Advanced F-15
For the Japan Air Self Defense Force
FX Fighter Program

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Agenda

- Introduction to F-15FX
- F-15FX Systems and Operations
- CONOPS and Mission Profiles
- Logistics Support
- Summary

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Boeing Proprietary/Competition Sensitive

- **Introduction to F-15FX**
- **F-15FX Systems and Operations**
- **CONOPS and Mission Profiles**
- **Logistics Support**
- **Summary**

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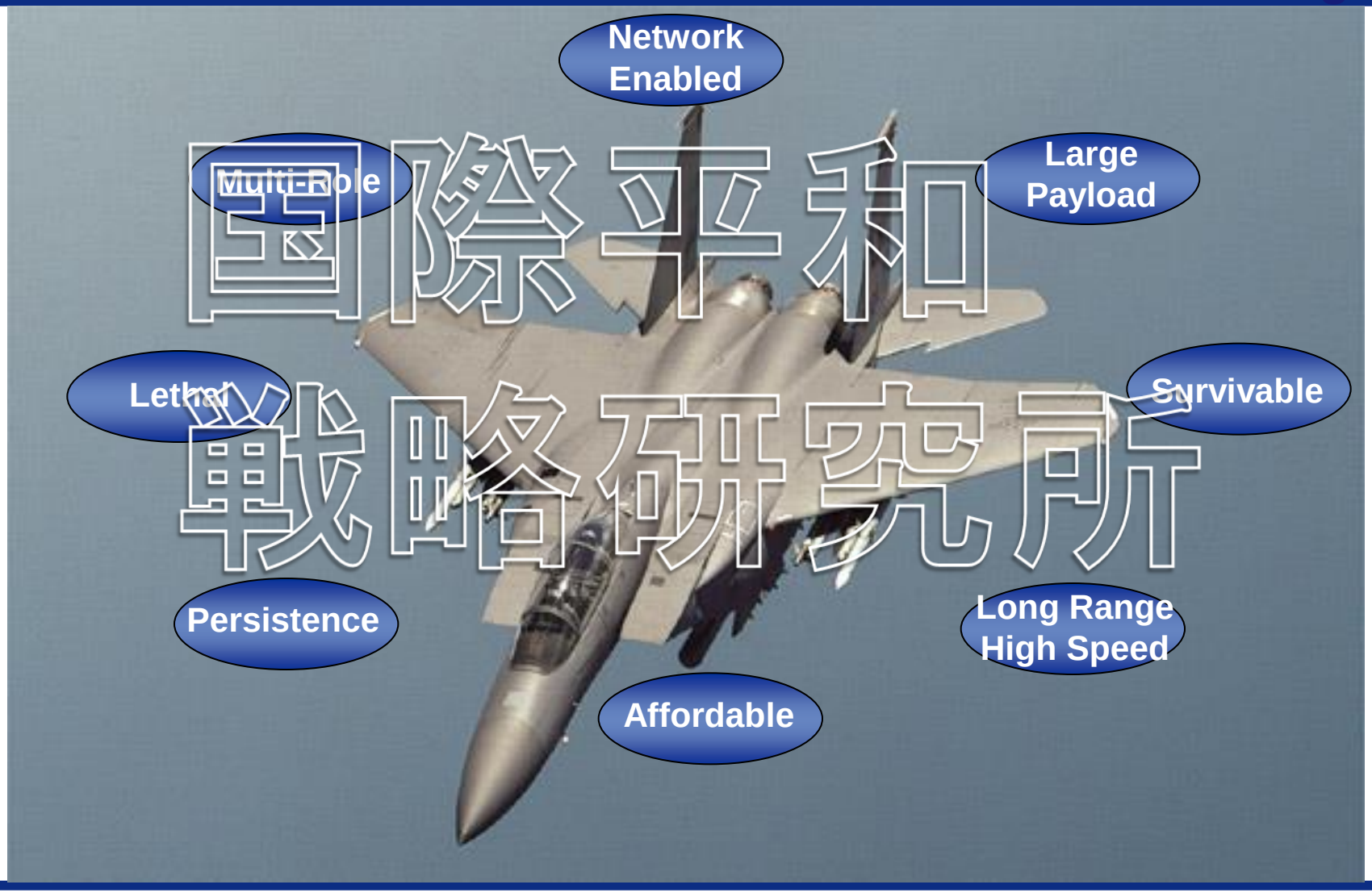
Boeing Proprietary/Competition Sensitive

F-15FX

New Generation Network-Centric Powerful Multi-Role Fighter



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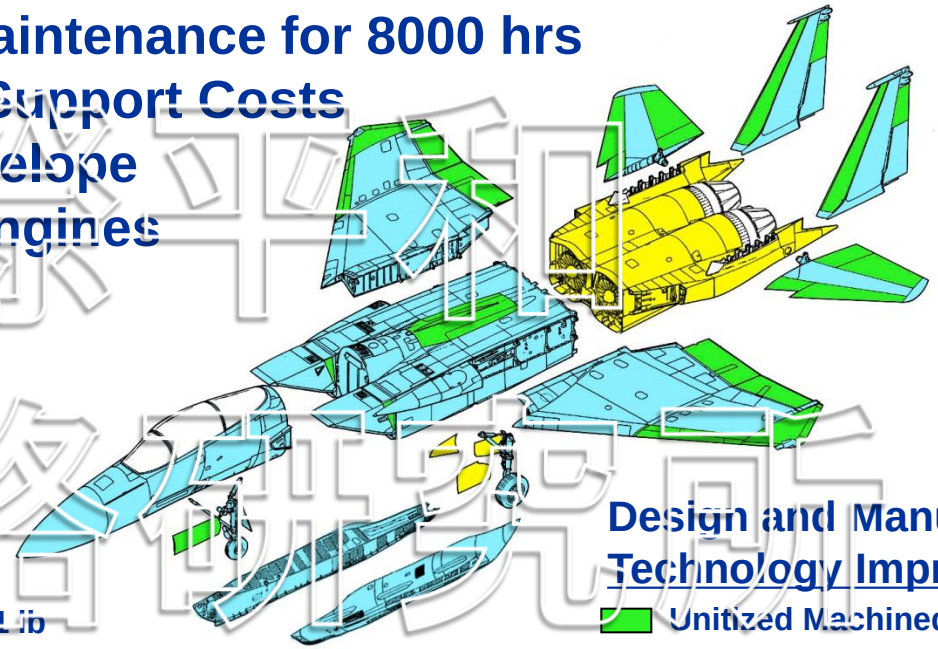
Completely Redesigned New 9G Airframe

- No Scheduled Depot Maintenance for 8000 hrs
- Significantly Reduced Support Costs
- 9G Throughout the Envelope
- 29,000 lb or 32,000 lb Engines
- 12,000 hr Service Life
- 23,000 lb Payload
- 2.5 mach



Fuel capacity with Conformal Fuel Tanks

• Internal Fuel Tanks	13,511 lb
• External Tanks (3 at 610 gal.)	12,444 lb
• Conformal Fuel Tanks	9,829 lb
Total	35,784 lb

Design and Manufacturing Technology Improvements

- Unitized Machined Assemblies
- Advanced Titanium Structures
- Airframe Upgrade

Advanced Flight Control System with Triplex Digital Flight Control Computer

- Robust, Redundant
- Excellent High AoA Performance, Spin Resistance and Recovery Modes

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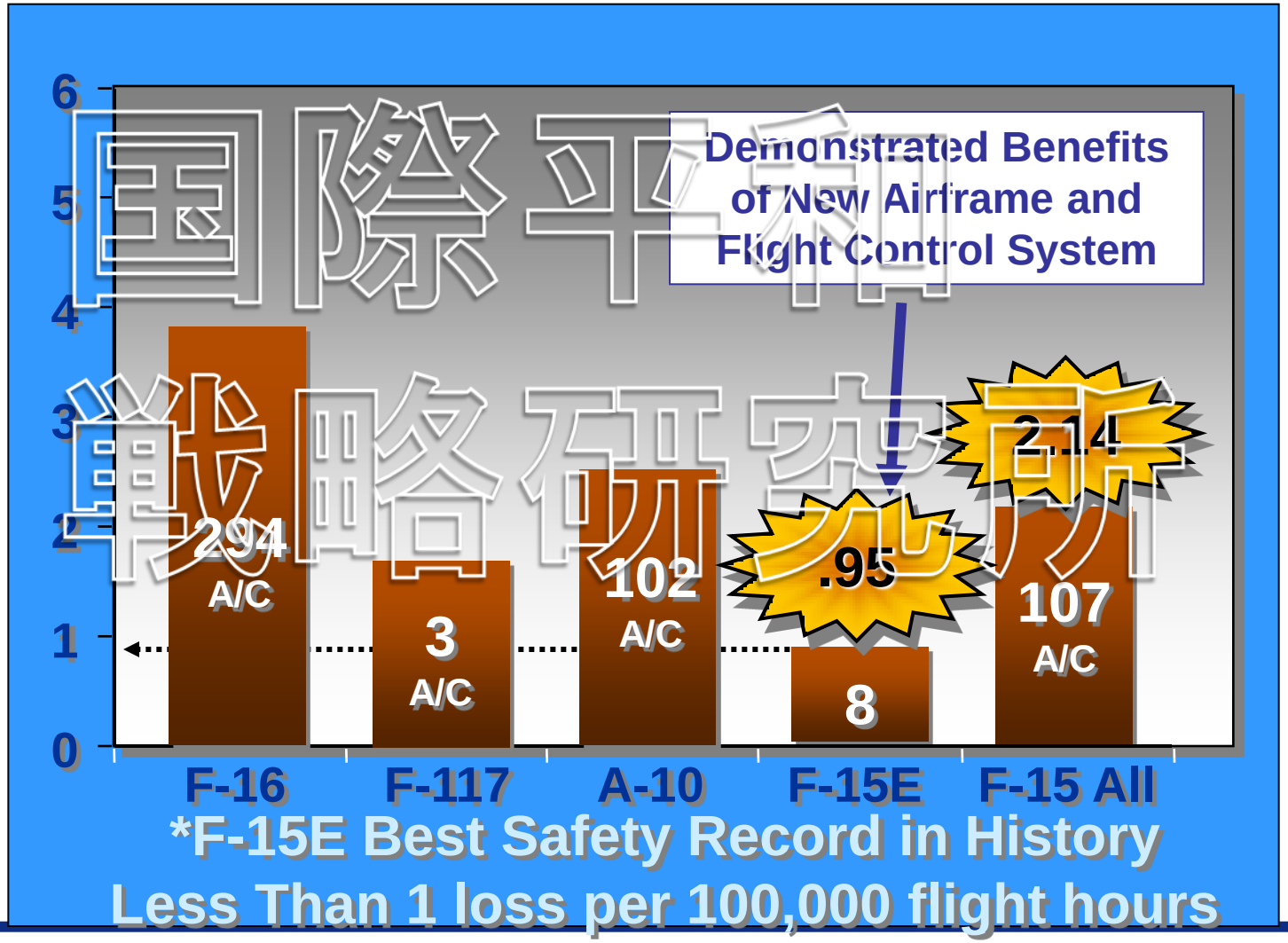
Excellent Safety Record*



