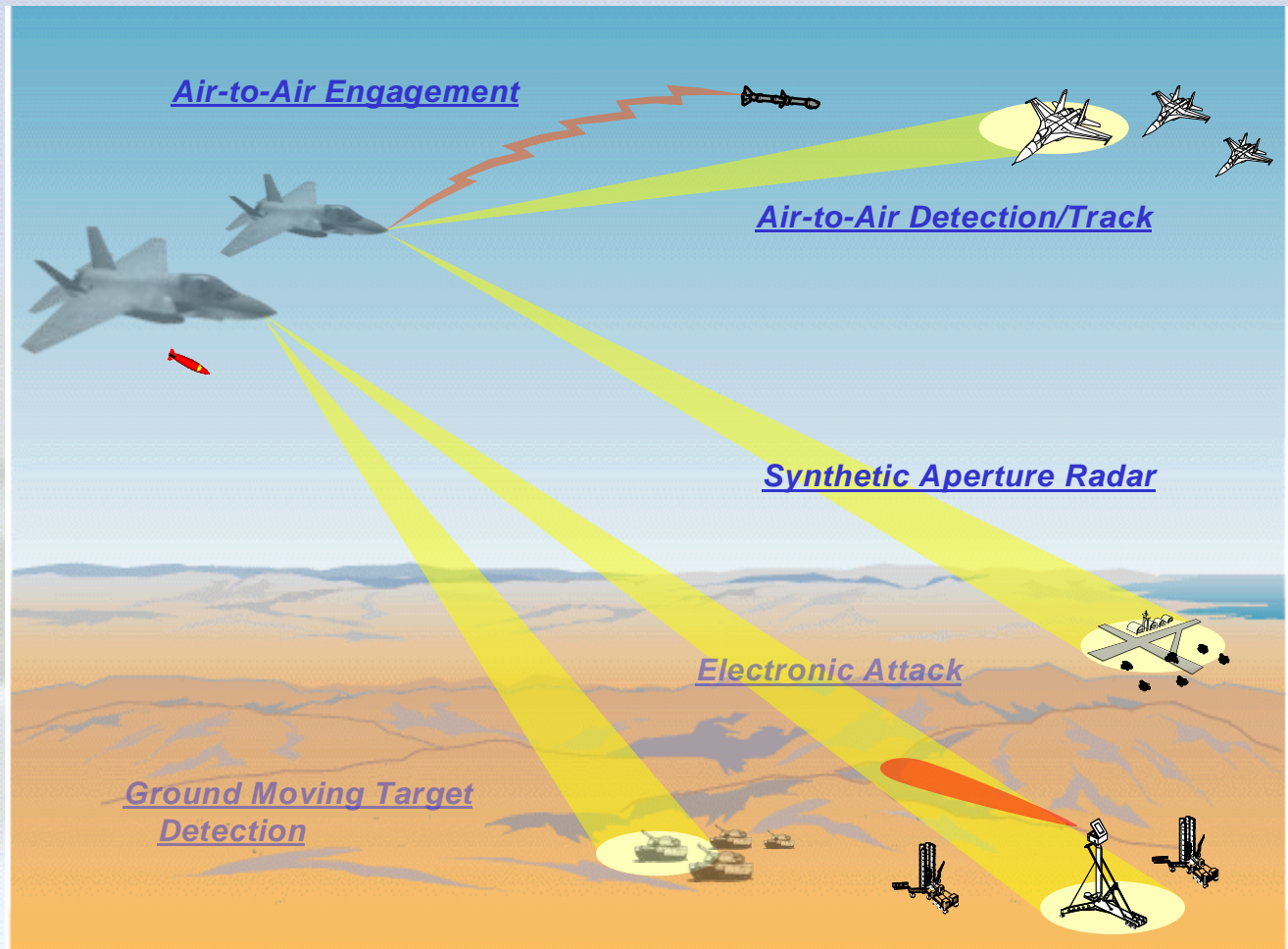
Autonomous Surface Target  
Detection and Engagement  
(Land and Sea)

Electronic Protection

High Gain ESM

Electronic Attack

Weather Detection

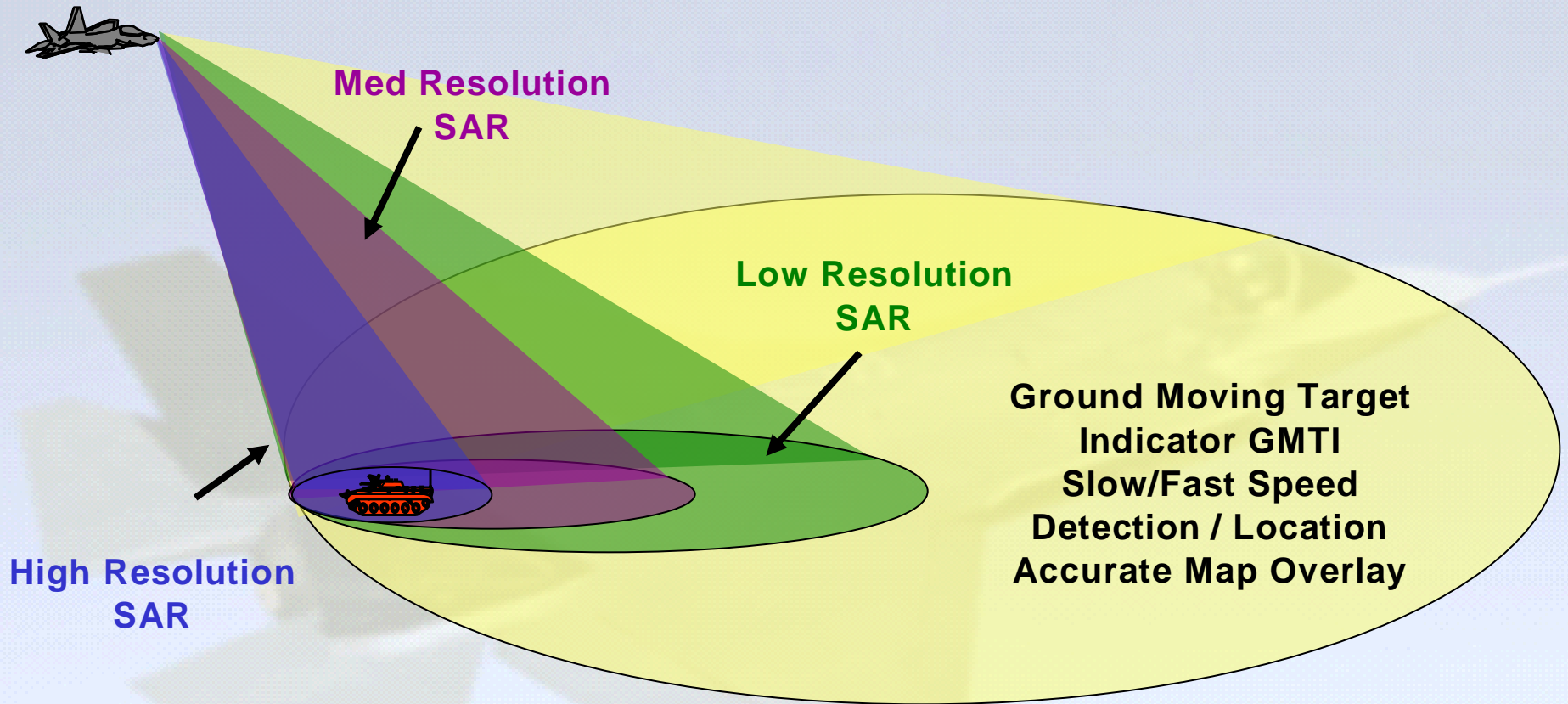


**New Air Combat Capability**

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.



# AESA Radar AIR-TO-GROUND



**Provides Day & Night Adverse WX, Multi-Mission, Long Range Target Detection and Classification Capability, and Near Precision Self-Targeting Capability With Standard JDAM**

***New Air Combat Capability***

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.





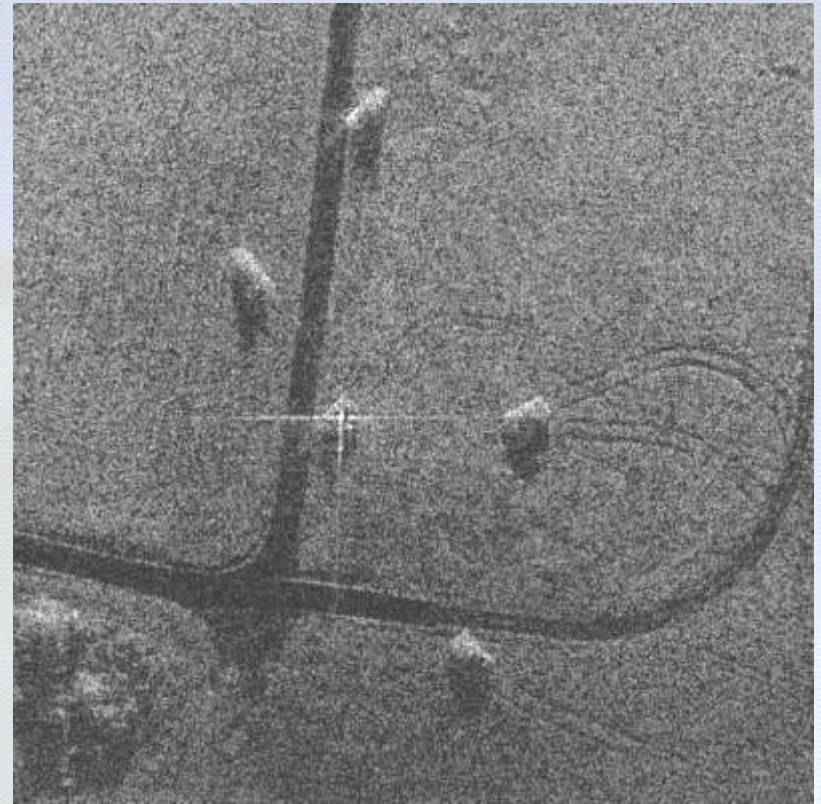
# SAR Capability

---

## Legacy Capability



## JSF Capability



---

## ***New Air Combat Capability***

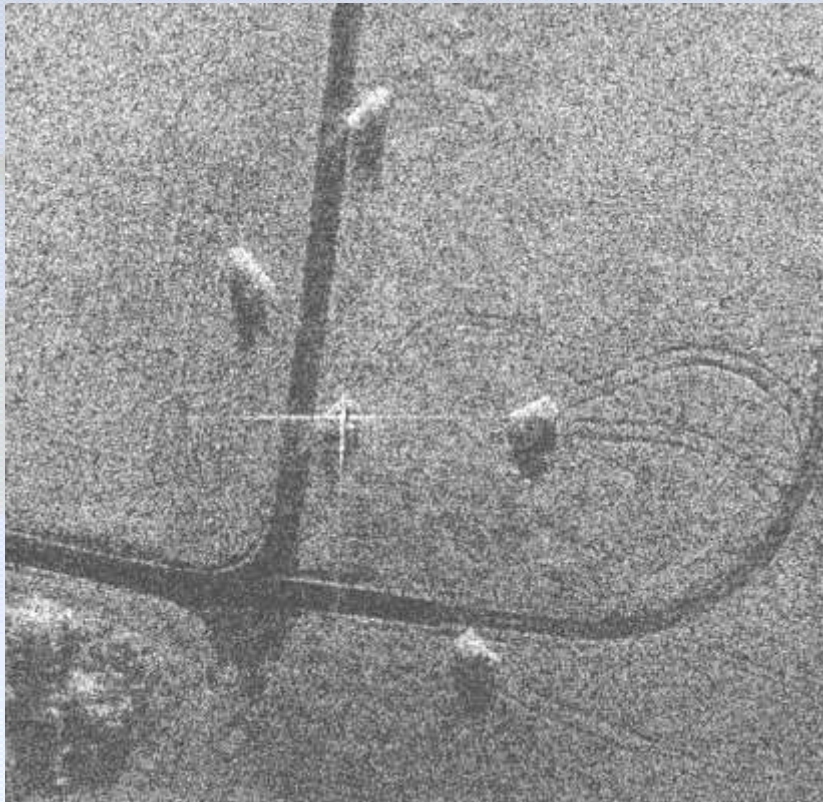
DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.  
DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.



