T-50 Application in an Interdependent Warfighting Environment

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Maj. General Deuk-Hwan Kim

ROK DAPA
I. ROKAF T-50 Development Concept
II. T-50 Program status
III. T-50 Performance
IV. T-50 Application to Future Warfare Environment
V. Conclusion

The views expressed in this presentation do not reflect the official policy or position of the Korea government or the Department of Defence.
I. ROKAF T-50 Development Concept
Advanced Jet Trainer (T-50)

Integrating two types of Aircraft

Present

Basic | Advanced | Fighter Lead-In
--- | --- | ---
T-38 | Hawk | F-5

Future

Basic | Advanced / Fighter Lead-In | T-50

Minimizes Training Period

Combat Readiness

T-50 Training System

Current Training System

Training Air Bases

Tactical Fighter Wing

Time
### Operational Needs (2/2)

#### Light Attacker (A-50)

<table>
<thead>
<tr>
<th>Mission</th>
<th>Class</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
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<tbody>
<tr>
<td>A-A</td>
<td>A-A</td>
<td>OCA</td>
<td>DCA</td>
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<tr>
<td>A-G</td>
<td>A-G</td>
<td>Deep Int *</td>
<td>Interdiction</td>
<td>CAS</td>
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<table>
<thead>
<tr>
<th>Aircraft Types</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
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<tbody>
<tr>
<td>F-15K</td>
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<tr>
<td>KF-16</td>
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<tr>
<td>A-50</td>
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</table>

* OCA: Offensive Counter Air
* DCA: Defensive Counter Air
* CAS: Close Air Support

ROKAF uses A-50 for “low” category combat aircraft.
Design Concept

The baseline of design is TA-50
Performance Design Goal

**Fighter/Trainer Performance Index**

- **Wing Loading/Lift (W/SC_{La})**

- **Fighter-Like maneuver performance**

- **T-50**
  - T-41
  - KT-1
  - Hawk-60/100
  - T-37
  - T-45
  - T-38
  - F-5B
  - F-15C
  - F-16
  - Mirage-2000
  - F-22
II. T-50 Program Status
## Program Schedule

<table>
<thead>
<tr>
<th>Year</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
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<th>2006</th>
<th>2007</th>
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<td>Full-Scale Development (FSD)</td>
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<td>Concept/Detail Design</td>
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<td>Flight Test</td>
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<td>Integrated Logistics Support / Training System</td>
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<tr>
<td>Up-grade Program</td>
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</tbody>
</table>

- **1999**: CDR
- **2000**: Production Contract
- **2001**: 1st A/C Delivery
- **2002**: Production
- **2003**: Production
- **2004**: Production
- **2005**: Production
- **2006**: Production
- **2007**: Export / A-50 Up-grade
LM Aero is not only Co-developer but also an Investor of T-50 Program.

Korean Government 70%
- $2 Billion

KAI 17%
- Primary Contractor
- Aircraft Design & Integration
- Major Component Fabrication

LM Aero 13%
- Primary Sub-contractor
- Flight Control & Avionics Development
- Technical Assistance
III. T-50 Performance

Nick Name: GOLDEN EAGLE
<table>
<thead>
<tr>
<th>Description</th>
<th>T-38 Talon</th>
<th>Hawk</th>
<th>T-50</th>
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<tbody>
<tr>
<td>Span (ft)</td>
<td>25.25</td>
<td>30.8</td>
<td>31.0</td>
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<tr>
<td>Length (ft)</td>
<td>46.4</td>
<td>39.3</td>
<td>43.1</td>
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<tr>
<td>Wing Area (sq. ft)</td>
<td>170</td>
<td>190.1</td>
<td>255</td>
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<tr>
<td>Empty Weight (lb)</td>
<td>7,663</td>
<td>8,877</td>
<td>14,200</td>
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<tr>
<td>Max. Takeoff Weight (lb)</td>
<td>12,050</td>
<td>20,060</td>
<td>29,700</td>
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<tr>
<td>Thrust to Weight Ratio</td>
<td>0.74</td>
<td>0.52</td>
<td>1.0</td>
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<tr>
<td>Internal Fuel (lb)</td>
<td>2,746</td>
<td>3,159</td>
<td>4,800</td>
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The T-50 is the largest in T/W and wing area.
Fighter-Like Performance
- Horizontal and Vertical Control Surface Sizing
- Blended Wing-Fuselage
- Variable-Camber Wing

Fore-body Strakes
- Improves Lift & Pitch Responses
- Maintain Directional Stability
- Reduces Trim Drag & Buffet Intensity

Proven, Reliable Engine (F404)

Wing Designed For Training
- Large Wing Area for Turning Performance & Take Off / Landing Performance
- Optimizes Wing Root Thickness for Strength, Durability, and Aero Efficiency

Modern Cockpit
- Integrated Digital Avionics
- Advanced Digital Flight Control System
- Sophisticated Sub-System
Maneuver Performance

1G V-H Envelope

Main Region of AJT/LIFT/OCU Training

T-50

4th-5th Generation Fighters

Typical Trainer

Mach 1.0

Air Speed

T-50’s Performance Envelope Provides a Wide Variety of Training Missions
Flying Characteristics

Positive Training
- Consistent Flying Characteristics
- +8G/-3G Maneuver
- Optimized for Knowledge/Skill/Attitude

Active Control Stick
- Programmable Gradient
- Electrically Coupled
- Feel and Motion
- IP’s Paddle Off