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*USAF Data thru FY04

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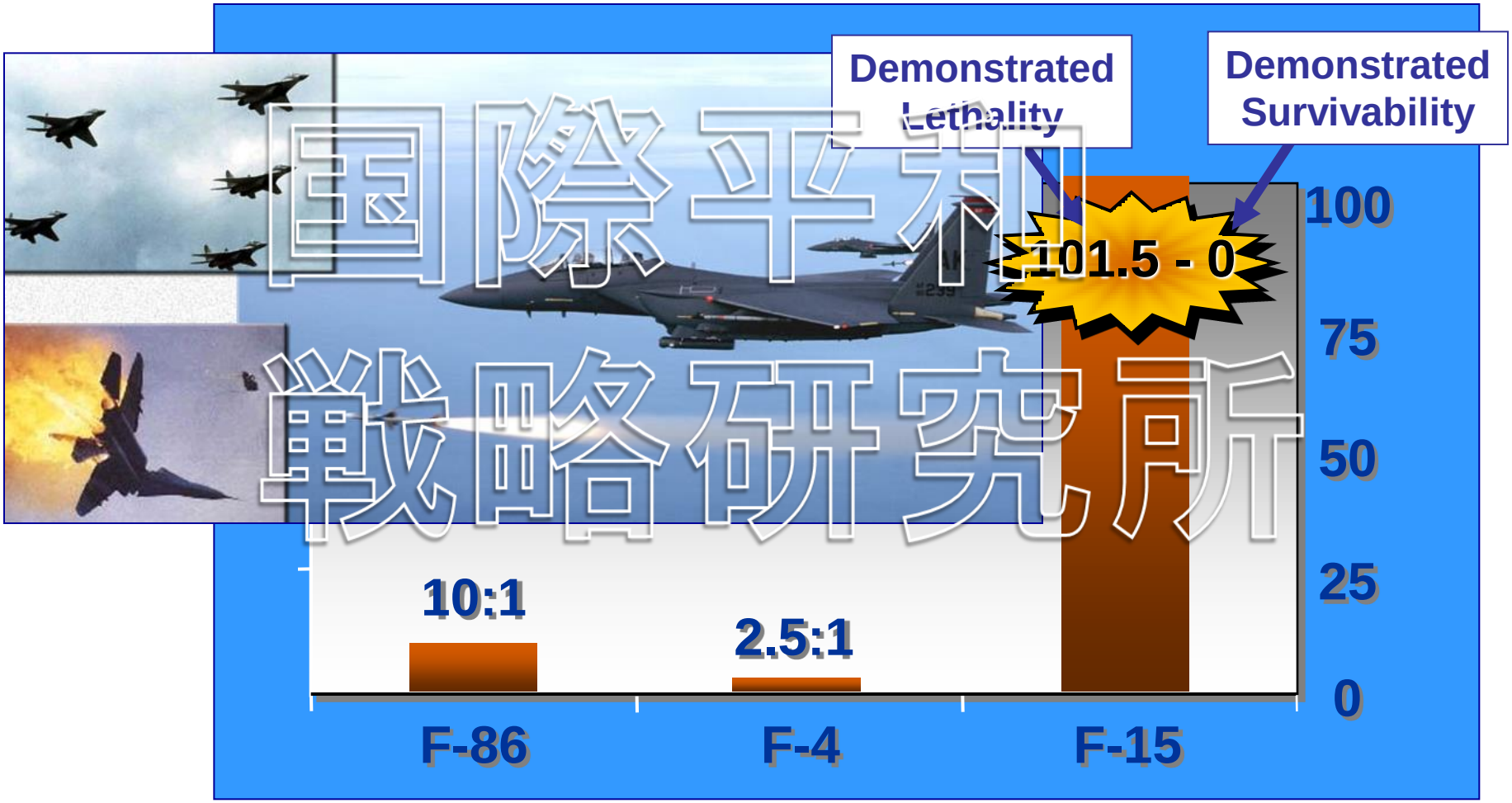
Best Air-to-Air Exchange Ratio in History



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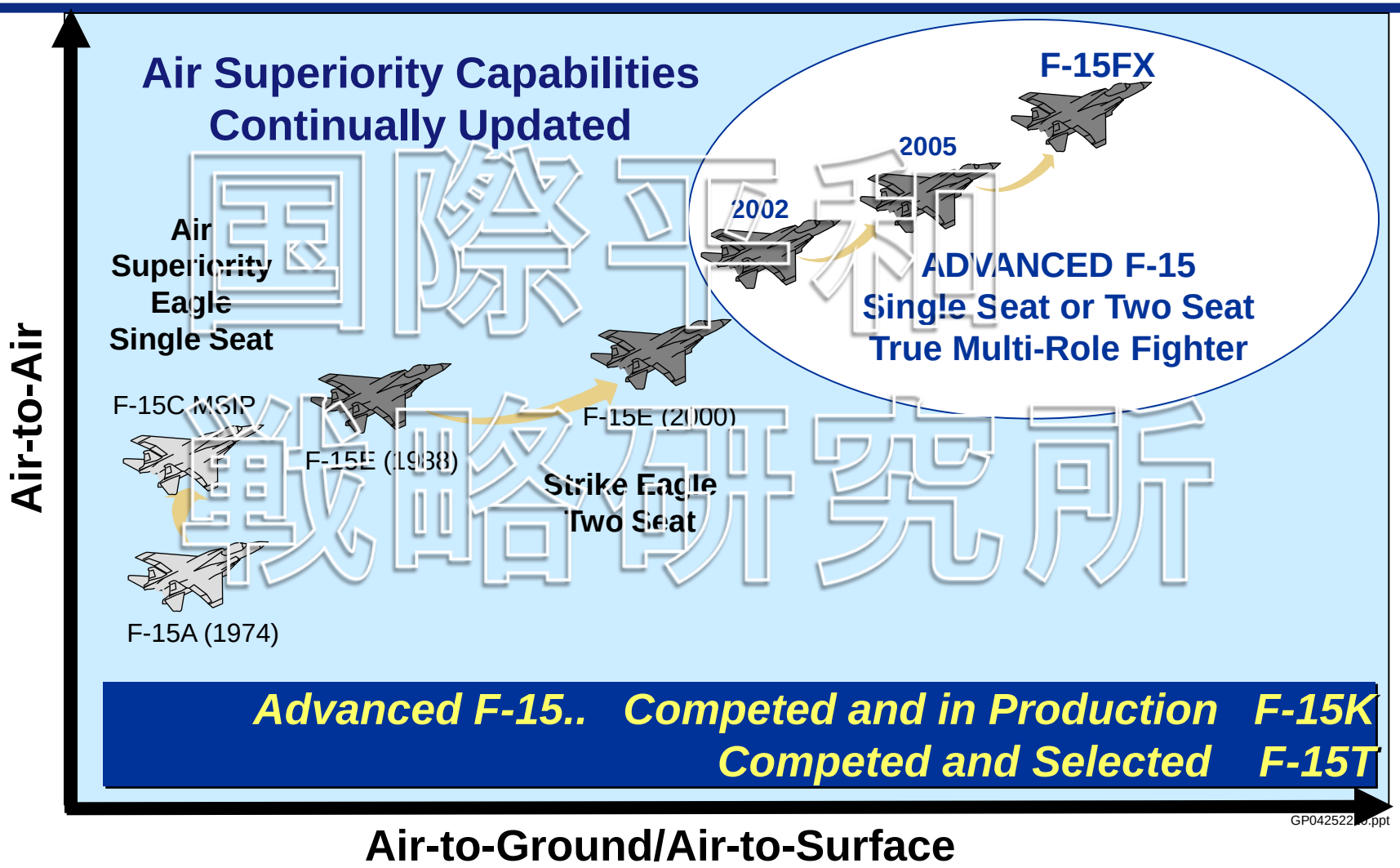
Distinguished Heritage and Remarkable Growth



Advanced F-15.. Competed and in Production F-15K
Competed and Selected F-15T

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Not drawn to scale
For discussion purposes only

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The Transformation to the Advanced F-15

Begin with the proven air superiority design

Original Design Philosophy – Superior Combat Maneuverability and Survivability Coupled with Long Range Sensors and Stand-off Weapons

Add significant multi-role capability

- Airframe 90% Redesigned to USAF's new 9G Operational Specification with Subsequent Continuous Improvements
- New Avionics and Subsystems
- Enhanced Supportability / Reduced Life Cycle Cost
- 12,000 Hour Service Life
- 29,000 lb engines
- 23,000 LB Payload
- Additional Fuel

Top it off with today's Advanced Capabilities

- Advanced Systems
- Highly Integrated Avionics
- Open System Architecture
- Additional Modes/Mode Enhancements
- Simultaneous Mission Operation
- 15 Smart Weapon Stations
- Advanced Logistics Concepts
- Customer Defined Systems

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USAF F-15E Status and F-15 Future Production

USAF F-15Es in inventory until 2035 and beyond

- New Threats
- New Missions
- New Technology

All F-15 Operators have expressed interest in Additional New Aircraft

USAF F-15E+

Korea F-15K

Singapore F-15T

Israel F-15I

Saudi F-15S

Production Prospects 2015 and beyond

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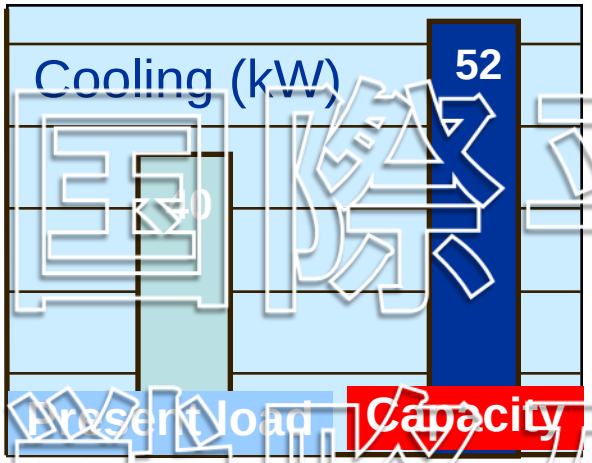
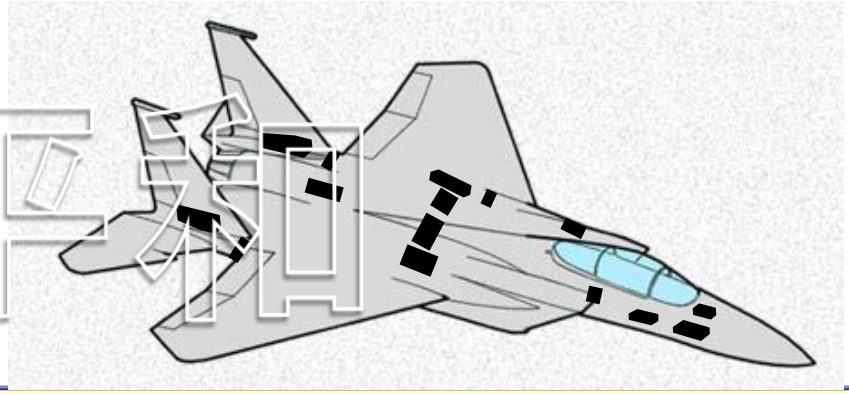
Growth Capacity