# Target Images

---

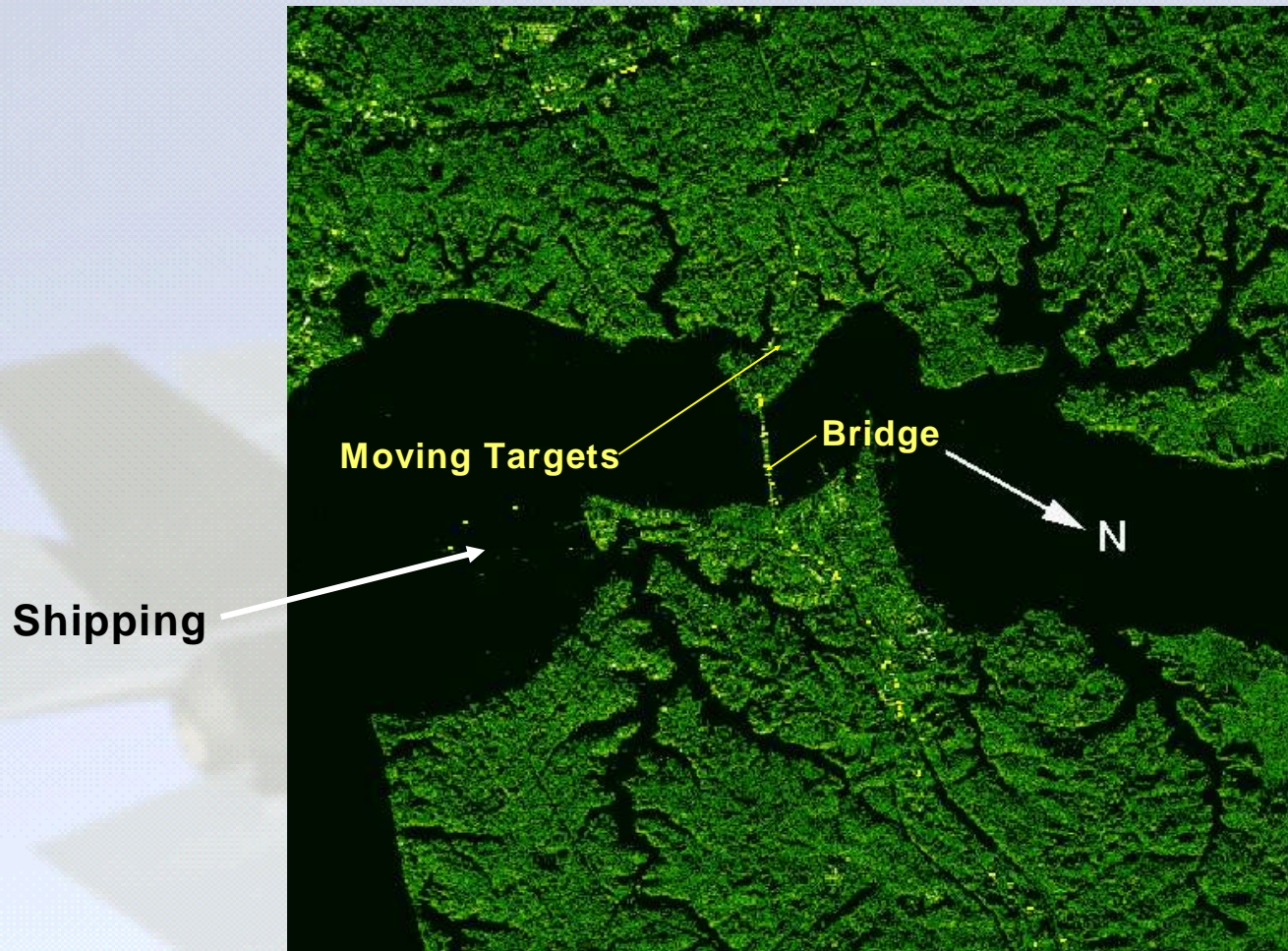
**SAR map**



**TFLIR image**



# PRECISE ALIGNMENT OF GMTI TARGETS ON SAR MAP



**GMTI Superimposed on SAR Map for Target Context  
Capable at Stand Off Ranges**



# Electronic Warfare/Countermeasures Functionality Overview

## Radar Warning (RW)

- w Analysis, ID, Tracking, Mode Determination, & AOA of Mainbeam Emissions
- w Rapid Response Time
- w Monopulse High Quality DF
- w Band 2 thru Band 4 (w/growth to Band 5)

## Situational Awareness and Offensive Targeting Support

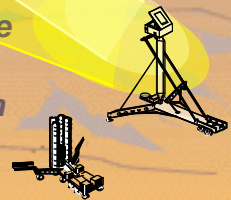
- w Acquisition and Tracking of Mainbeam & Sidelobe Emissions
- w Precision Emitter Geolocation & Range
- w Emitter Identification & Precise Signal Measurement Parameters

## Self Protect

- w IR Countermeasures (IRCM)
- w RF Countermeasures (RFCM)

## High Gain (Sensitivity) Electronic Support Measures

- w Wideband Search, Acquisition, ID, & AOA of Mainbeam & Sidelobe Emissions - High Gain ESM
- w Utilizes Wideband EW Receivers (EWRs) With Radar Multifunction Array (MFA)
- w MFA Field-of-View and Passive Frequency Coverage
- w High Gain ECM



UNCLASSIFIED

**New Air Combat Capability**

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.



# CNI Functional Overview

## Audio Functions

- ✧ Voice Messaging
- ✧ Voice Recognition
- ✧ Air Refuel Intercom (CTOL)
- ✧ Maintenance Intercom
- ✧ 3-D Audio
- ✧ Voice Synthesis

