USD(R&E)

Foreign Comparative Testing (FCT) Program Overview

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International Partnership

Strategic Opportunity

- US and Allies modernizing forces with orientation toward near-peer competition
- Allies devoting R&D resources to modernize their military capabilities in similar priority areas
- Cooperative, structured US and partner nation R&D will maximize modernization, increase interoperability, and reduce vulnerabilities

Solutions

Foreign Comparative Testing (FCT):

- Find, assess, and field mature foreign technologies to deliver affordable, near-term solutions to satisfy capability gaps, enhance lethality, and increase readiness
- US Gov-to-Foreign Industry technology evaluation executed under a contract

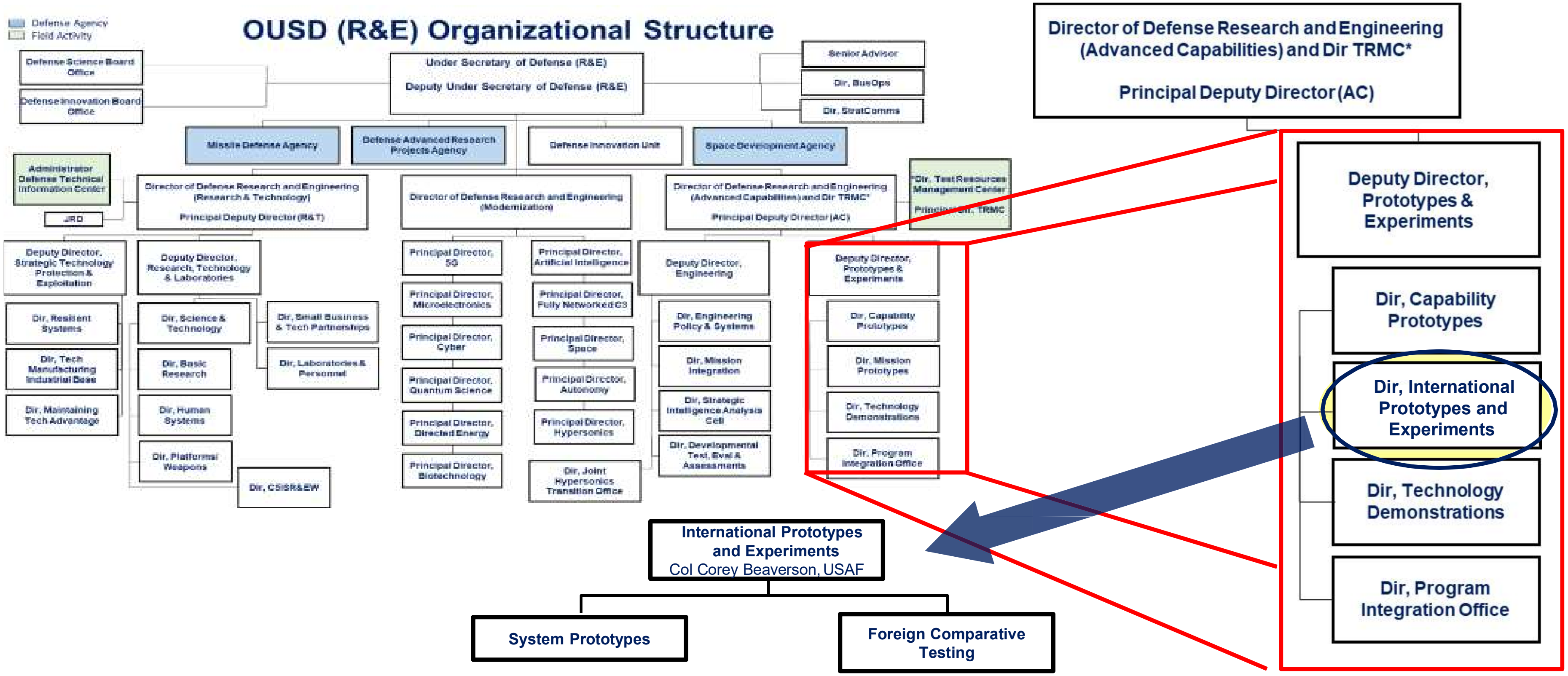
International Prototyping:

- USD (R&E) continues to identify opportunities for international partnerships in support of the NDS and modernization efforts and aligned to critical needs of the US and Partner Nations

Strengthening Partnerships to deliver operational capability

Organization

Foreign Comparative Testing can be found within the Mission Prototypes office under the leadership of Col. Corey Beaverson, USAF



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Foreign Comparative Testing

<u>Mission</u>: Find, Assess & Field World-Class Technologies to Enhance Military Capabilities and Provide Long-Term Value

- **Technologies should present:**
  - Significant cost savings resulting in positive ROI
  - Significant performance enhancements
  - Significant schedule savings resulting in earlier fielded capability
  - Novel, Innovative approaches
- ***<u>Connects</u>*** **Foreign Technologies to U.S. DoD Development and Acquisition Programs**
- **Strengthens alliances by sourcing world-class solutions to shared defense problems through *<u>"2-way street"</u>* of defense procurement**

OSD Selects & Funds Projects. The Military Services & USSOCOM Execute Projects.