Flight Control System
- Ease of Maintenance
- High Reliability

Care Free Handling
- AOA-G Limiter
- Anti-Spin Logic
- Stall/Departure Free

Safety
- Triple Redundancy
- Continuous System Self Test

Training Modes
- Selectable Handling Qualities for Training
- Embedded Training

Easy To Fly
- Superior Low Speed
- Handling Quality

Fighter-Like Maneuver and Safe Trainer-Like Low Speed Handling
Comparative Superiority

- *F-16 has better payload, range, thrust performance*
- *T-50 has better PGM, Flight Control, Avionic system*

<table>
<thead>
<tr>
<th>Attack Capability</th>
<th>Payload</th>
<th>F-16</th>
<th>T-50</th>
<th>Superiority</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>10,000 lb</td>
<td>16,000 lb</td>
<td></td>
<td></td>
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<tr>
<td>PGM capability</td>
<td>GPS/INS</td>
<td>LGB</td>
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<tr>
<td>Aerodynamics</td>
<td>Thrust</td>
<td>17,700 lb</td>
<td>29,100 lb</td>
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<tr>
<td>Flight Control</td>
<td>Control Type</td>
<td>3-Dimension Digital</td>
<td>1-Dimension Analog</td>
<td></td>
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<tr>
<td></td>
<td>3-Dimension Digital</td>
<td>1-Dimension Analog</td>
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<tr>
<td>Avionics</td>
<td>Computing Margin</td>
<td>80 %</td>
<td>10 %</td>
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<tr>
<td></td>
<td>5 x 5 Color</td>
<td>4 x 4 Mono</td>
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</table>

Strong Resemblance in Cockpit
The Total Training System Approach Provides a Proven, Lowest-Risk and Highest-Quality Pilot Training Solution
Advanced GBTS
Essential Part of Total Training System
Improved Training Effectiveness

T-50 Training Program

Skill Level

Basic

Advanced

Fighter Lead-IN

OCU

NOTIONAL T-50 SYLLABUS:
- Training Effectiveness Increase
- Reduction of Training Time & Expense

CONVENTIONAL SYLLABUS:
- Basic Tactics
- Formation
- Navigation
- Instrument
- Basic Flight
- Operational Tactics
- Additional Employment
- Weapon Sensors

T-50 Training System Increases Skill Level and Reduces Training Period
T-50 Syllabi is Established Based on MIL-HDBK-29612 (ISD)

Single Platform For AJT/LIFT Increases Training Efficiencies

OCU Download is Derived From
- Similar System and Operation Procedure
- Similar Handling Quality and HOTAS
- Same Avionics System Concept
- Perform Same Mission Task as F-16 Training Course

Preliminary Analysis Shows that the T-50 Training System Can Reduce the Training Sorties Dramatically!
IV. A-50 Application to Future Warfare Environment
A-50 Derivatives - Light Attacker (FA-50)

- Attack Capability Reinforced through the Enhancement of Survivability and Lethality

**TA-50 Equipment**
- Existing Airframe and Subsystems
- Weapon Capability (Max 10,000 LB)

**New Equipment**
- Survivability Improved: RWR, CMDS
- Lethality and Mission Range Improved:
  - Precision Guided Bomb: JDAM, WCMD
  - Data Link

Identical OML to TA-50 LIFT
A-50 Derivatives - Utilities

RA-50
- Survivability (RWR, CMDS)
- EO/IR Pod
- ECM Pod

EA-50
- Survivability (RWR, CMDS)
- Anti-radiation missile
- Jammer Pod

A-50 has Derivative Development Potential for RA-50 and EA-50
Increasing usefulness of small platform

- **Mk.82 Free Fall Bomb**
  - 500lb x 4 = 2,000lb

- **SDB (GPS Guided Stand-off Bomb)**
  - 250lb x 4 = 1,000lb

- Increase in demand for Small Platform like a A-50 in NCW Environment
  - Replace sensor by network will save empty weight
    - F-15K: Radar, IRST and sensor structure weight about 2400 lbs
    - About 8% of empty weight

- Smaller/More Precise Weapon will cause downsizing fighter aircraft
Increasing Cost-Effectiveness of small platform with Small Guided Bomb & Long Range Stand-off Missile

- Improved CAS Mission with A-50
  - Multiple target attack capability with beyond enemy's SAM range
  - Deep strike with long range Air-to-Ground Missile (Over 200 nm)

- SHRAD
- Long Range SAM

- Long Range delivery: 200nm (370km)
- 40nm (78km)
- Stand-off Multiple target delivery

- 12 x SDB
- 2 x JASSM
A-50 could UAV controller role

- Command Mission Diversion/Abort for UAV
- Expand Line-Of-Sight limitation and enables communication relay

T-50 Platform have an economical advantage for UAV Control & Communication Relay mission
A-50 UCAV for SEAD Mission

- Cockpit: Replace with 2,300lb Additional Fuel Tank
  -> 100nm increase range
- Gun: Replace with UAV control system

A-50: (2) AIM-9 + (6) MK82 + (1) 150 Tank
A-50 UCAV: (2) HARM + HTS + 150 Tank + Cockpit Tank

Replace A-50 UCAV cockpit with additional fuel tanks, that can be operated in SEAD mission
V. Conclusion

T-50 is the Future in an Interdependent Warfighting Environment of Korea