## Voice Communications

- ✧ VHF
- ✧ UHF
- ✧ SATCOM
- ✧ Survival Radio Comm

## Identification

- ✧ IFF
- ✧ IFF interrogate

## Data

## Communications

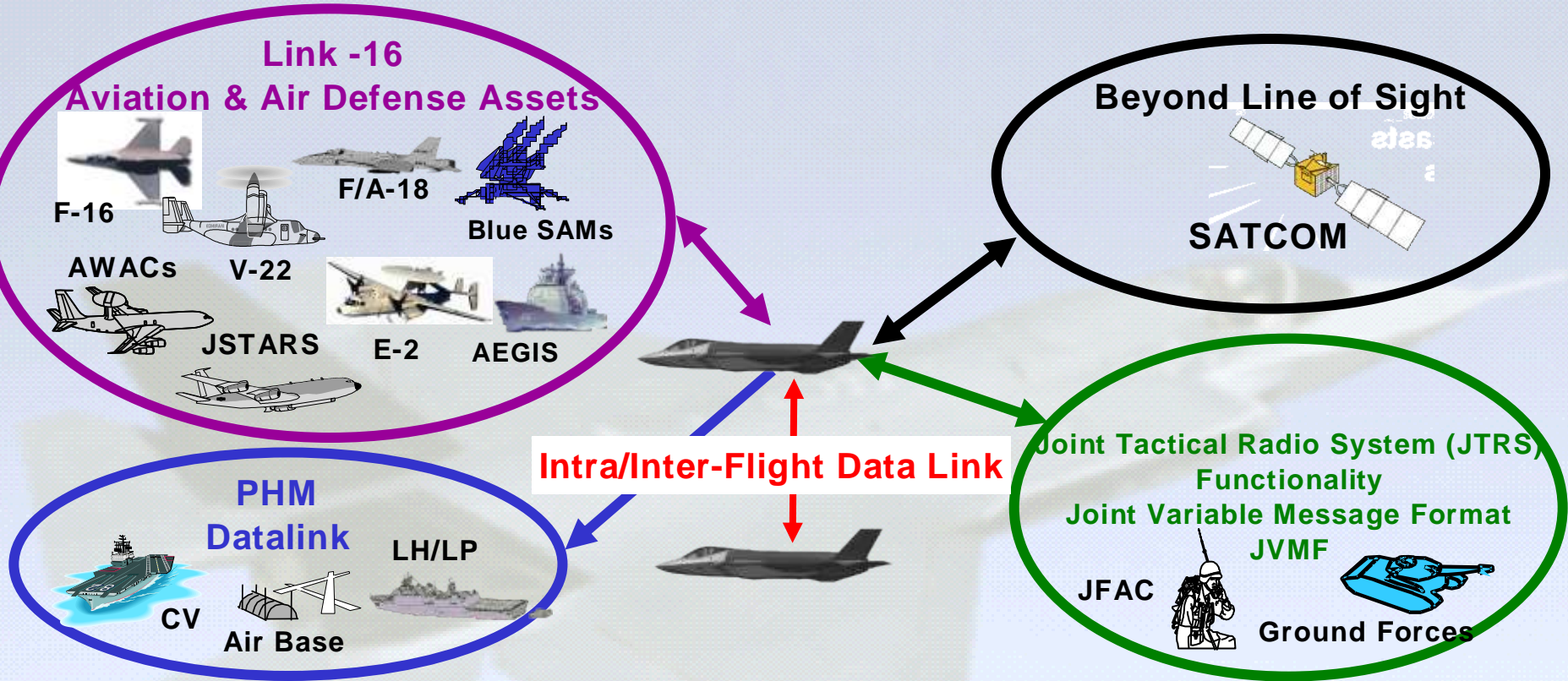
- ✧ Link 16

## Navigation/ Landing Aids

- ✧ INS
- ✧ GPS
- ✧ Radar Altimeter
- ✧ ILS
- ✧ TACAN
- ✧ JPALS\*



# Voice and Datalinks Interoperability



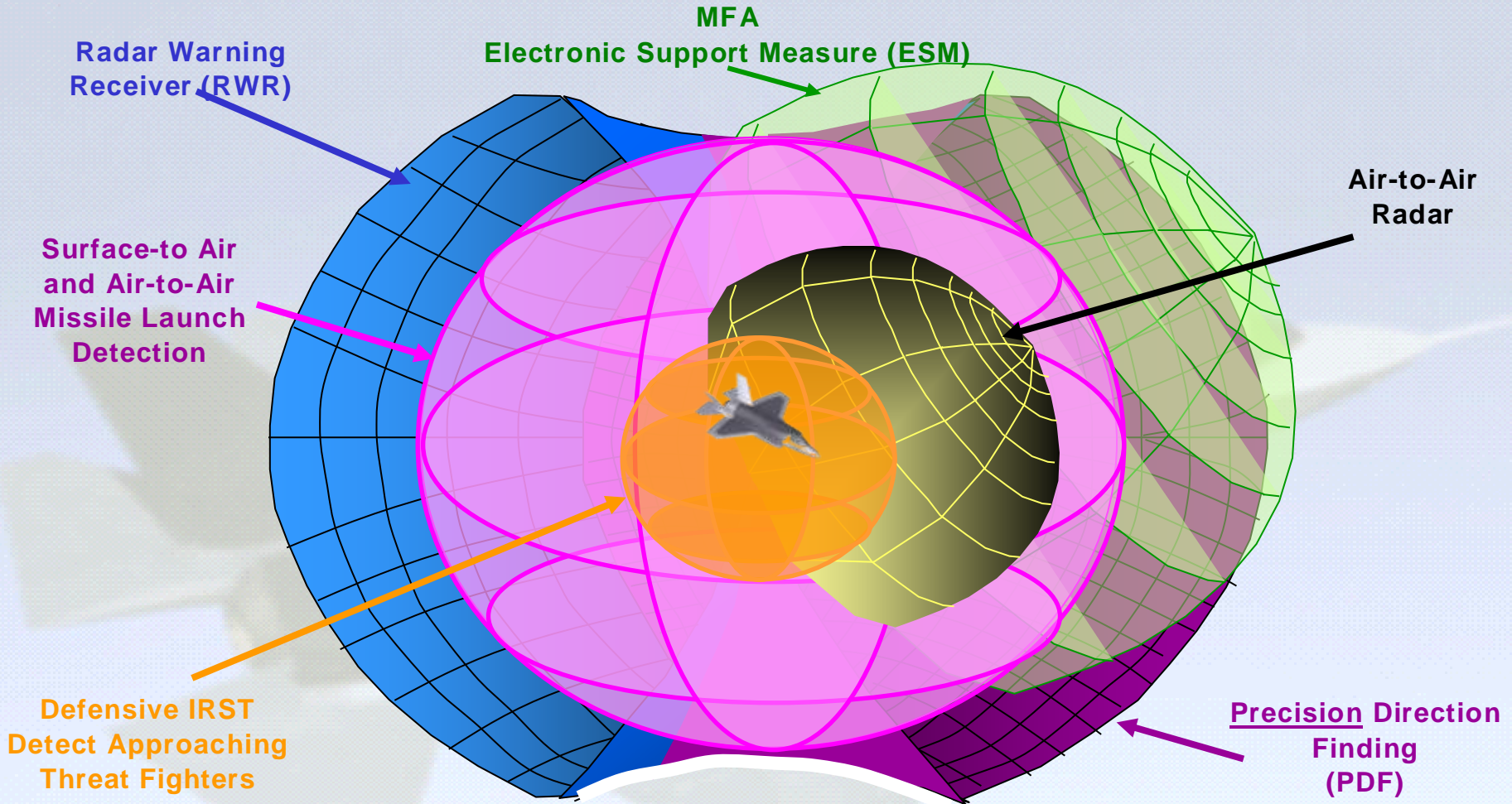
**Over 120 Information Exchange Requirements to Ensure Interoperability Across US and Coalition Forces**

**New Air Combat Capability**

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.  
DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.



# Integrated Sensor Suite Fused Situational Awareness



Unprecedented Multi-Spectral Offensive & Defensive Situational Awareness  
**Information vice Data**

***New Air Combat Capability***

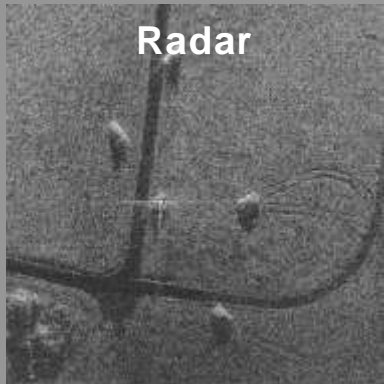
DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.



# Information Fusion Enhances Situational Awareness

## Multi-Spectral Sensors

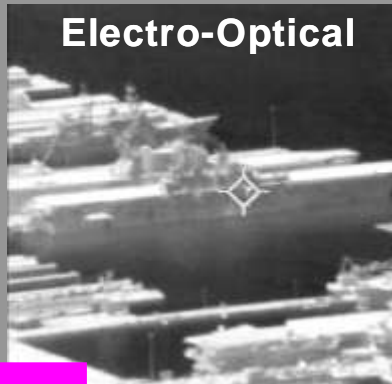
Radar



Ground Moving Target



Electro-Optical



Missile Warning



Fused Tactical Information Managed & Displayed To The Pilot



**New Air Combat Capability**

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.







# Weapons Bay



***New Air Combat Capability***

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.



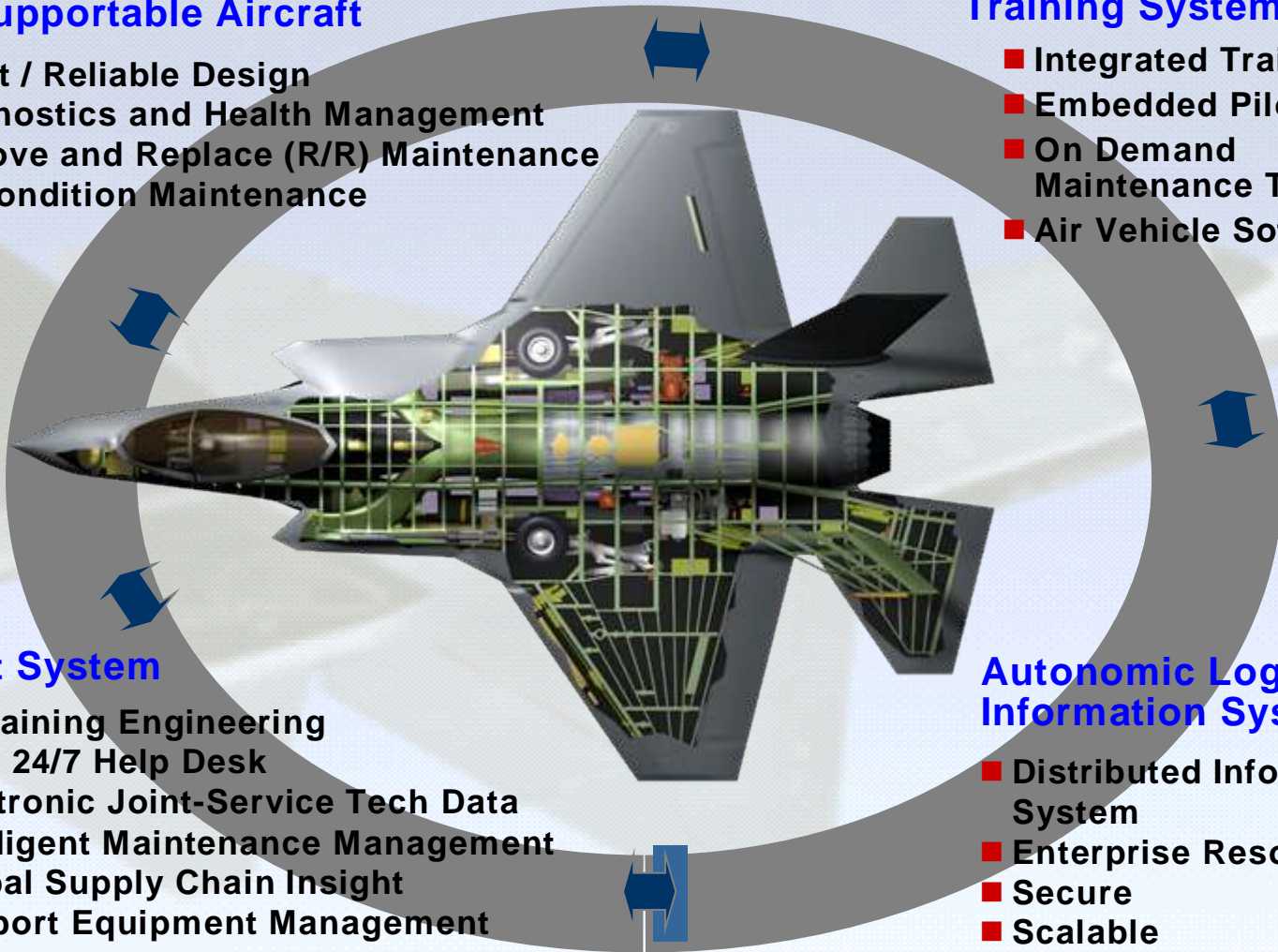
# JSF Autonomic Logistics System

## Highly Supportable Aircraft

- Smart / Reliable Design
- Prognostics and Health Management
- Remove and Replace (R/R) Maintenance
- On Condition Maintenance

## Training System

- Integrated Training
- Embedded Pilot Training
- On Demand Maintenance Training
- Air Vehicle Software Reuse



## Support System

- Sustaining Engineering
  - 24/7 Help Desk
- Electronic Joint-Service Tech Data
- Intelligent Maintenance Management
- Global Supply Chain Insight
- Support Equipment Management