USD(R&E) Modernization Priorities

- **FCT project alignment**
  - Supports national strategies, readiness and joint lethality in contested environments
  - Technologies satisfying urgent operational needs on a relevant fielding schedule
  - Technologies providing significant life-cycle cost savings
- **Aligns with OUSD(R&E) Modernization Priorities*:**

- **Trusted Artificial Intelligence & Autonomy**
- **Biotechnology**
- **Quantum Science**
- **Integrated Network Systems-of-Systems**
- **Integrated Sensing & Cyber**
- **Microelectronics**
- **Human Machine Interfaces**
- **Hypersonics**
- **Future G (beyond 5G)**
- **Space Technology**
- **Advanced Computing & Software**
- **Directed Energy**
- **Advance Materials**
- **Renewable Energy Generation & Storage**

* *https://www.cto.mil/modernization-priorities/*

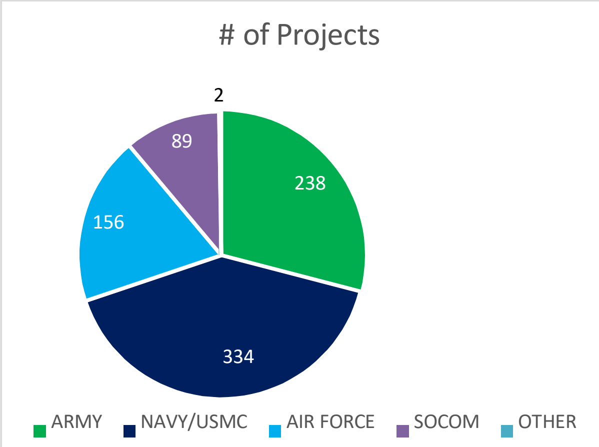
FCT Progress - Last 40+ Years

- ***OSD investment: $1.42 Billion (constant FY20$)***
  - *Procurement of 281 projects worth over $11B*
- ***Accelerates Fielding an Average of 2–4 Years***
  - *Vice starting a new U.S. defense Research & Development program*
- ***Enhances U.S. Industrial Base***
  - *Foreign vendors, 34 countries, teaming with U.S. industry*
  - *39 states & 1/3 of projects procured*
- ***Average project – $500-700K/year, 18-24 months***
  - *Review 100's of technologies*
  - *10 – 15 new starts/year*

FCT Project Breakout by Service

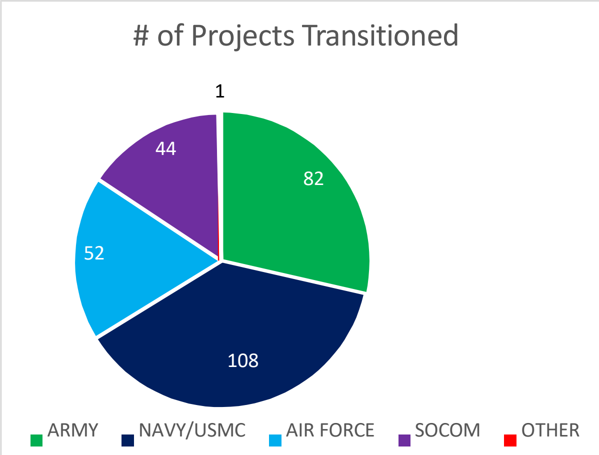
Total # Projects Funded = 819

Army 29.0 % projects
Navy/USMC 40.8 % projects
Air Force/Space Force 19.0 % projects
Special Operations Command 11.0 % projects
Other 0.2 % projects



Total # Projects Transitioned = 287

Army 28.6 % projects
Navy/USMC 37.6 % projects
Air Force/Space Force 18.1 % projects
Special Operations Command 15.3 % projects
Other .3 % projects

