# Headquarters U.S. Air Force

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# Directed Energy Solutions

**Col John "JC" Costa**

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**UNCLASSIFIED BRIEFING**

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# *Overview*

- **DE Effects**
- **Laser Advantages**
- **Types of Lasers**
- **RF Advantages**
- **Task Forces**
- **Offensive Roadmap**
- **Passive/Active Defense**
- **Advanced Tactical Laser**
- **DE Threats**

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# DE Advantages

- Effects Based Operations Redefine Precision
  - Destruction of Target May Not be Desired
  - Collateral Damage and Reconstruction Costs
- Allows for Targeting of Specific Component
- Graduated Effects
- Reduces Predictive ISR Requirement
  - Near Instantaneous Results
  - Stand-off capability

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# *Laser Advantages*

- **Extremely Precise**
- **Deep Magazine**
- **Rapid retargeting**
- **Self-defense**
- **Minimal Collateral Damage**
- **Graduated Effects**
- **Highly agile speed of light delivery**
- **Low incremental cost per shot**

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# *Types of Lasers*

- Chemical (THEL/ABL)
  - Power Derived from Chemical Reaction
  - Very Powerful – Large Footprint
- Solid-state (JHPSSL)
  - Electricity Passed through Crystal
  - Less Powerful - Smaller
- Free Electron
  - Tunable Electric Laser
  - Large Footprint
- Diodes
- Fiber

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# *RF Advantages*

- **All Weather**
- **Non-lethal**
- **Covert action is possible**
- **Low targeting, tracking, and pointing accuracies are required**
- **Protective measures are *not* readily available**
- **Reconstitution is easier**

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# Task Forces

## DETF Established Sep 2004

- 2-Star GOSG
- 75 DOTMLPF Action Items

## EPTF Established Oct 2004

- DOD, DHS, DOT & DOJ

## IUBIP Established Sept 2005

- OSD, JOINT, Services & DHS

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# Offensive Roadmap

- Passive/Active Defense Development—Sensors
- Support Non-Lethal

- High Powered Microwave Munitions & Platform
- Force Protection
- Advanced Tactical Laser
  - ATL—DE Cornerstone

# Passive/Active Defense

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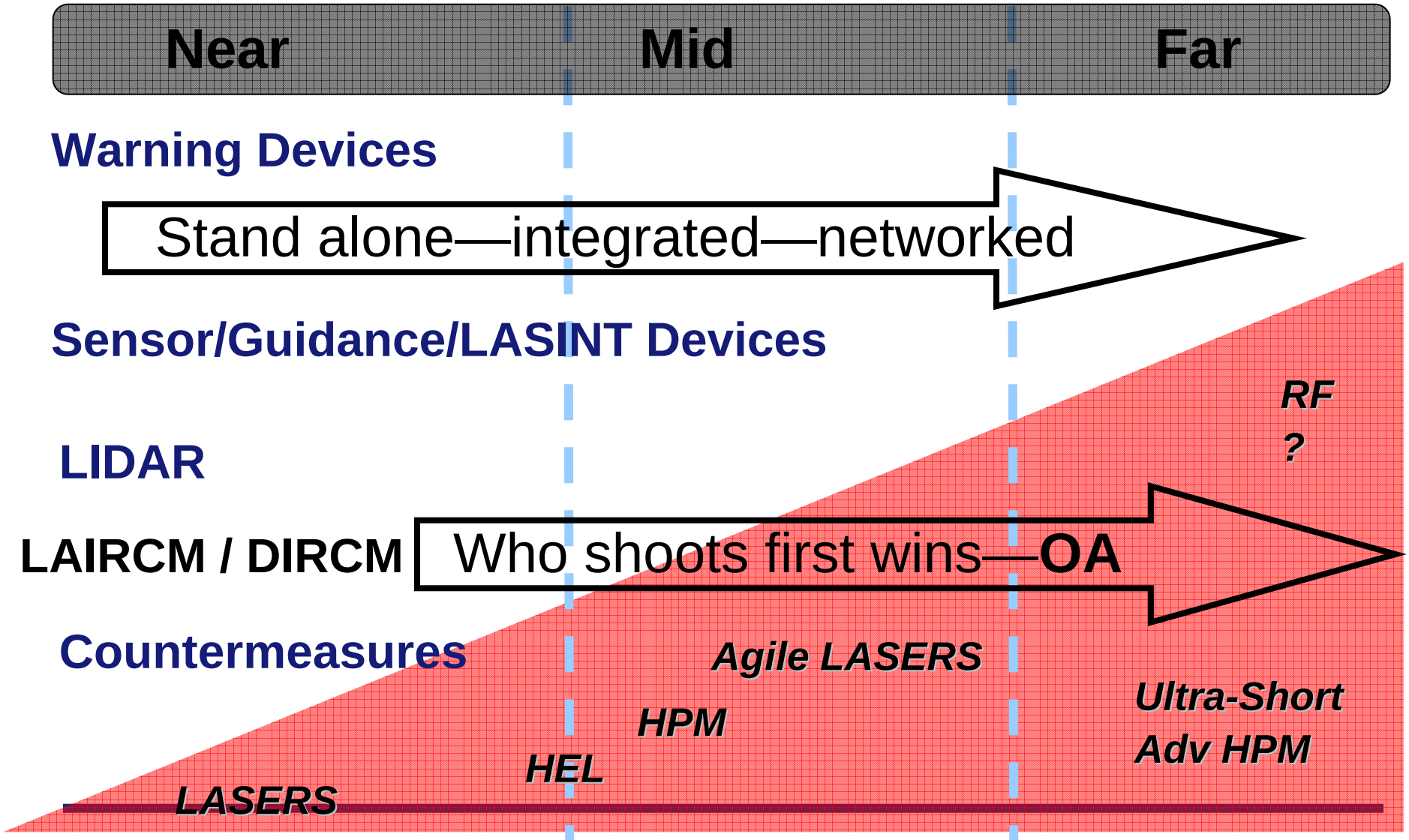