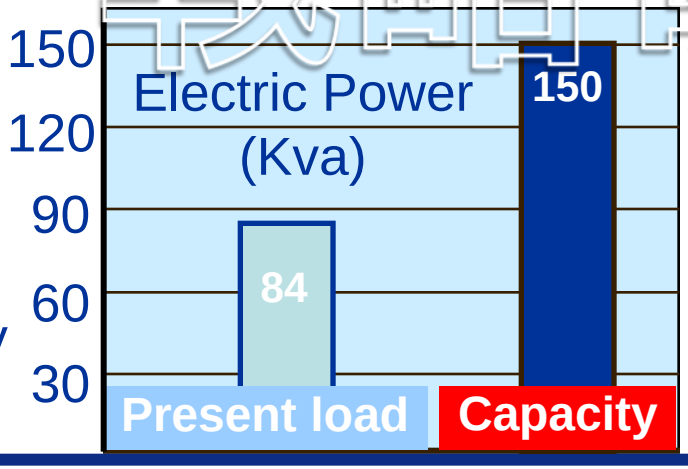
Cooling 30% Growth Capacity





Space 43% Growth Capacity Total 33.30 ft³

Power 78% Growth Capacity



Significant Growth Capacity and Open Architecture in Avionics Systems Provides Easy Integration of Japan Indigenous Weapons and Communications Equipment

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F-15FX Systems

Avionics

- Advanced Display/Core Processor (ADCP)
- COM-NAV
  - Link 16/Advanced WideBand Data Link (in USAF plan)
  - Combined Interrogator/Transponder (APX-113/114)
  - Dual Embedded GPS/INS
  - TACAN
  - VHF/UHF/HF
- DAS Flight Data Recorder
- 4 Channel DVR

Sensors

- AESA Radar (APG-63(V)3)
- RWR (ALR-56C(V)1)
  - Optional ALR-56C(V)2 Digital RWR (Development required)
- ICS (AN/ALQ-135M)
- Chaff/Flare (ALE-47(V))
- Towed Decoy (ALE-50)
- EO System (3rd Gen)
- IRST System
- Navigation Pod

Armament

- 15 Station Mil-Std 1760
  - Expandable to 17 Stations
- AIM-9X/AMRAAM
- Harpoon Block II
- SLAM ER
- Smart Weapons JDAM/SDB
- JSOW
- EGBU-28

Propulsion

- F100-PW-229 Engine
- F110-GE-129 Engine (F110-GE-132 available)

Crew Station

- JHMCS Fwd & Aft
- Night Vision Compatible
- Displays
  - Fwd 3 – 6x6 Displays
  - Aft 4 – 6x6 Displays

(Crew Station Can be Designed to Meet Operator's Requirements)

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All Supported by New Advanced Logistics Programs

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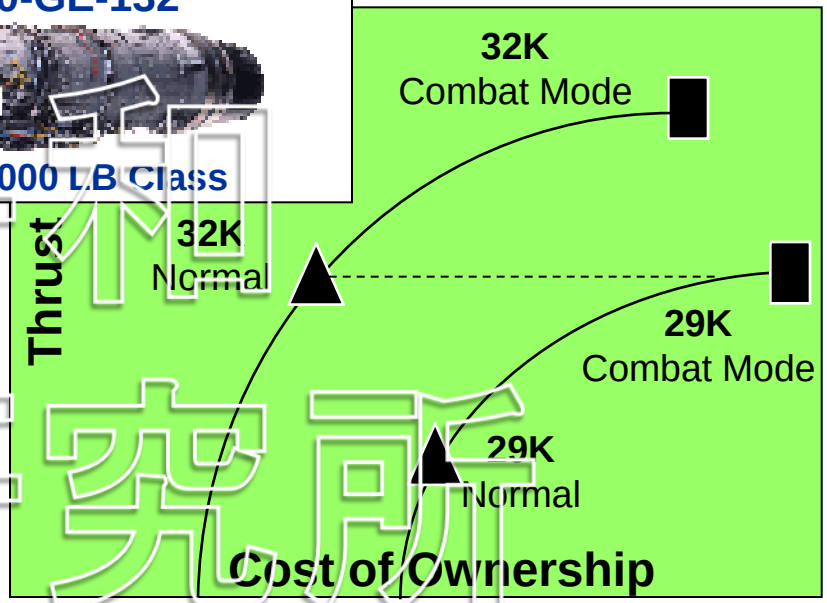
F-15 Engine Evolution and 32,000 lb Engine Option

Available for Advanced F-15
F-110-GE-132

32,000 LB Class



F-15E/I/S
F100-PW-229

F-15K
GE-129

F-15C/D/E
F100-PW-220/-220E

F110-GE-132

- **Qualification and F-16 flight test complete Mar '03**
- **Production engine deliveries begin Apr '03**
- **All airframe/SE interfaces same as F110-GE-129**
- **F-15 flight test required. Low Cost/Low Risk.**

Significant Combat Thrust Available
Total Ownership Cost Reduced

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Large Versatile Weapons Loads

23,000 lb Payload

- **Up to 8 Air-to-Air Stations**
  - Four Wing Stations Always Available
- **Up to 15 Air-to-Surface Stations**
  - Can carry up to 28 SDB's with 4 A/A weapons
  - Three Stations Capable of 5000+ Pound Store Weight
- **2 additional stations available (L & 9)**
  - Structure and wiring exists
  - New pylon required. Testing may be required.

All Weapon Stations are Mil-Std-1760

Mixed Loads enable Self Escort and Provide Combat Mission Flexibility

AIM-9X
AMRAAM
JDAM
SDB
Harpoon Blk II
SLAM ER
JSOW
EGBU-28
Laser Guided Bomb

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Unmatched Weapon Flexibility

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Unmatched Weapon Flexibility

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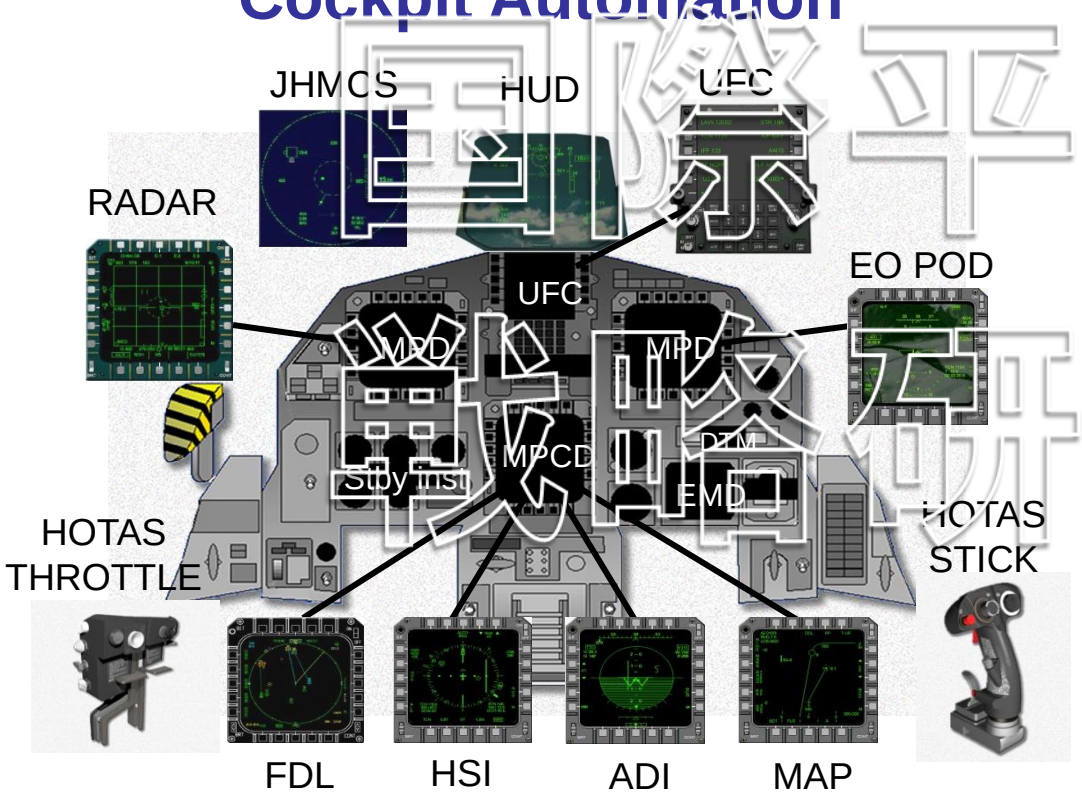
Single Seat Configuration

High Degree of Cockpit Automation



- Low Aircrew Workload
- Night Vision Compatibility
- Easy to Read Formats
- Programmable Independent Displays
- Crew Station Can be Designed to Meet Operator's Requirements

Full Multi-Role Mission Capability

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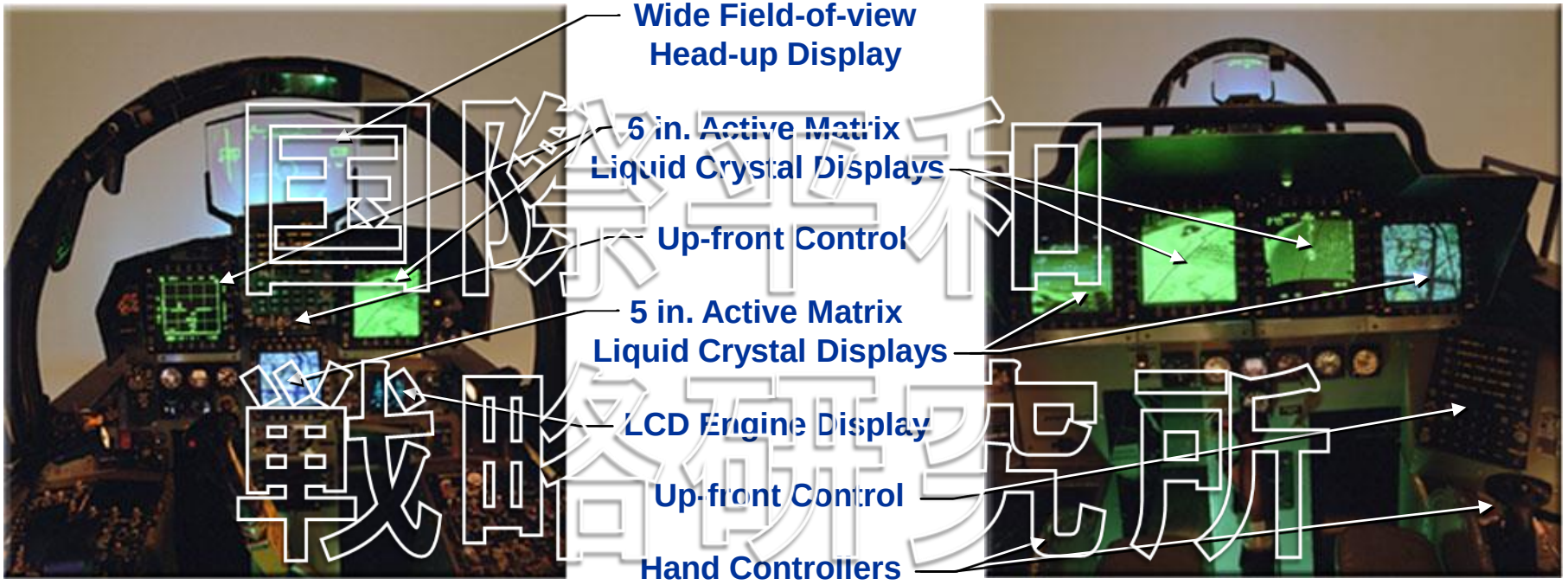
2 Seat Configuration
Independent Missionized Crew Stations