## Autonomic Logistics Information System

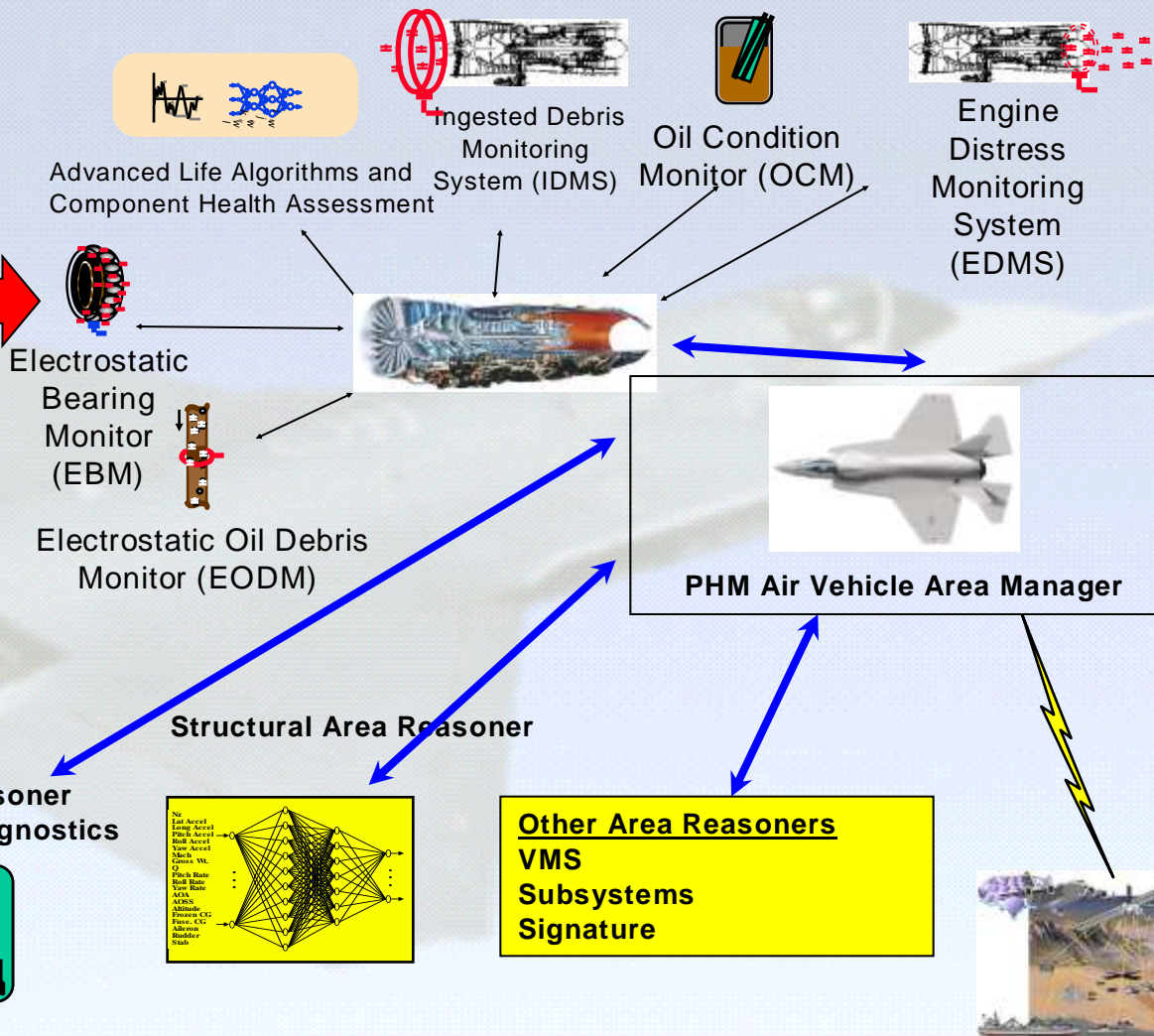
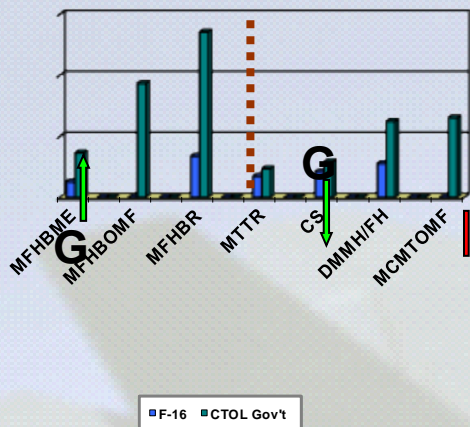
- Distributed Information System
- Enterprise Resource Solution
- Secure
- Scalable
- Deployable

## New Air Combat Capability



# Highly Reliable Aircraft Using PHM

## Reliability Reconciliation Process



**New Air Combat Capability**



# LOGISTICS COST DRIVERS

## Maintenance Costs

- Reliability & maintainability

## Mission Personnel

- Sortie generation rate, personnel infrastructure & training

## Unit Level Consumption

- Fuel consumption, depot level repairables, training munitions

## Sustaining Support

- Sustaining engineering, software maintenance

## Indirect Support

- Base operations



**INNOVATE - DRIVE DOWN COSTS**

**New Air Combat Capability**



# The JSF Project and a Way Forward

---

- The JSF Project
  - Australia s involvement with JSF
  - What is the JSF?
  - JSF Capabilities
- Way Forward to Focus Research
  - Australian Industry Participation
  - Opportunities for inserting new technology
  - Suggested coordination approach



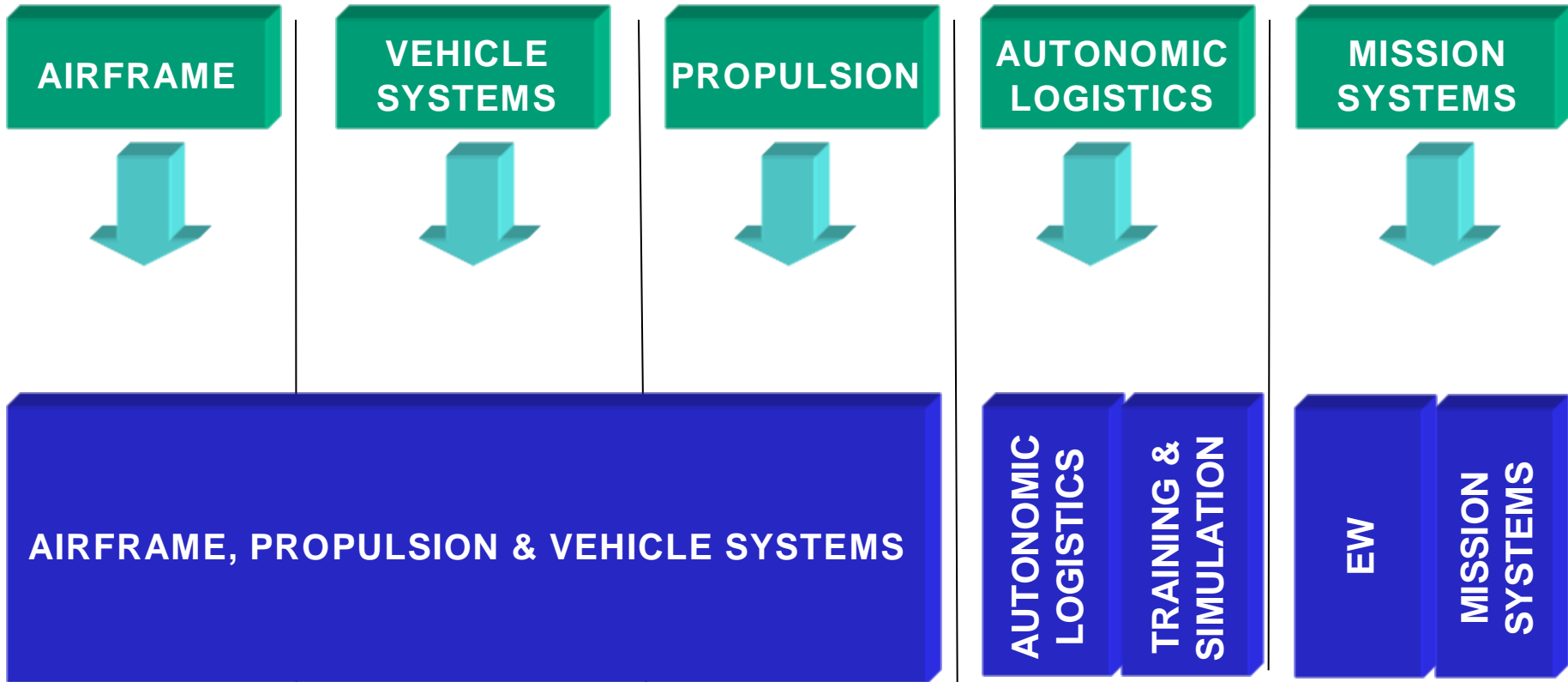
# The JSF Project and a Way Forward

---

- The JSF Project
  - Australia s involvement with JSF
  - What is the JSF?
  - JSF Capabilities
- Way Forward to Focus Research
  - Australian Industry Participation
  - Opportunities for inserting new technology
  - Suggested coordination approach