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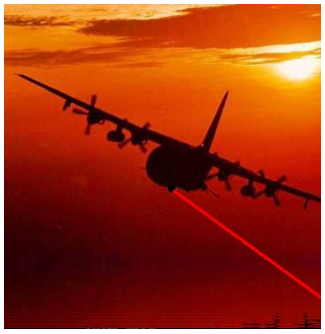
# *Advanced Tactical Laser*

- **Fills QDR force requirements & CRRA gaps**
- **Potential to greatly lower:**
  - **Collateral Damage**
  - **Reconstitution Costs**
- **Provides new capabilities against targets**
  - **New effects & new targets can be engaged**
- **Path for rapid HEL employment--only mature program**
- **Lowers cost for future DE weapons**
- **Captures knowledge for Electric Lasers**
  - **Numerous components remain**



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# ATL Answers

**Integration**

1. Weapon integration
2. System power and thermal control
3. Aircraft
4. Avionics and BMC4I

**Laser device (COIL)**

5. Resonator optics
6. Beam management
7. Power distribution and management
8. Cooling

**Optical systems**

9. Acquisition Tracking and Pointing (ATP)
10. Sensors
11. Beam Director
12. Beam director aero-optical effects

**Beam Propagation Effects**

13. Precision Engagement
14. Target / material interactions
15. Collateral damage effects
16. Weapon command and control

**Operational concept**

17. System capabilities / trades
18. CONOPS Modeling & Simulation
19. Mission planning
20. Master Test Plan / System Test & Evaluation

**Logistics and support**

21. Training
22. Infrastructure and logistic support
23. Reliability, Availability and Maintainability (RAM)
24. GSE & STE
25. Software

**Knowledge & Components for**
**Electric-based Weapon**
**Substantial– 16 Elements**
**Some– 9 Elements**
**Little or none– 0 Elements**

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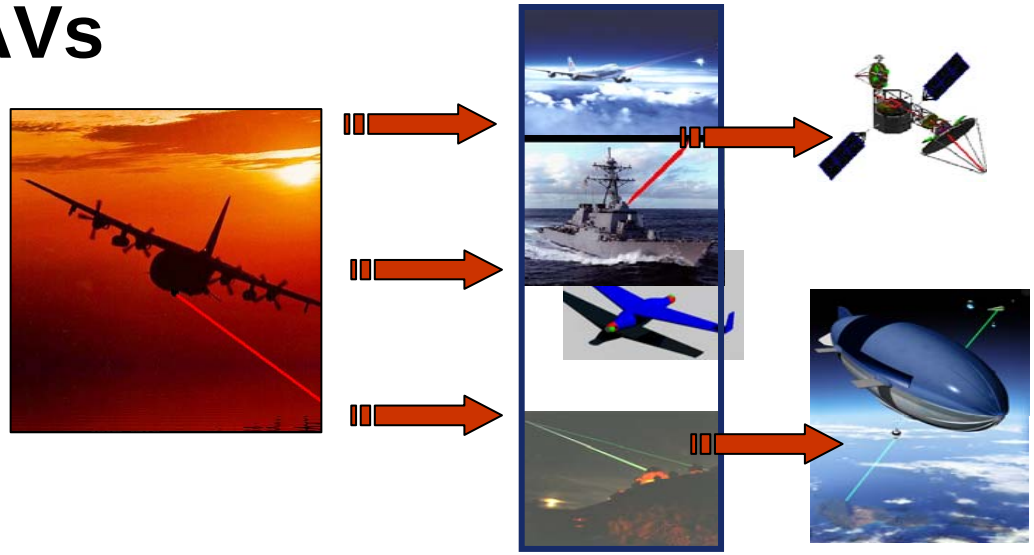
# ATL is High Energy Laser (HEL) Cornerstone

- Effects analysis (target vulnerability)
- Counter IED & UAVs
- ISR (LIDAR)
- Bomber defense
- Tactical defense
- Ground attack
- Collateral damage assessments
- Exploitation of non-lethal to lethal capability



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# DE Threat

- DE Denies Full Kill Chain-Even at Low Power Levels
  - Find, Fix, Track, Target, Engage & Assess in Air or Space
- Threatening Devices Available Today
  - Use: non-State actors or US civilians
  - Future: more power, smaller and agile
- NEED SPEED OF LIGHT TO FIGHT SPEED OF LIGHT
  - Requirement to find them first

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# Summary

- **Effective laser weapons are already under development and testing**
- **Integration into land, sea, air and space platforms eased by technology advances**
- **Operational concepts must be developed to guide investment and effort**

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***DETF SIPR Website:***

***http://www.a3a5.hq.af.smil.mil/a5r/a5re/docs/directedenergy.htm***

***EPTF SIPR Website:***

***http://www.a3a5.hq.af.smil.mil/a5r/a5re/docs/eyeprotection.htm***