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- Can be Designed to Operators Preferences
- Hands-on-Throttles and Stick (HOTAS) Controls
- Programmable, Independent Displays
- Low Aircrew Workload
- Night Vision Compatibility
- Easy to Read Formats

Full Independent Multi-Role Mission Capability in Both Seats

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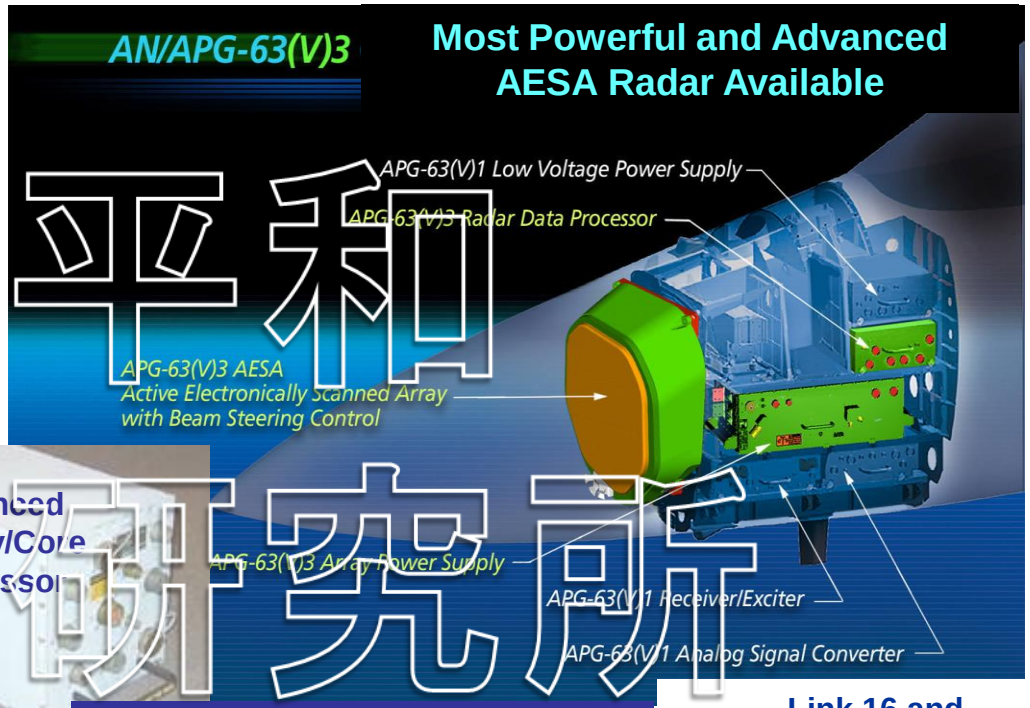
Advanced Next Generation Systems

Joint Helmet Mounted Cueing System (JHMCS)



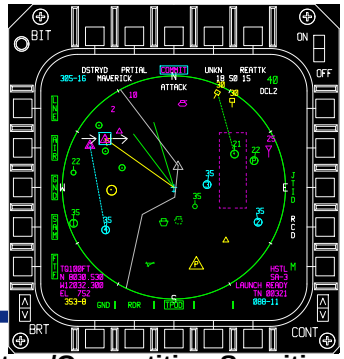
Most Powerful and Advanced AESA Radar Available

Advanced Display/Core Processor

3rd Gen EO/IR Sensor Suite

Integrated Sensors and Networking provide Optimum Situational Awareness and Air Superiority

Link 16 and WideBand Data Network



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AESA Interleaved Modes

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Radar Mode-Sea Surface Search

with Simultaneous Air to Air

Can be interleaved with real beam map

- Positionable azimuth sectors
- Precision targeting
- Detection of patrol type vessels and ships

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Harpoon Block II

Sea surface search capability profiles for detection of surface ships in sea clutter

Superior Multi-Role Performance Against Attacks from the Sea and Littoral Defense

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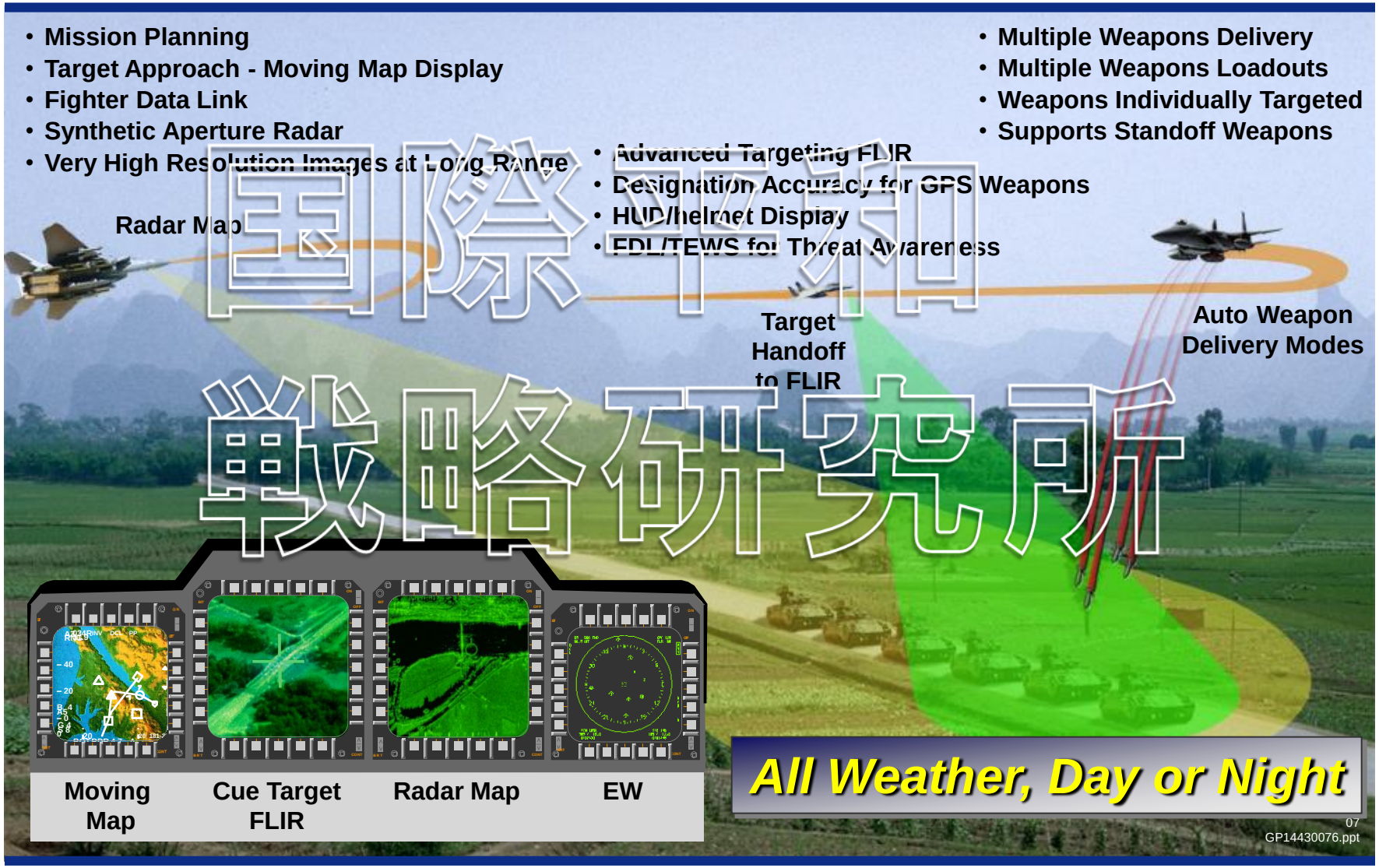
Air-to-Ground Precision Operations

- Mission Planning
- Target Approach - Moving Map Display
- Fighter Data Link
- Synthetic Aperture Radar
- Very High Resolution Images at Long Range

- Multiple Weapons Delivery
- Multiple Weapons Loadouts
- Weapons Individually Targeted
- Supports Standoff Weapons

- Advanced Targeting FLIR
- Designation Accuracy for GPS Weapons
- HUD/helmet Display
- EDL/TEWS for Threat Awareness



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F-15FX FDL NCO Technology Enhancements

USAF/DARPA/Boeing have developed and demonstrated Network Centric Operation Technologies with F-15

Key NCO Attributes:
- JTRS Compliance
- Open Systems
- Expanded Functionality

Off Board Targeting (June 1997)

F-15E to C2 Collaboration (Dec 2002)

F-15E to UAV Collaboration (Jul 2004)

USAF is integrating NCO technologies into the F-15

- **Imagery in the cockpit to be fielded Jan 06 (USAF OFP Suite 5)**
- **Transmit/Receive Imagery and Expanded Weapons Data Link planned for introduced in 2008 (USAF OFP Suite 6)**

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Advanced NCO Technologies

- Boeing and DARPA/USAF are developing and demonstrating Next Generation NCO Systems e.g. JTRS, TTNT, etc.

- In Sept 2005 the F-15 successfully demonstrated wideband datalink capabilities using a Joint, future Airborne Internet Protocol Network of 11 nodes in the air and on the ground. The Pentagon was able to view streaming video from the F-15's SNIPER targeting pod and talk to the F-15 using Voice Over Internet Protocol

- WideBand Data Link supported by high speed data bus to be fielded around 2010 (USAF OFP Suite 7 --)

  Functionalities include:

  - IP addressability
  - Streaming Video
  - Voice Over IP (VoIP)
  - Enhanced Imagery Xmit/RCV
  - Enhanced UAV Collaboration

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Survivability

A Key Element of Air Superiority & Multi-Role Operations

1st Look – 1st Shot – 1st Kill

- Sensor Detection Range
- Reduced Signature
- Situational awareness
  - Network
  - AESA
  - JHMCS
- Weapon payload/capability

Low Vulnerability

- Redundant flight controls
- Small critical vulnerable area
- Two engine

Low Susceptibility

- Network
- Advanced EW system
- Speed/maneuverability
  - 29,000 or 32,000 lb Engines
  - 9G Airframe
- Reduced Signature
- Stand-off Targeting
- High Off-Boresight capability
- Terrain Following Radar