# LOCKHEED MARTIN & PARTNERS

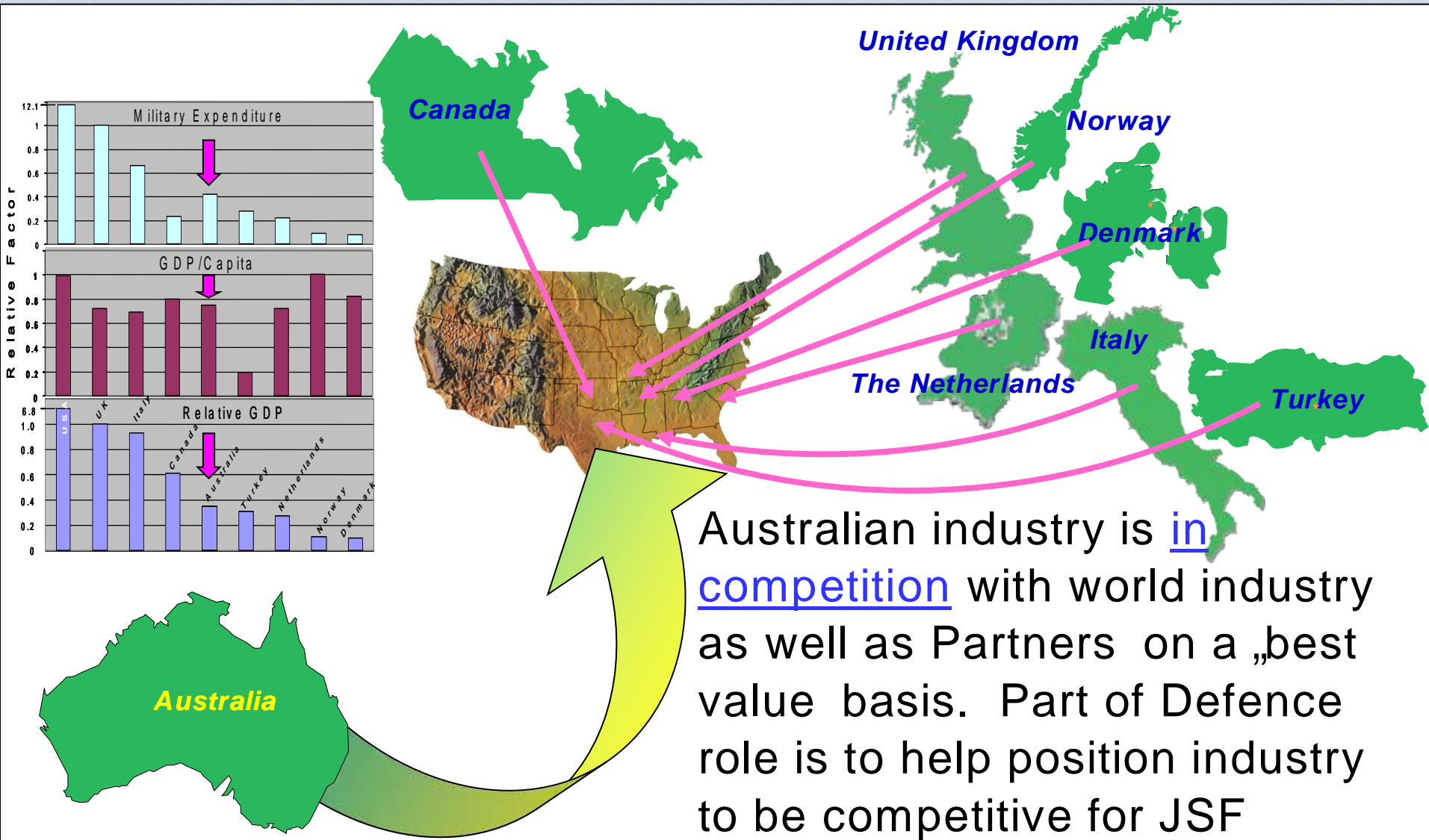


**AUSTRALIAN INDUSTRY (Industry Capability Teams)**

~ 130 Australian Companies



# Positioning Australian Industry

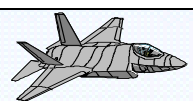
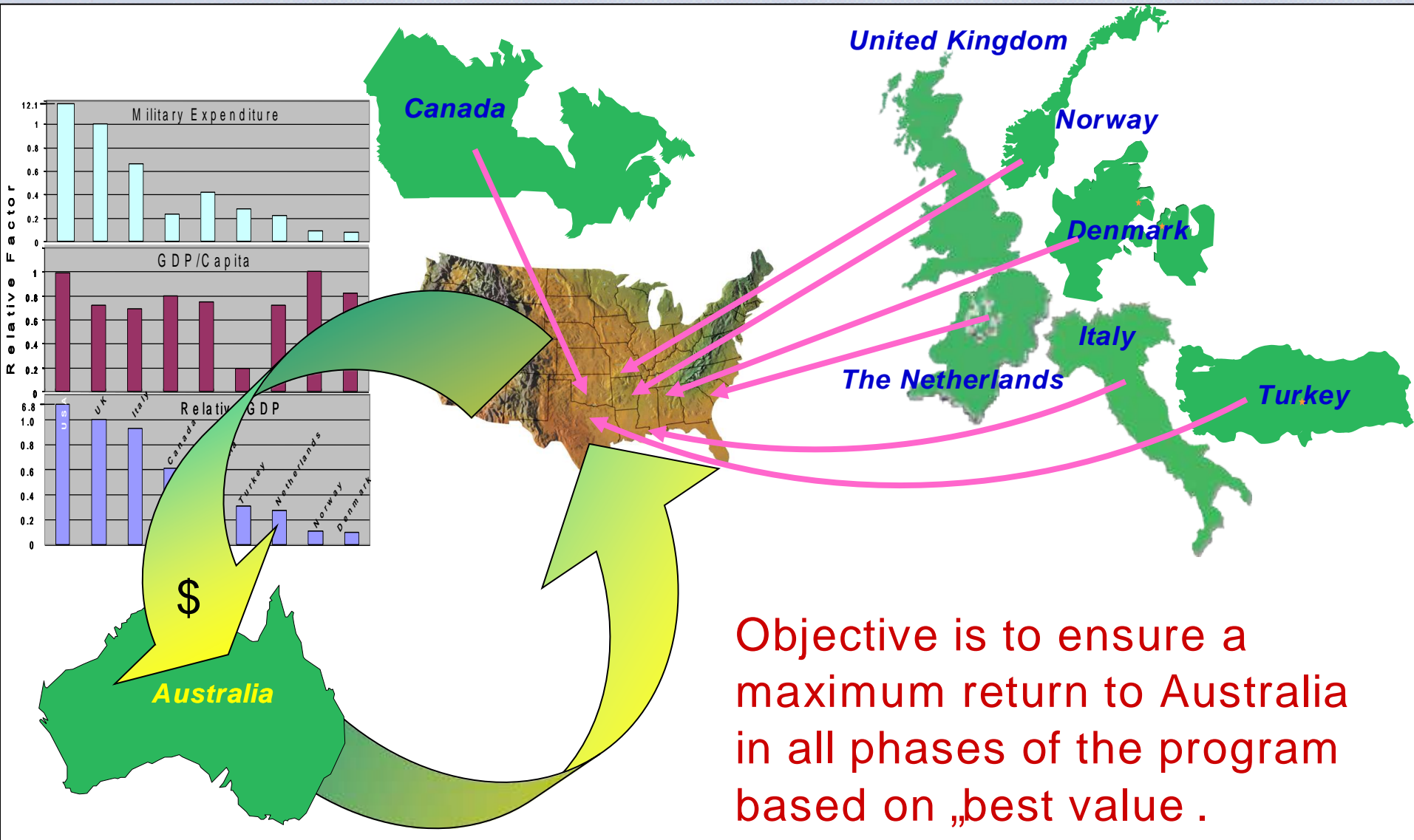


Australian industry is in competition with world industry as well as Partners on a „best value basis. Part of Defence role is to help position industry to be competitive for JSF contracts

**New Air Combat Capability**



# Positioning Australian Industry



# What has Australian Industry Achieved?

---

- ~ 20 companies have won work in SDD to date.
  - Equates to ~ US\$90m in contracts in SDD
  - Subject to „best value“ potentially equates to
    - ~ US\$170m in LRIP
    - ~ US\$800m in FRP
  - over **US\$1 Billion** in expected „export value

**But it is up to Australia to create its own future opportunities in bringing technology to the JSF**



# The JSF Project and a Way Forward

---

- The JSF Project
  - Australia s involvement with JSF
  - What is the JSF
  - JSF Capabilities
- Way Forward to Focus Research
  - Australian Industry Participation
  - Opportunities for inserting new technology
  - Suggested coordination approach



# Opportunities for Technology Innovation

---

Throughout the life of the JSF Aircraft, it will be subject to:

- **Technology Refresh**

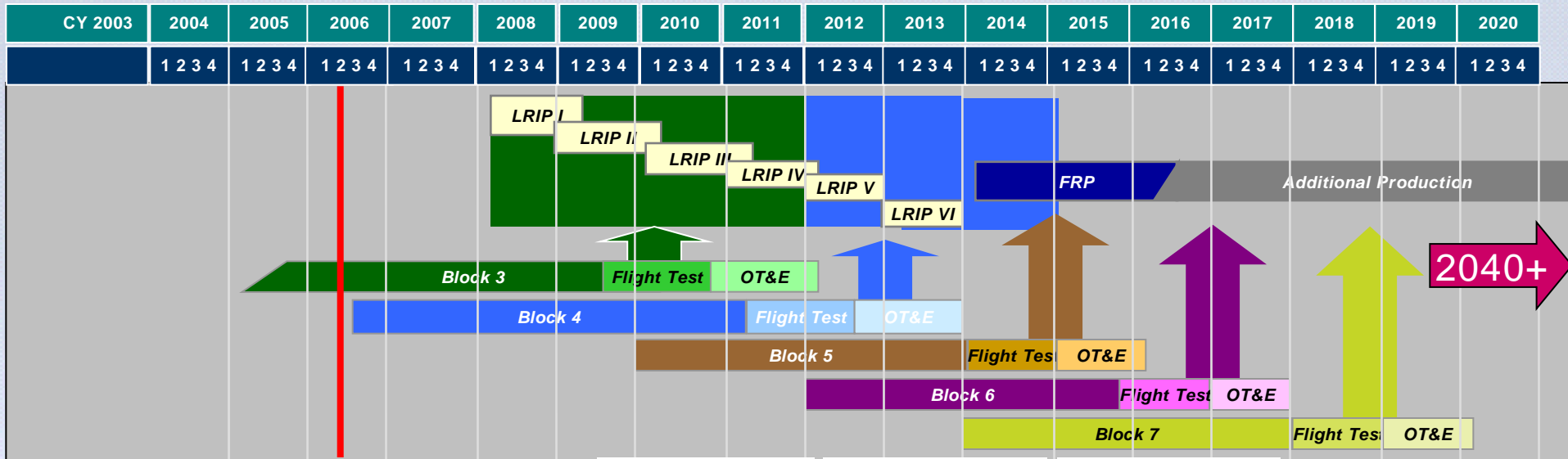
- Development and improvement of existing systems and processes
- Production Development
- Improvements to sustainment

- **Follow-on Development**

- Development and insertion of new capabilities as part of a Block Upgrade process



# Follow-On Development



2040+

- Block 3 Baseline**
- AESA Radar
    - ✓ Air-to-Air
    - ✓ SAR/ GMTI
  - Electronic Warfare
    - ✓ ESM and RWR
  - EO Targeting System
    - ✓IRST
    - ✓ Targeting FLIR
    - ✓ Laser Spot Tracker
  - Distributed Aperture System
    - ✓ Missile Warning
    - ✓ Situational Awareness
  - Com, Nav, ID
    - ✓ UHF/VHF
    - ✓ Link-16, MADL
    - ✓ GPS, INS, ILS, TACAN
    - ✓ IFF I/T (1, 2, 3/A, C, 4)
    - ✓ IFF Mode S Transponder
  - Advanced Cockpit
    - ✓ Color, Flat Panel Displays
    - ✓ Helmet-Mounted Display

- Block 4 TBD**
- A/A & Strike
    - ✓ GMTI/WAS
    - ✓ GMTC
    - ✓ Ground Map
    - ✓ RAID
    - ✓ IFF Mode S I/T
    - ✓ IFF Mode S Interrogate
    - ✓ Weapon Datalink
    - ✓ SDB Phase II/III
    - ✓ JASSM, AGM-130, NSM
  - EA / Survivability
    - ✓ Bands 2 & 5 RWR
    - ✓ TADIRCM (pod)
  - D/T/O/T Corrections
    - ✓ SDD Deferrals
    - ✓ SDD Corrections
  - Infrastructure
    - ✓ Hi-Temp Power Electronics

- Block 5 TBD**
- A/A & Strike
    - ✓ Multi-Platform Battle Management (A/S)
    - ✓ 2-Color DAS
    - ✓ LOCAAS
    - ✓ AARGM
  - EA / Survivability
    - ✓ Incr. Hi-Band EA FOV
    - ✓ Counter DRFM
    - ✓ Active, Internal IRCM
  - ISR
    - ✓ Higher Resolution SAR
    - ✓ Incr. Sensitivity ESM
    - ✓ Wideband SATCOM
  - Infrastructure
    - ✓ 10 GB/s Fibre Channel
    - ✓ Increased ECS Capacity