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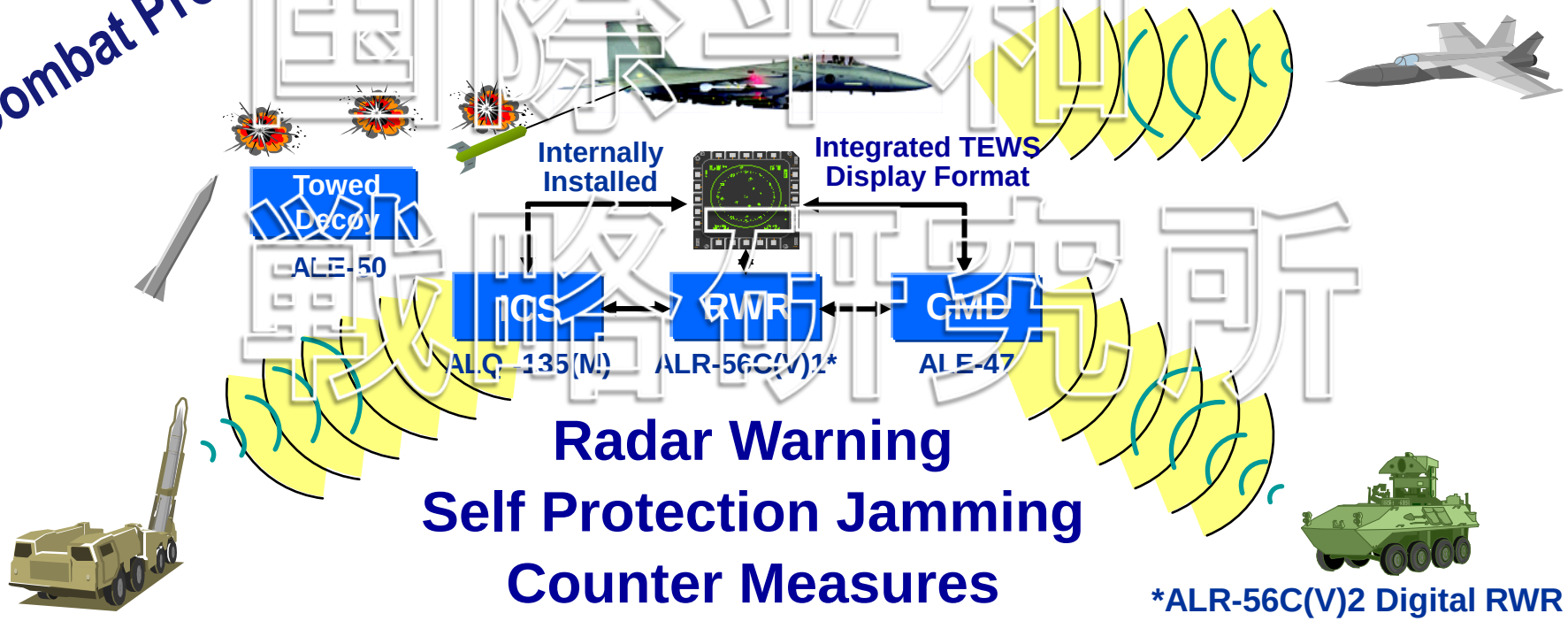
TEWS: Tactical Electronic Warfare System

360° Threat Situational Awareness

Disrupts Threat Operation

Avoid the Hit

Combat Proven



Radar Warning

Self Protection Jamming

Counter Measures

***ALR-56C(V)2 Digital RWR**
Optional – Development Required

In-Country Programmable to Specific Threat Requirements

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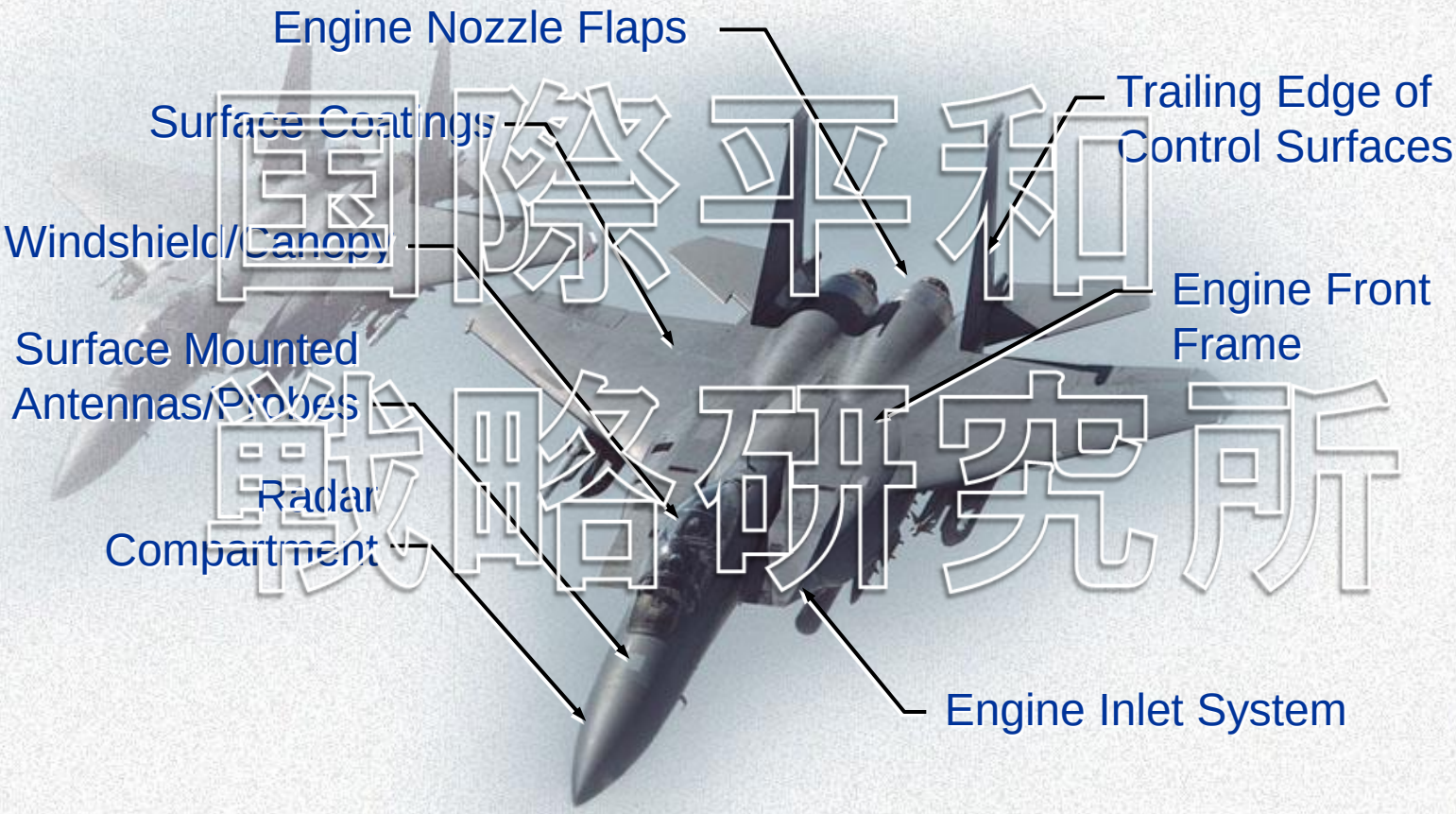
Areas of LO Enhancement



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Tactically Useful RCS Reduction Available

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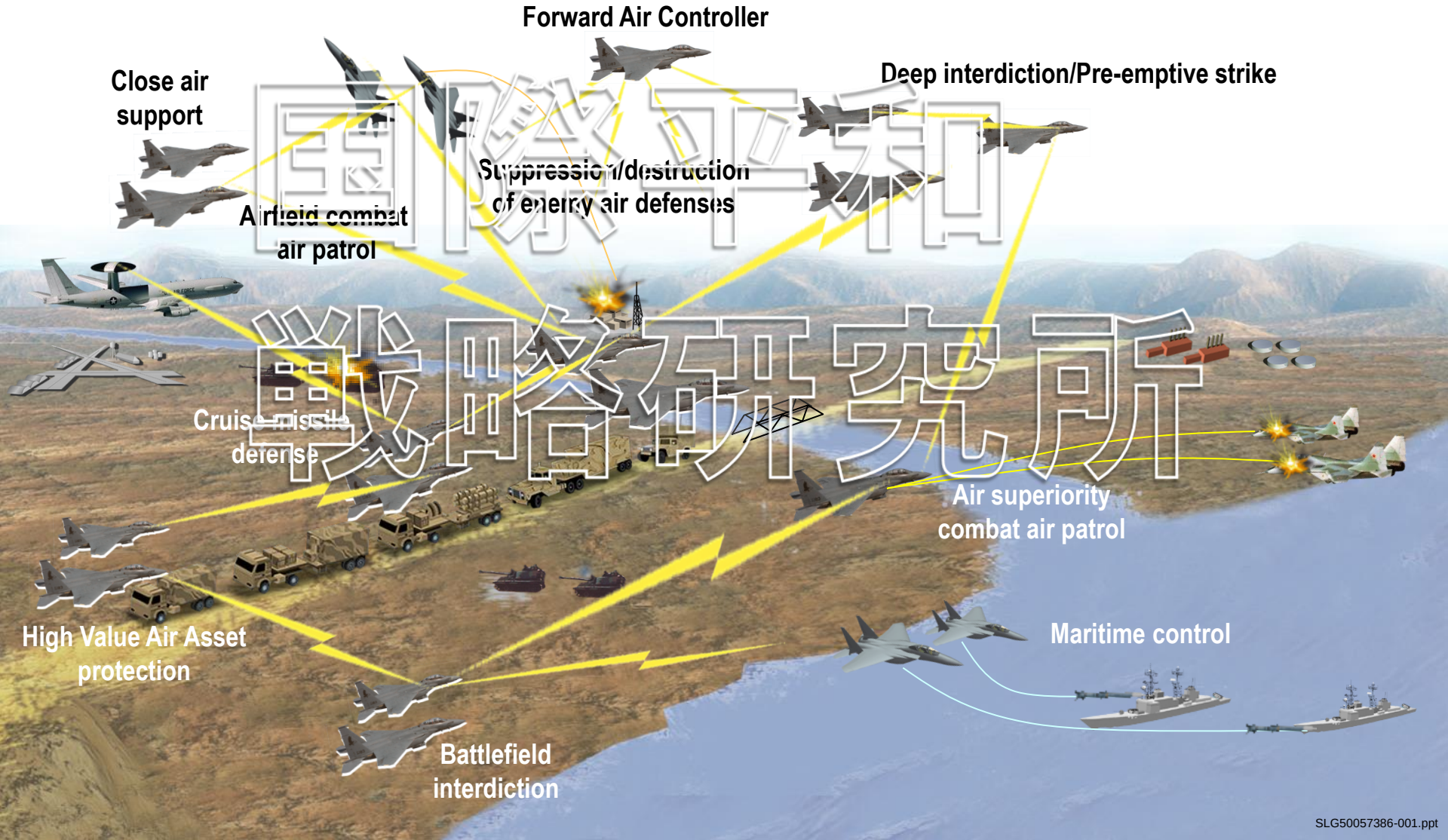
BOEING®

F-15FX - Flexible Air Power

Air Superiority | Stand-off Precision Strike | All-Weather Day/Night | Long Range Large Payload



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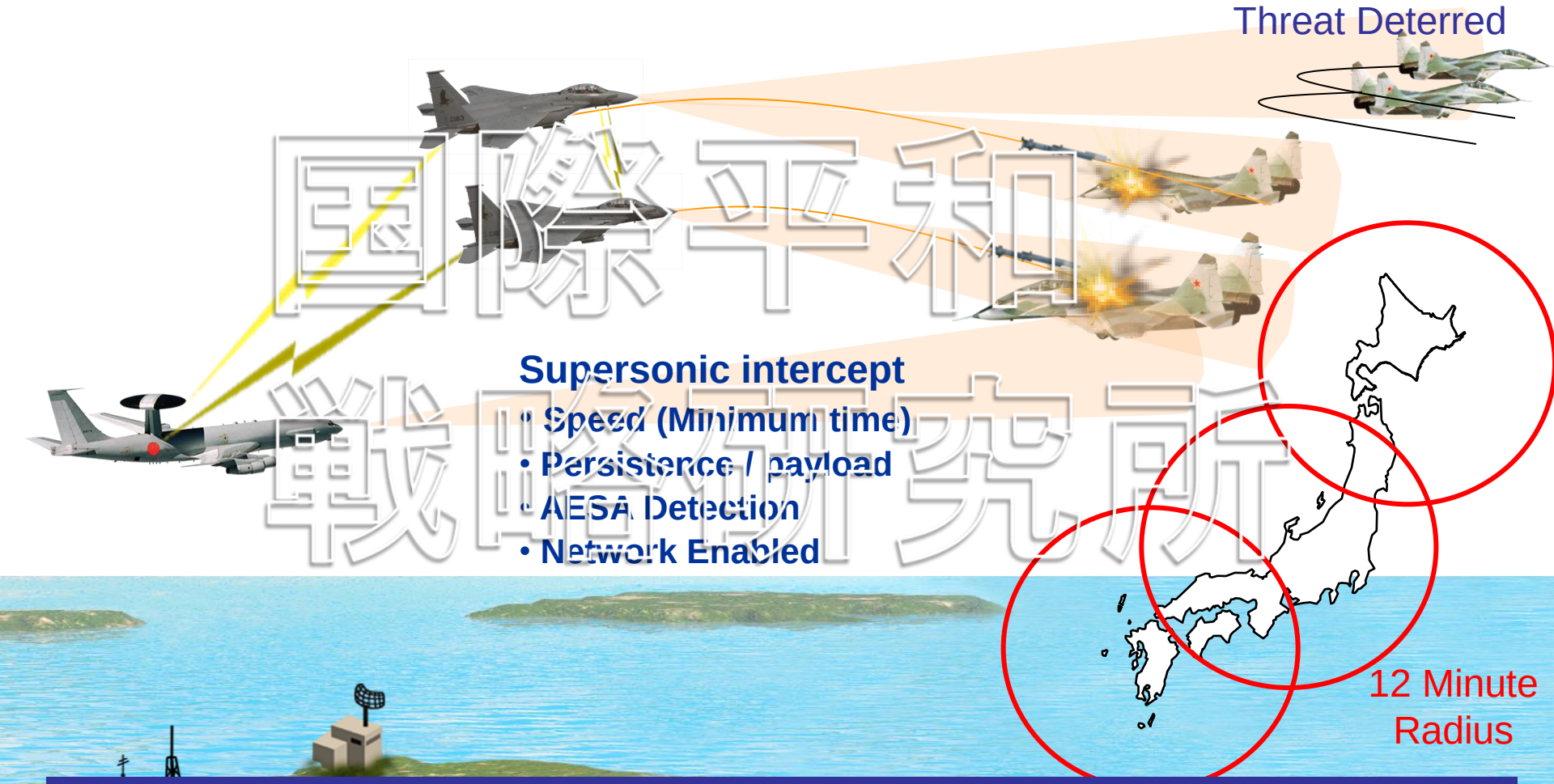
Supersonic Intercept



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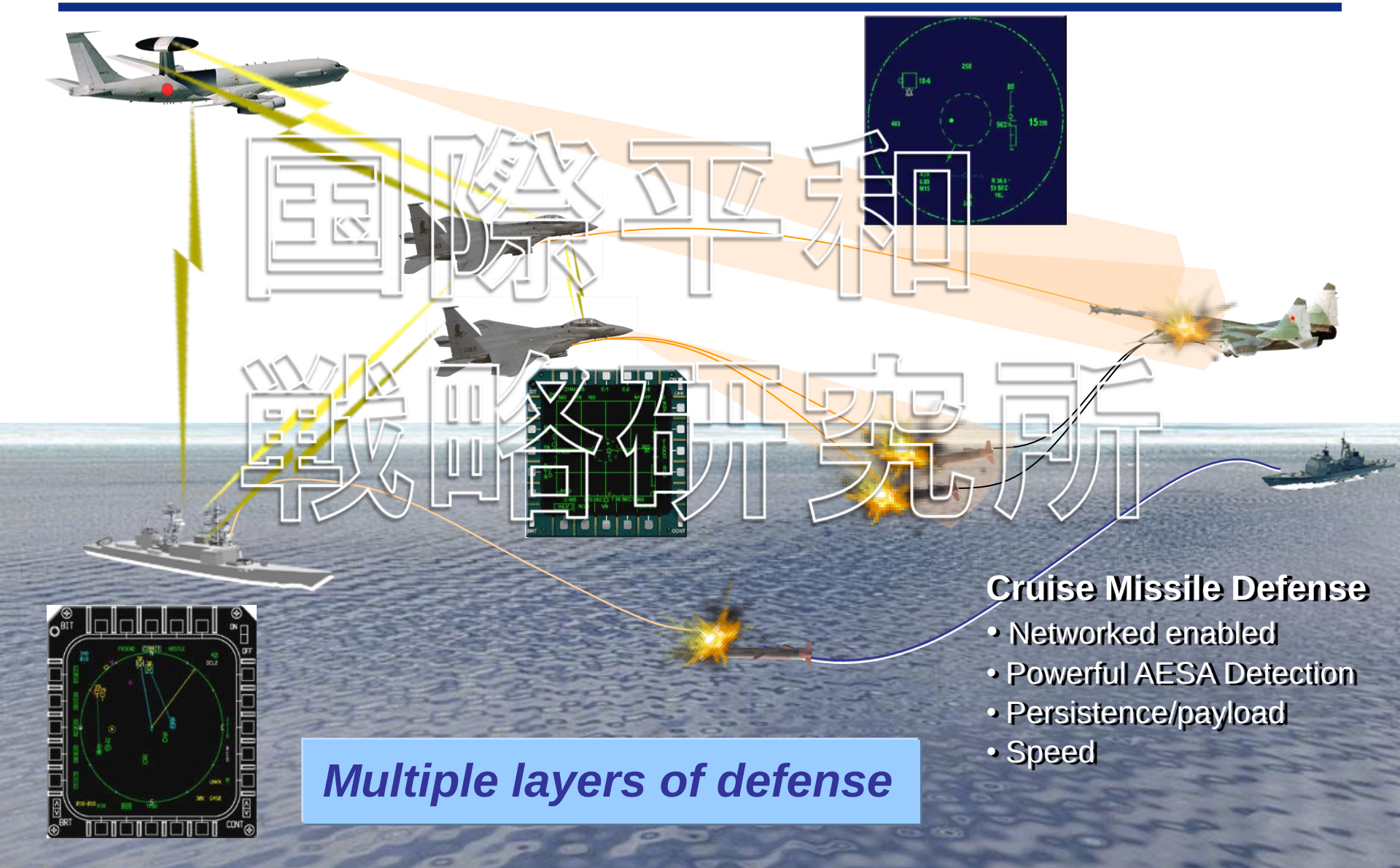
Supersonic intercept

- Speed (Minimum time)
- Persistence / payload
- AESA Detection
- Network Enabled

F-15FX with Powerful AESA Radar flying at SuperSonic speed that no aircraft can match provides intercept capability to defend the entire airspace within 12 minutes from Chitose, Komatsu, Tsuiki and Naha.

Cruise Missile Defense Operations



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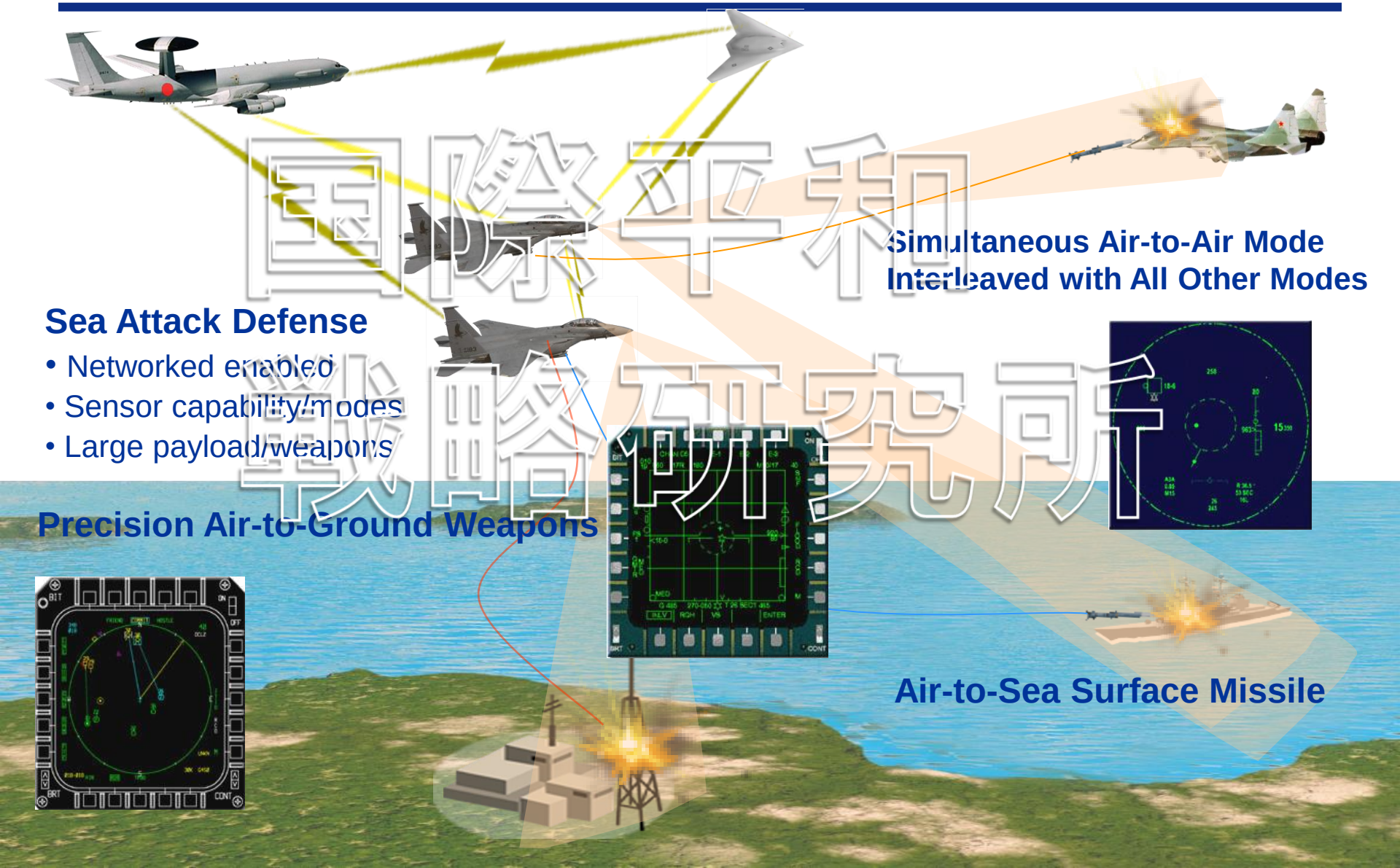
Cruise Missile Defense