- Block 6 TBD**
- A/A & Strike
    - ✓ Multi-Platform Attack Management (A/A)
    - ✓ Advanced Combat ID
    - ✓ Internal Precision Penetrating Weapon
  - EA / Survivability
    - ✓ Improved EA
    - ✓ Laser Warning
  - ISR
    - ✓ Common LO Datalink
    - ✓ Wideband A/G Datalink
    - ✓ Net Ready
  - Infrastructure
    - ✓ Expanded Mass Storage

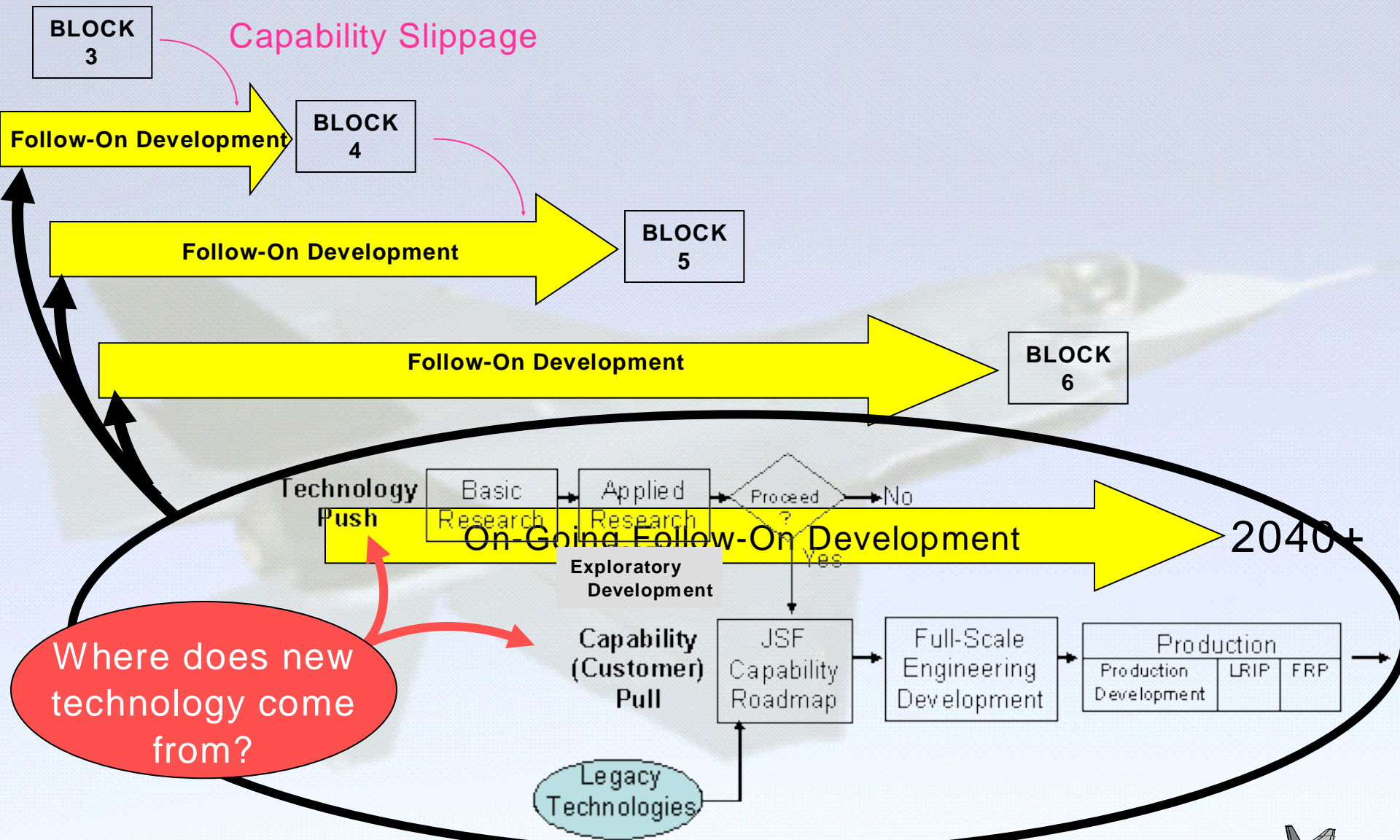
- Block 7 TBD**
- A/A & Strike
    - ✓ Extended Combat Range
    - ✓ Photon Torpedo
  - ISR
    - ✓ HDTV
    - ✓ IPOD

Hypothetical Upgrade Options

New Air Combat Capability

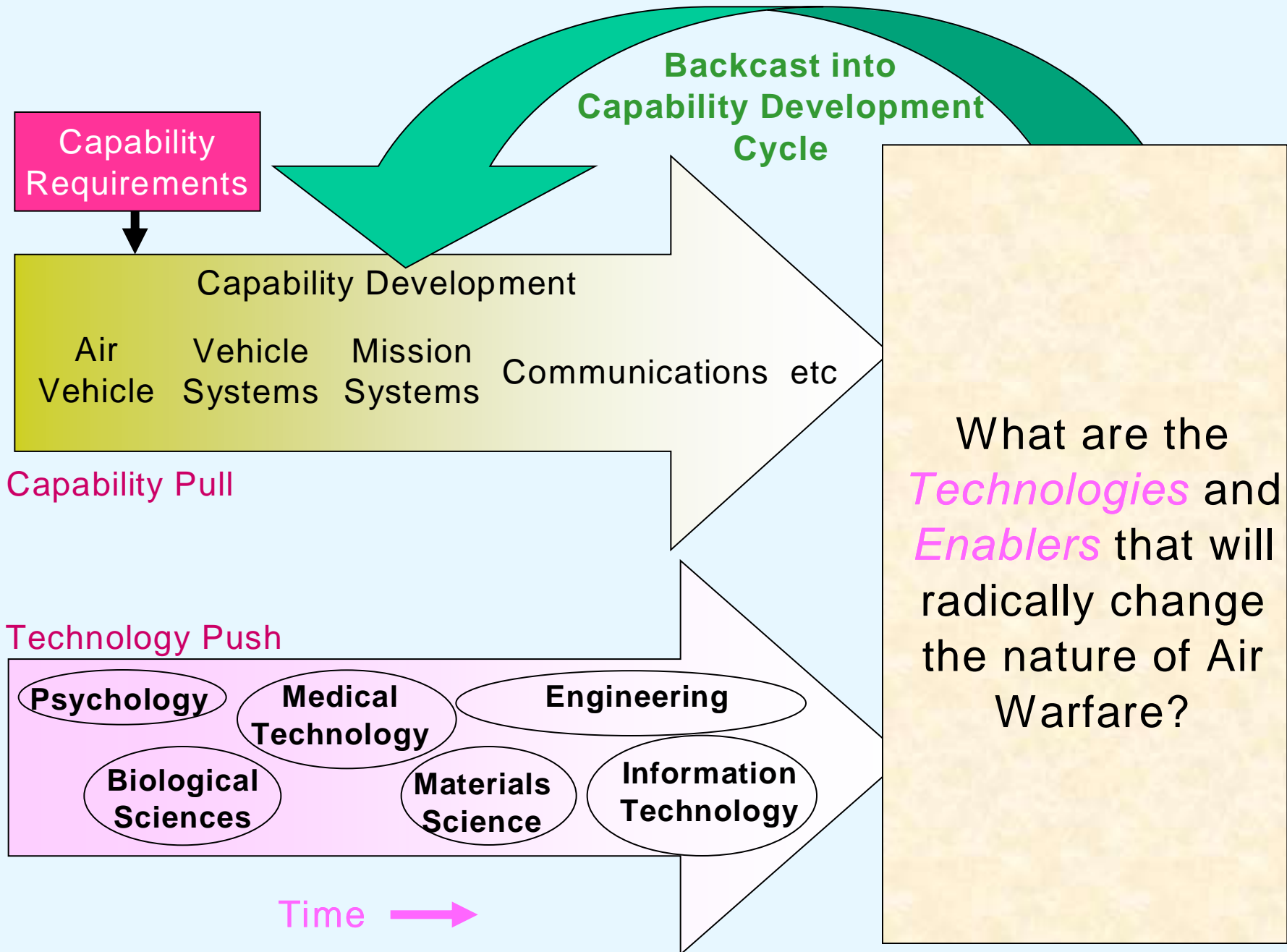


# R&D CYCLE AND BLOCK UPGRADE PROCESS



**New Air Combat Capability**





**New Air Combat Capability** \_\_\_\_\_





# The JSF Project and a Way Forward

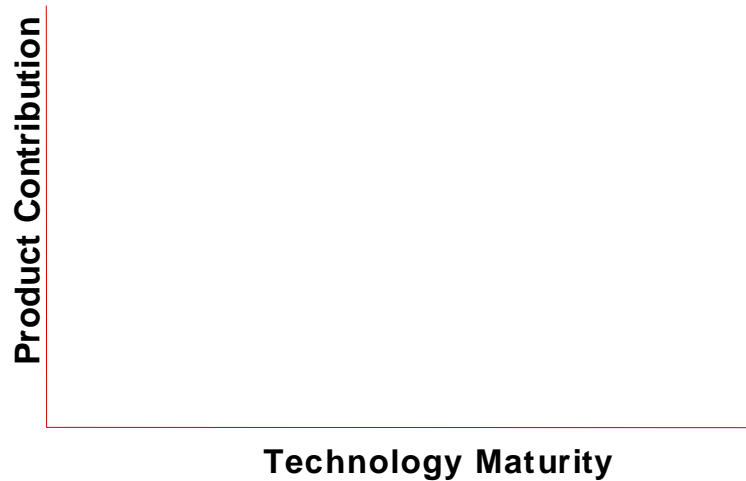
---

- The JSF Project
  - Australia s involvement with JSF
  - What is the JSF
  - JSF Capabilities
- Way Forward to Focus Research
  - Australian Industry Participation
  - Opportunities for inserting new technology
  - Suggested coordination approach

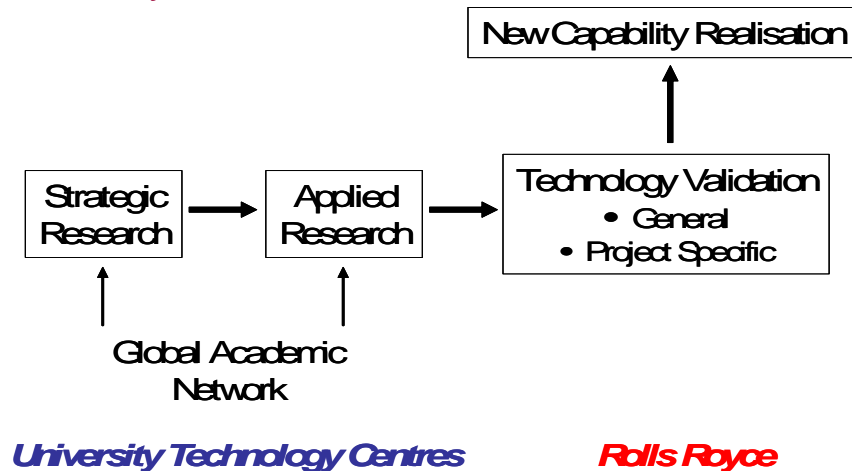


## BAE Systems UK

Scope of ATG Positioning



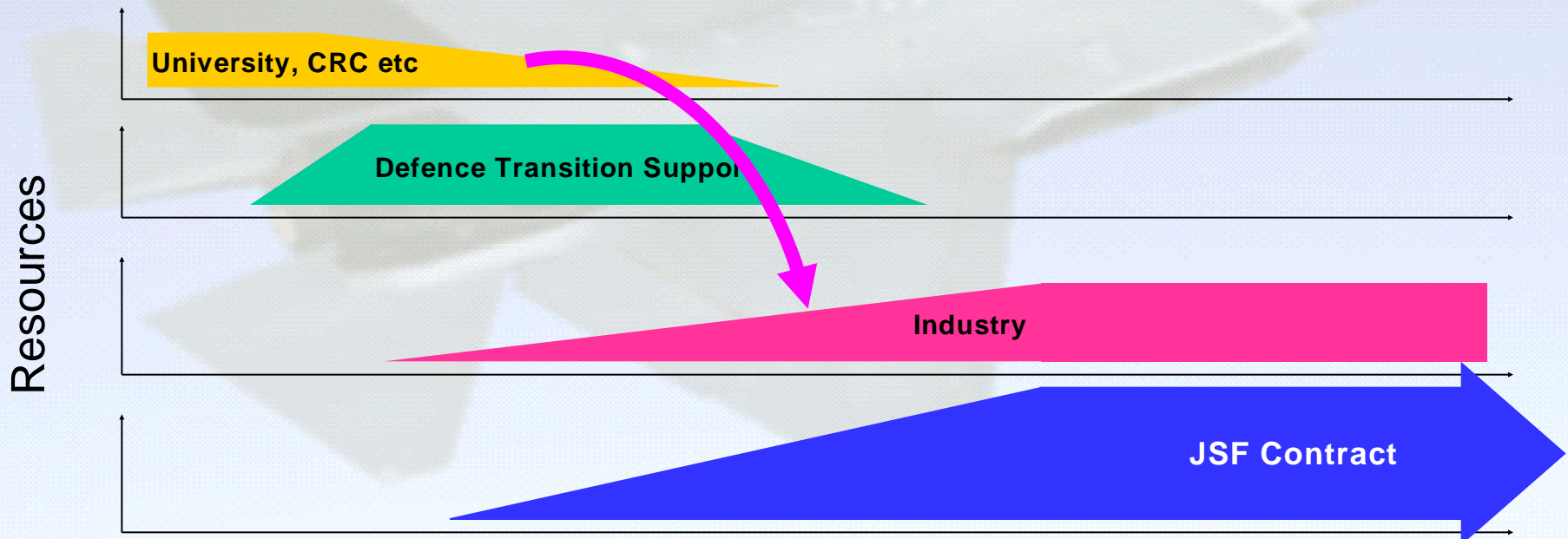
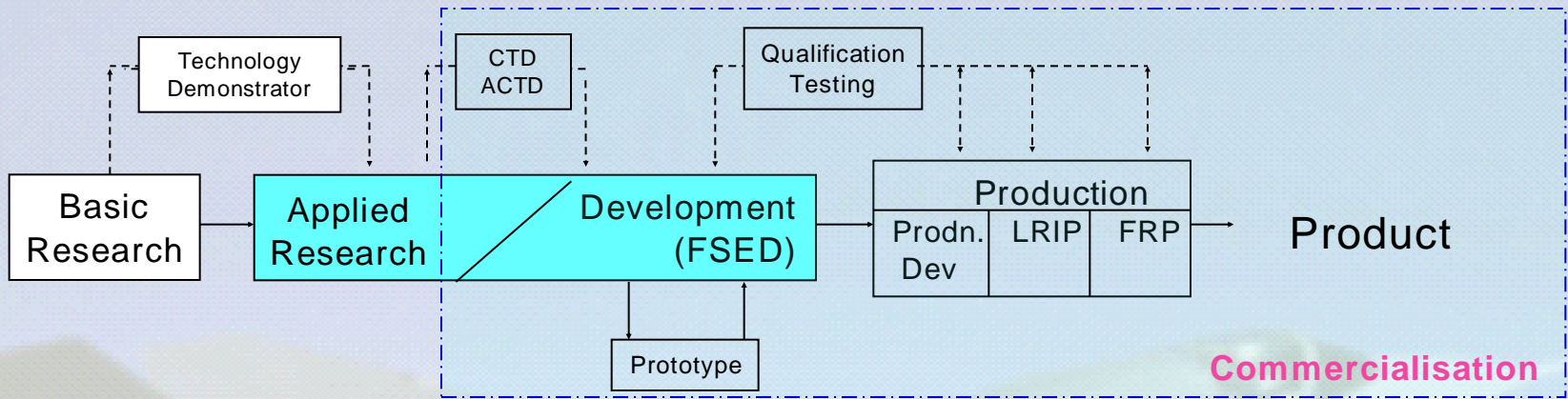
## Rolls Royce Model



## Australian JSF R&D Base

- Equivalent unified system to leverage basic research in support of JSF does not currently exist in Australia.
- Active industry participation in on-going support to JSF will require access to resource pool of R&D .
- Proposal is to form & coordinate a conceptual Australian R&D Base as a source of indigenous technology to be exploited on JSF.
- It may comprise relevant R&D capabilities within universities, CRCs and public funded R&D organisations.
- Limited funding may be available for most promising areas, particularly of ADF interest

# JSF Model of Technology Innovation

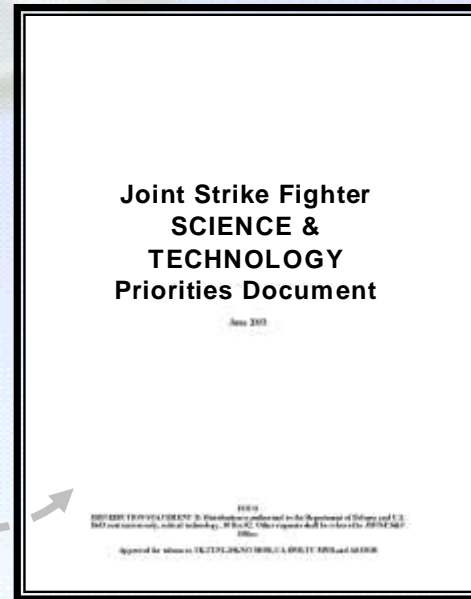
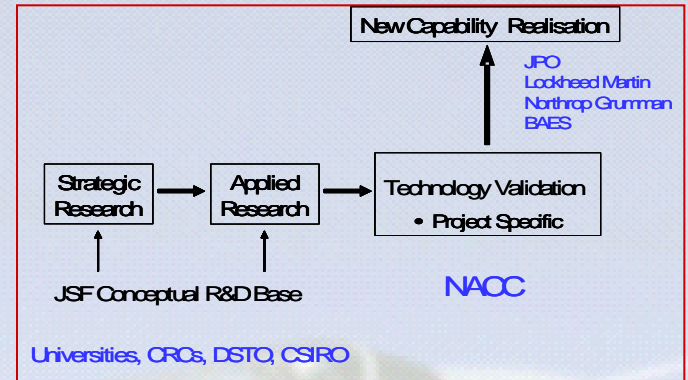
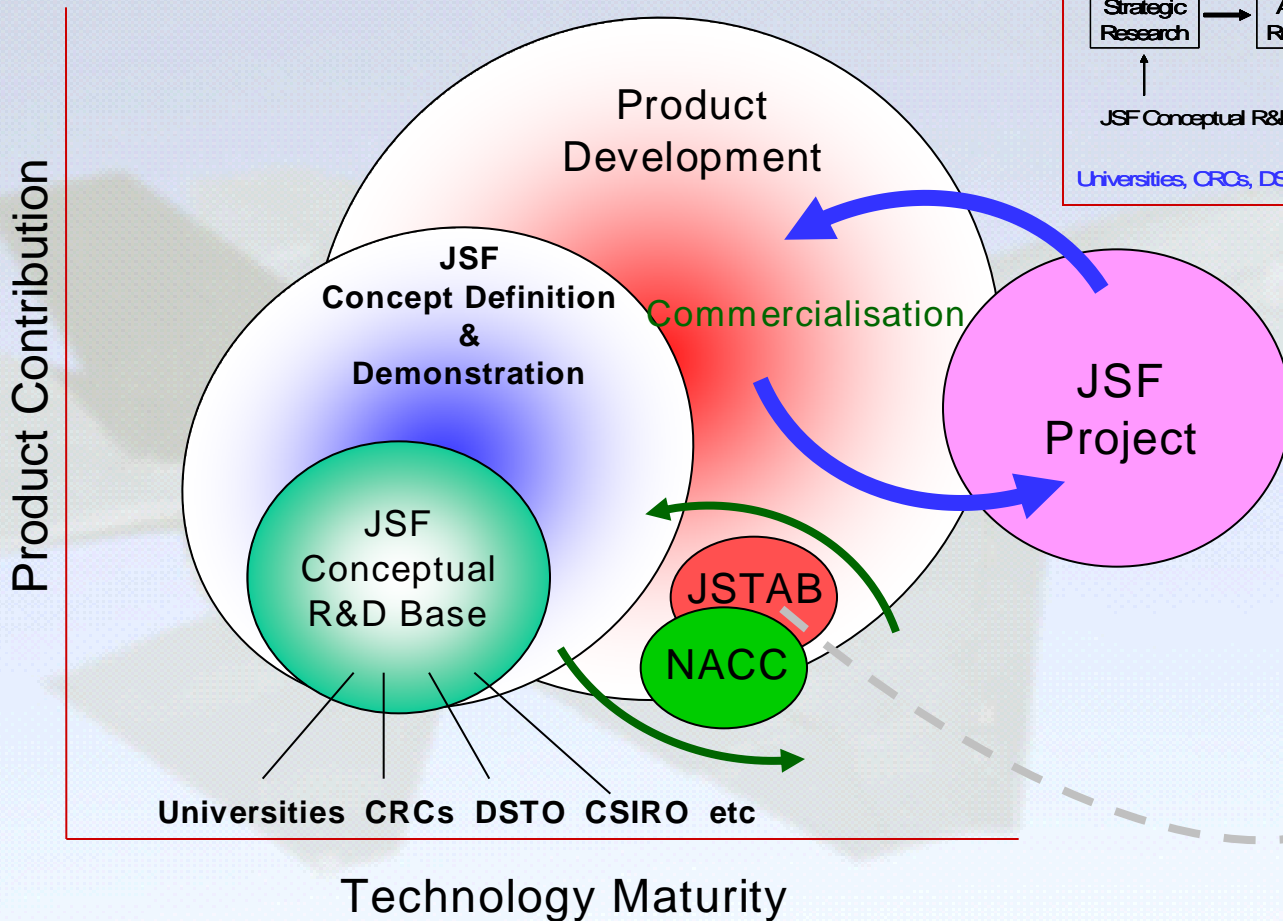


**New Air Combat Capability**



# Concept For Australian Model

JSTAB - JSF Science and Technology Board



**New Air Combat Capability**



# The Bottom Line

---

## What Do We Want?

- To establish an R&D network to support Australian Industry in relation to:

- Production development,
- Sustainment, and
- Follow-On Development

over the life of JSF.