- Networked enabled
- Powerful AESA Detection
- Persistence/payload
- Speed

Multiple layers of defense

Remote Island Defense Operations



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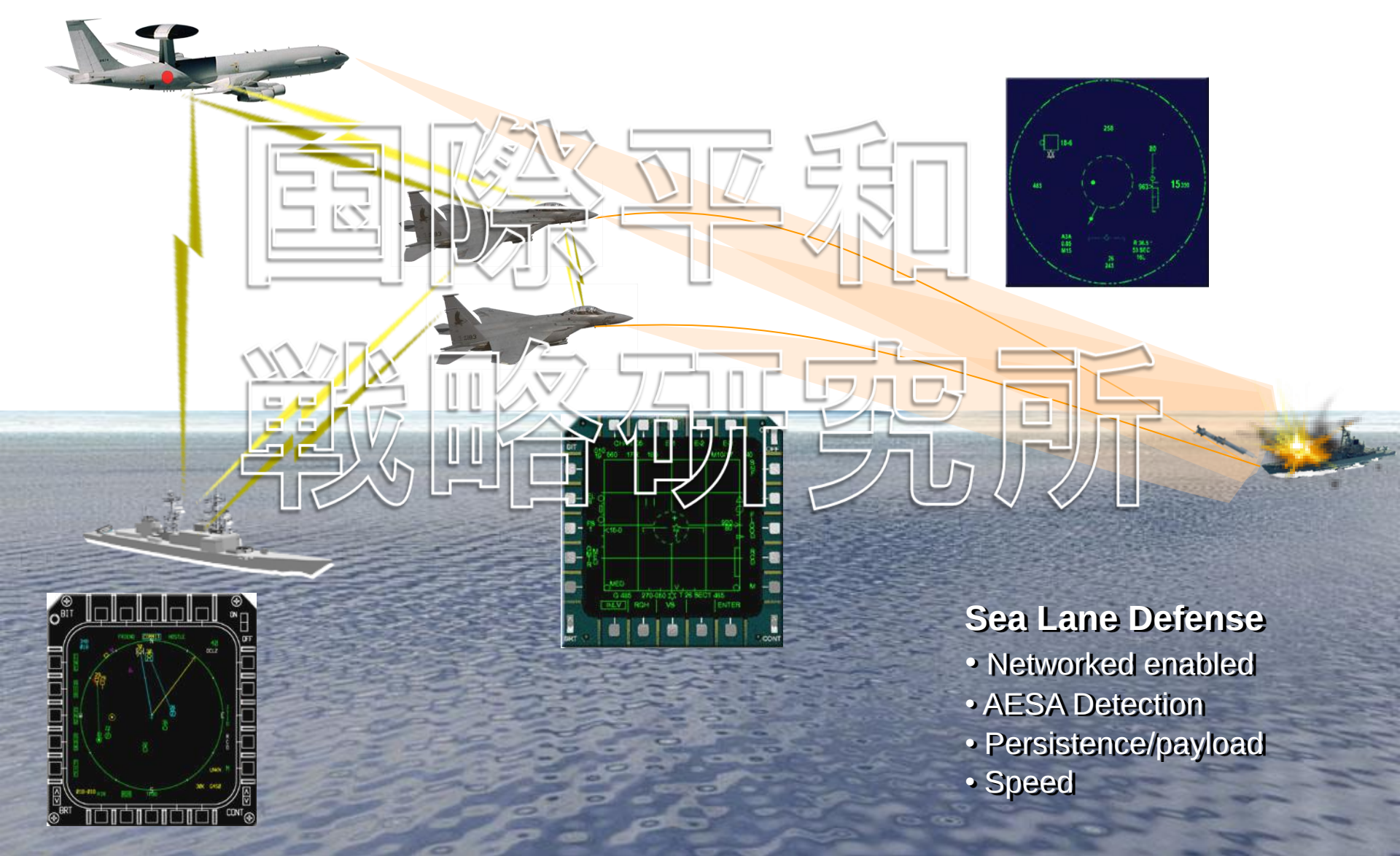
Sea Lane Defense



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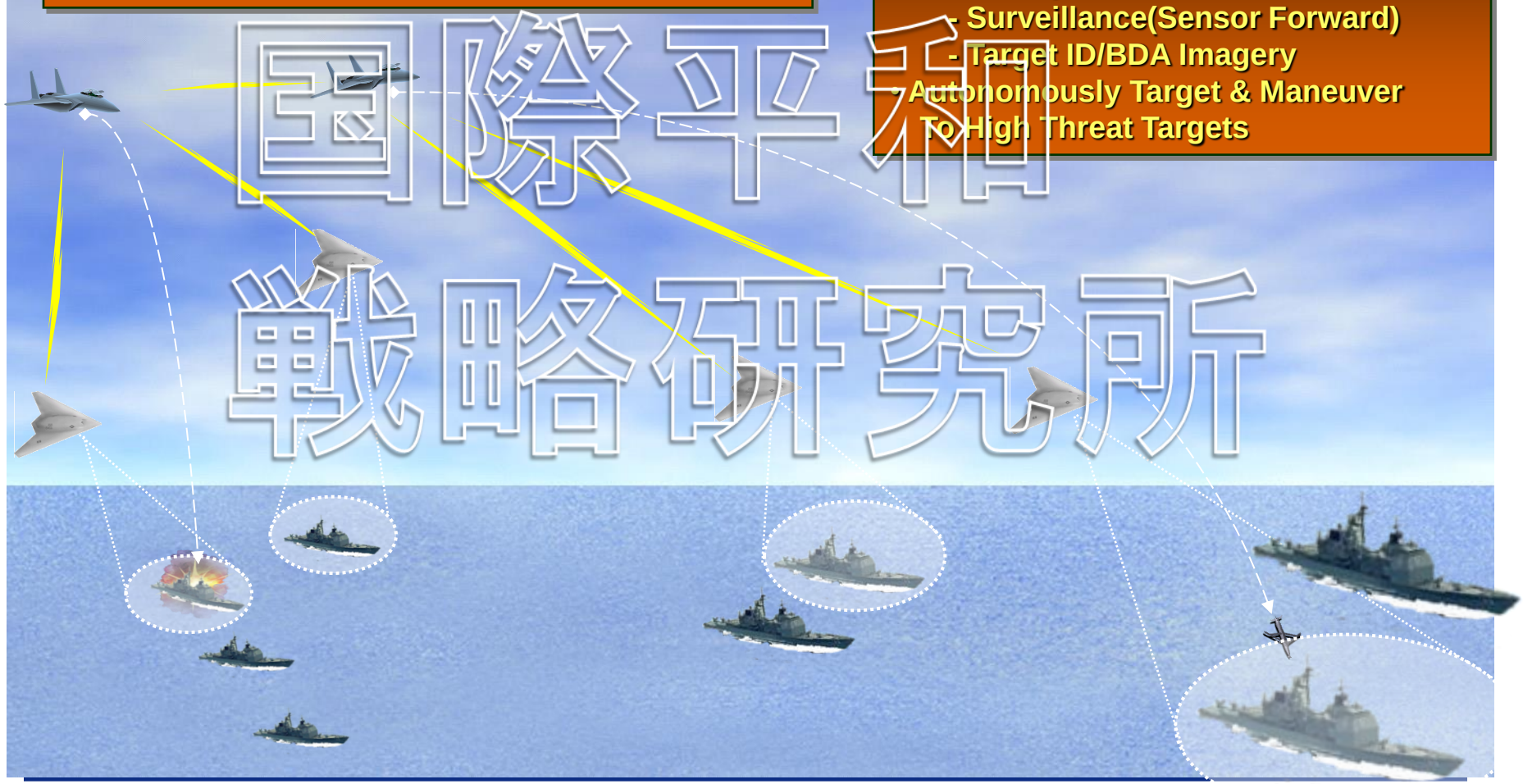
Sea Lane Defense

- Networked enabled
- AESA Detection
- Persistence/payload
- Speed

F-15FX/UCAV Maritime Interdiction

F-15FX
- Collaborates w/UCAV as Sensor Forward Team
- Both a Sensor & a Shooter

UCAV
- Unmanned CAP Airspace
- Tasked By F-15
  - Surveillance(Sensor Forward)
  - Target ID/BDA Imagery
- Autonomously Target & Maneuver To High Threat Targets



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Battlefield Interdiction/CAS

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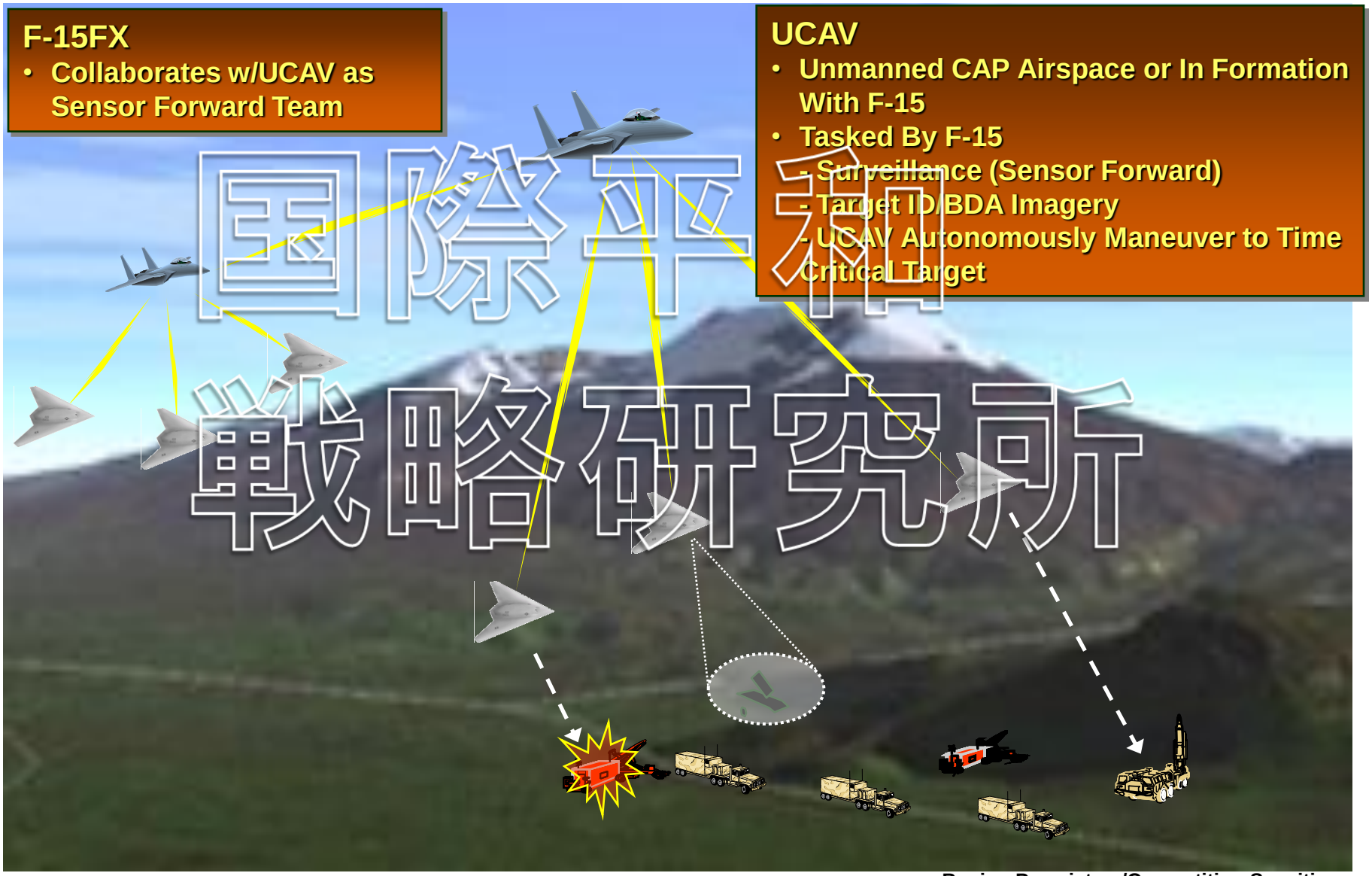
F-15FX/UCAV Collaboration

F-15FX
- Collaborates w/UCAV as Sensor Forward Team

UCAV
- Unmanned CAP Airspace or In Formation With F-15
- Tasked By F-15
  - Surveillance (Sensor Forward)
  - Target ID/BDA Imagery
  - UCAV Autonomously Maneuver to Time Critical Target



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F-15FX Delivers Regional Air Power

Supersonic Intercept
450 KM in 12 Minutes
(4 AIM-9, 4 AIM-120)

Combat Air Patrol:
1600 KM
(4 AIM-9, 4 AIM-120)

Sea Control:
1350 KM
(2 AGM-84, 2 AIM-9, 2 AIM-120)

Battlefield Interdiction/CAS:
1600 KM
(16 SDB, 2 AIM-9, 2 AIM-120)

Deep Strike:
1600 KM
(4 GBU-31, 2 AIM-9, 2 AIM-120)

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Logistics Support

Advanced Support Technology Integrated into F-15FX

Aircraft & Subsystem Design Enhancements

Integrated Maintenance Information System (IMIS)

Integrated Electronic Tech Manuals (IETMs)

Computerized Fault isolation & Reporting

Advanced Logistics Systems

Operator Defined Support Structure

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- Introduction to F-15FX
- F-15FX Systems and Operations
- CONOPS and Mission Profiles
- Logistics Support
- **Summary**

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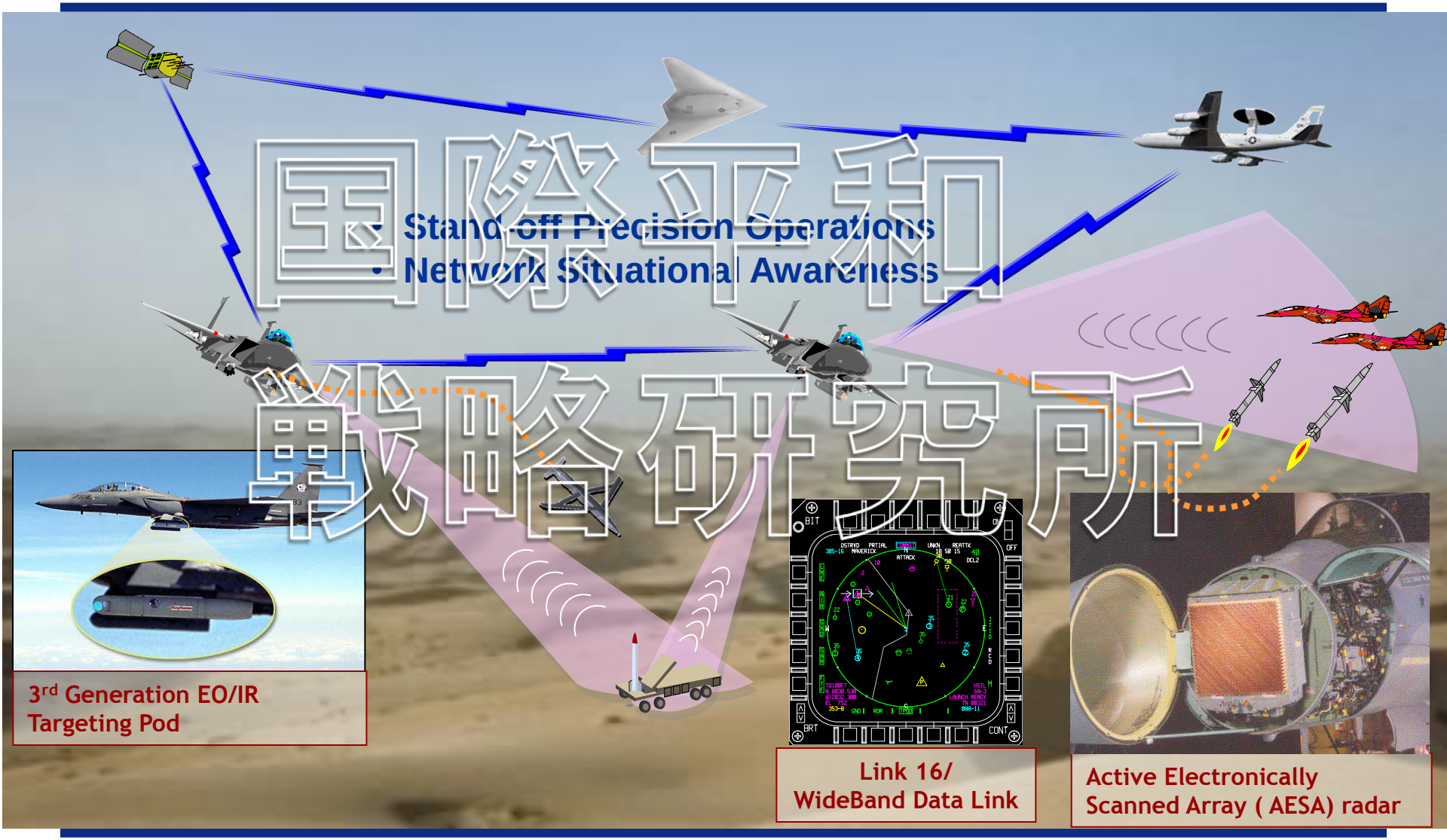
Boeing Proprietary/Competition Sensitive

F-15FX – A Lethal Deterrent

Boeing Proprietary/Competition Sensitive

Network Enabled

Able to Continually Exchange and Share Sensor Data without Voice Communications



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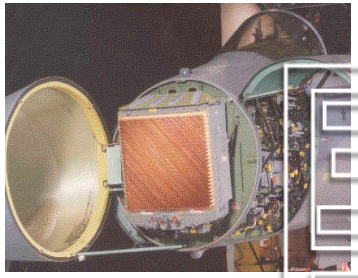
Survivable



Situational Awareness
- Network Enabled
- Onboard Systems

Countermeasures
- Fully Integrated
- All Internal

A Balanced Approach

Advanced Sensors
- Long Range
- Fully Integrated

Weapons
- Standoff Ranges
- Self Protection

Aircraft Design
- Redundant Systems
- Robust Structures
- LO Enhancements

Most Survivable Combat Proven Fighter Today

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F-15FX F-15J

Beneficial Commonality
Beneficial Differences

F-15J Infrastructure supports F-15FX
- Common elements in production and support
- Common elements in aircrew training
- Common LRU's in (V)1 and (V)3 radar
- F-15FX Systems and Advanced Support programs may have mutual cost sharing benefits with F-15J

All other F-15 A-D operators have introduced F-15E's into their fighter force structure and continue to add more
- C's and E's have never been grounded for a common issue
- F-15J and F-15FX have Complementary Operation & Support
- High Degree of Interoperability with USAF

New design, production and support technologies significantly reduce acquisition and life cycle costs

New state-of-the-art systems provide the best capabilities available

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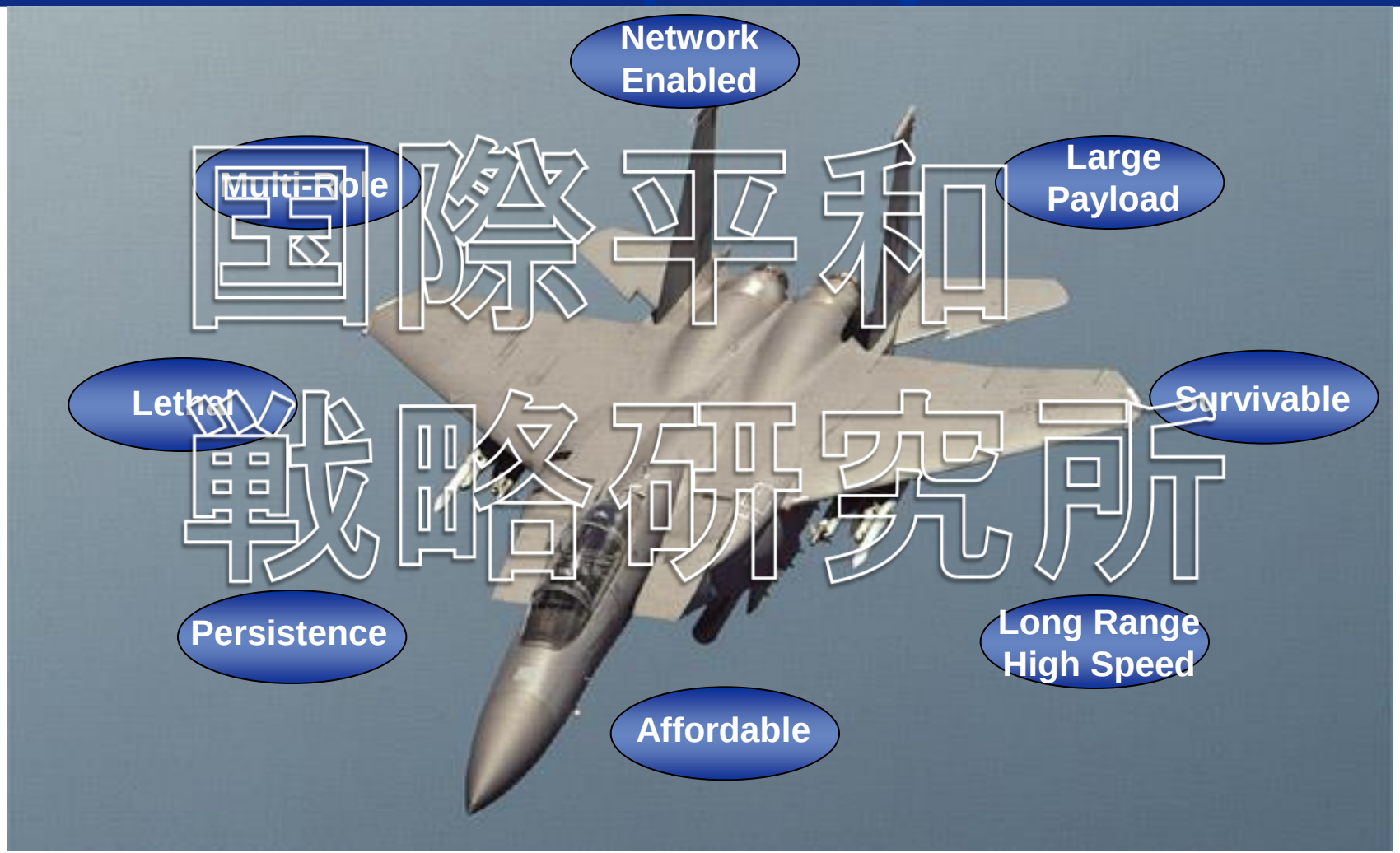
F-15FX has the Required Capability Attributes



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F-15FX has the Required Program Attributes

- Technology Transfer
- Licensed Production
- Japan Integration of Indigenous Systems and Weapons
- In-Country Support
- Cost Effective Acquisition and Life Cycle Costs
- Easily Introduced into JASDF's Force Structure
- Advanced Logistics Support Systems

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Boeing will work with JDA and Japan Industry to establish the best balance of capability, cost, Japan content and Japan workshare

Boeing will make the best coordination with USG and U.S. Industry to satisfy ASO's requirements for the FX Program

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F-15FX

A Line of Defense
that Nobody Crosses