## What Do We Offer?

- Coordination of:
  - ~ 130 companies for exploitation of R&D,
  - R&D organisations
  - Defence support
- Limited funding to support ADF priorities
- Access to JSF Program (Gov & Industry)

***New Air Combat Capability***

---



# Approach

---

Step 1 – Initial Contact Visit covering breadth & scope of project

➔ Step 2 – Scope Briefing to wide interest audience

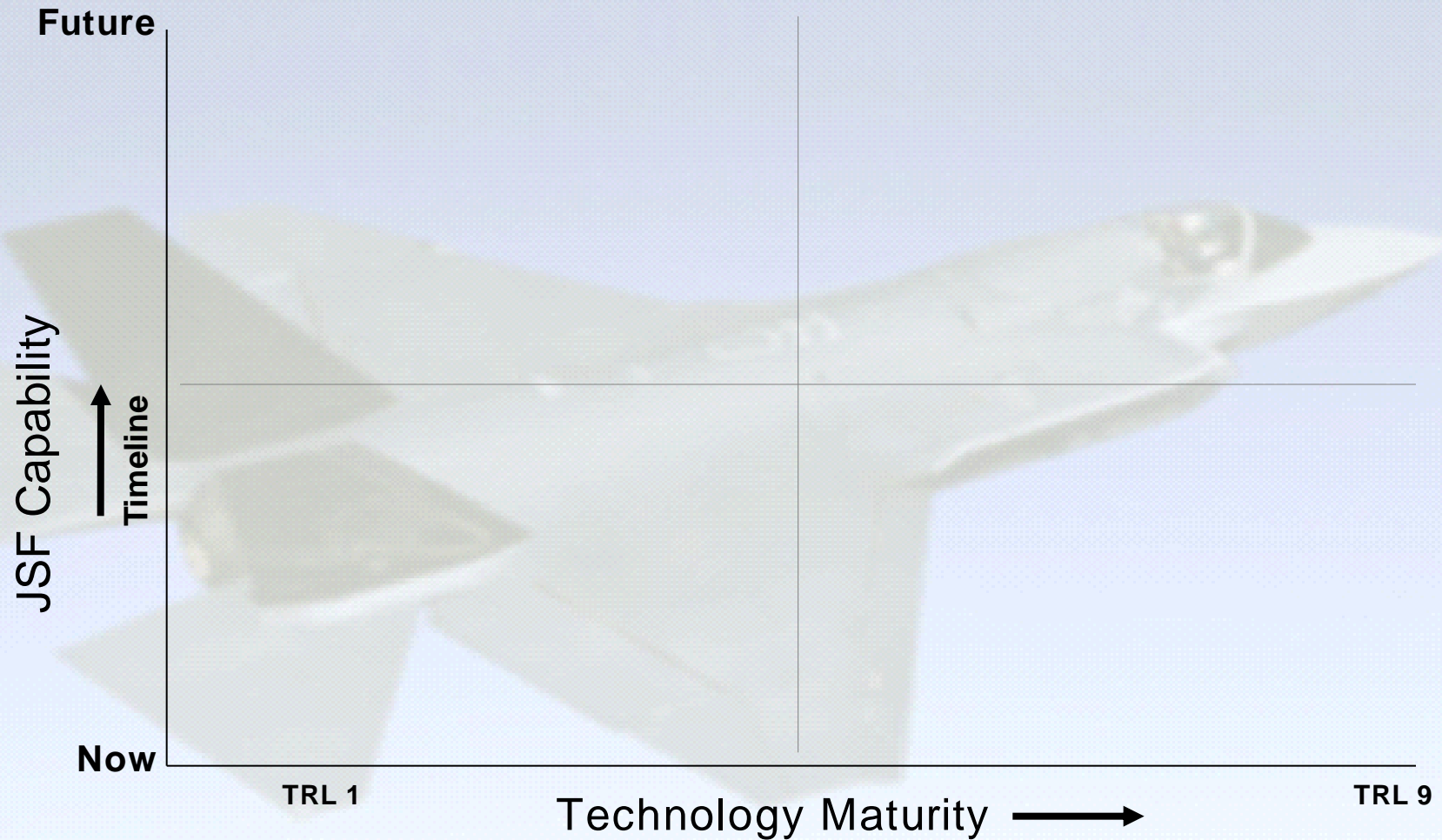
➔ Step 3 – Presentations to Government & Industry Panel  
- Agree candidate R&D of potential application or interest

Step 4 – Panel feedback and recommendations wrt maturity level (TRL)

Step 5 – Agree way forward on individual basis  
- Review opportunities on a collective basis



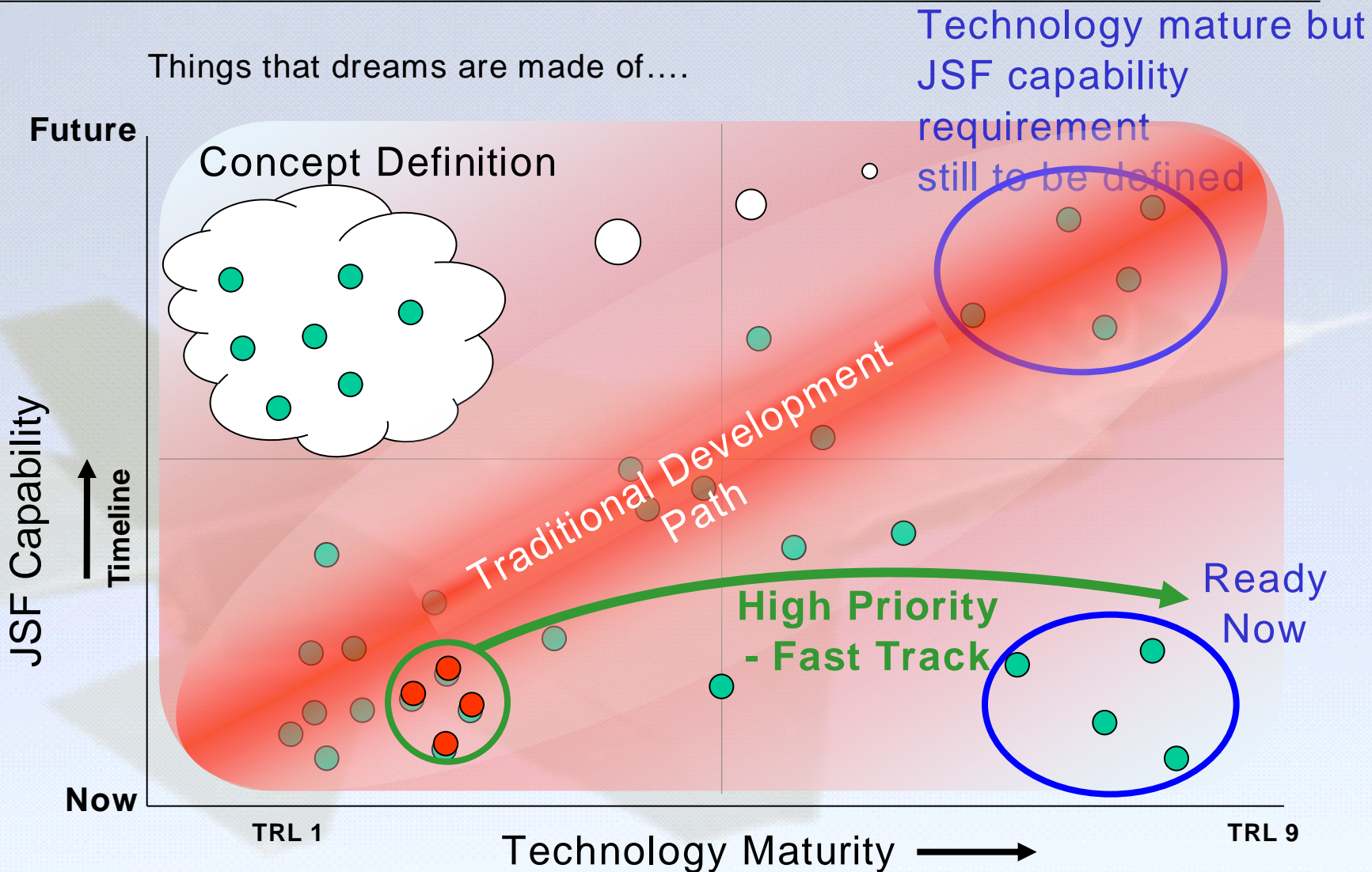
# Technology Mapping



***New Air Combat Capability***



# Technology Mapping






# Approach

---

Step 1 – Initial Contact Visit covering breadth & scope of project

Step 2 – Scope Briefing to wide interest audience

Step 3 – Presentations to Government & Industry Panel  
- Agree candidate R&D of potential application or interest

 Step 4 – Panel feedback and recommendations wrt maturity level (TRL)

Step 5 – Agree way forward on individual basis  
- Review opportunities on a collective basis



# Advanced Technology for a Future JSF Melbourne Grand Hyatt - Sunday, 18 March 2007

Registration of Interest Required by 1 Dec 2006 to NACC



## Twelfth Australian International Aerospace Congress

Monday 19 - Thursday 22 March 2007 The Grand Hyatt, Melbourne, Australia

Postage  
Paid  
Australia

### *Incorporated Conferences:*

- Twelfth Australian Aeronautical Conference
- Fifth DSTO International Conference on Health & Usage Monitoring
- Sixth Australian Pacific Vertiflite Conference on Helicopter Technology
- Second Australasian Unmanned Air Vehicles Conference
- Sixteenth National Space Engineering Symposium
- First International Helicopter Safety Team - South Pacific Regional Conference

### *Associated Events:*

- Air Force  
The Air Chiefs Gala Dinner
- Australian International Airshow 2007
- Australian JSF Industry & Technology Innovation Conference

A collage of three images: a blue and white aircraft in flight, a green and black aircraft on a runway, and a green helicopter.

## Aerospace - The Global Industry

# Call for Abstracts



# Point of Contact

---

Your BCO



# Joint Strike Fighter

Join The Team



*Questions?*