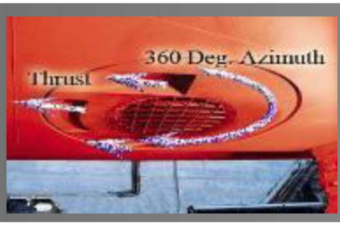


U.S. Military Services & USSOCOM Propose & Execute Projects

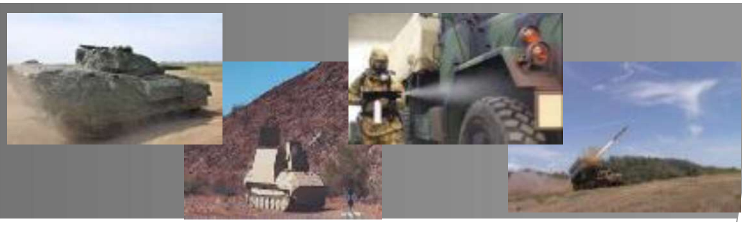
FCT Evaluation Options

Developmental Prototype (TRL 6)

Operational Prototype (TRL 7)



Qualification Test (TRL 8-9)



Assessment

Transition/ Procurement

[Technology Readiness Level (TRL)]

FCT projects may be side-by-side comparative evaluations

FCT Process

Selection Year

Oct - Dec: Global Technology Scan

Initial Proposals

Jan - Apr: Full Proposals / Project Selection

May - Jul: Global Technology Scan

Aug - Sep

Selection Criteria:

OSD (Top Down)

- Joint Warfighting Concepts
- OSD Priorities/Focus Areas
- Joint Application
- Cost Avoidance/ Long Term Value

Services (Bottom-Up)

- Mission Need
- Sponsor Support/Endorsement
- Risk (Cost/Schedule/Performance)
- Procurement Strategy

Project Execution Years 1 & 2

Contract & Funding → Test & Evaluation Phases → Reporting & Project Closeout → Procurement Decision

Expedited process available to respond to Emerging Operational Needs

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Working with FCT

- *Product Template*
- *Marketing Materials*
- *Individual meetings with FCT (Virtual or in person)*
- *Trade shows, local conferences, e.g. AUSA, Modern Day Marine, Paris Air Show, CANSEC, Farnborough Air Show, etc.*
- *Industry days in the Washington, DC area (Virtually or in person)*
- *FCT Program Team international travel*

Bring your most innovative systems and ideas

Send Us Your Product Information

Available to download at https://ac.cto.mil/pe/fct/

Product Template

- Product
- Company Name
- Country
- POC Information
- Website
- Technology Readiness Level
- Countries Using
- Application (So What?)
- Science (How It Works)
- Data (Key Performance Metrics)
- US Partners
- Previous Work w/ DoD

OSD Foreign Comparative Test – Product Template

Product: XX mm High Velocity (HV) Airburst Munitions System (ABMS)

Company Name: Advanced Systems (AS)
Country: Republic of Antarctica
Point of Contact: Mr. Jones
Phone: (555) 555-5555
Website: www.abcd.com
Email: abcd@abcd.com

Short Description: The HV ABMS consists of a Fire Control System, an Ammunition Programmer and XX x XX mm Air Burst Munitions. High explosive, Flash and Bang, Counter defilade, increased lethality, improved accuracy.

Technology Readiness Level (fielded, lab tested, operational test): TRL: 9 The HV ABMS is qualified and in production.

Countries using the technology: Madagascar, Dominican Republic, Greenland, etc.

Application: (the so what?) The HV ABM is specially designed to allow soldiers to effectively engage enemies in defilade and to provide improved accuracy and higher lethality through a technologically improved muzzle velocity compensation capability.

Science (how it works): Muzzle velocity compensation for the immediate round fired. The 40mm HV ABMS is an upgrade kit to existing launchers to provide Air Bursting Precision capability. The FCS accurately lazes the target and the ballistic card computes the time to burst. The computed time to burst based on the measured velocity is programmed into the fuze only upon exit at the ammunition programmer. Enhanced safety with its built-in self-destruct mode and gives ABM the ability to function as a point detonating HE cartridge as well as an Air-Burst cartridge.

Data:
• Grenade Length: XX mm • Weight : XXX gm
• Muzzle Velocity : XXX m/s • Maximum Range: XXXX m
• Lethal Radius : X m • Arming Distance : XX to XX m
• Fuze Type : Programmable Time Fuze

U.S. Partner: AS does not currently have a relationship with a US company.

Previous work with DoD: Technology developed through US DoD laboratory funding.

Help us understand how your technology is Better, Affordable or Novel!

How to Get More Info

- ***FCT Webpage – https://ac.cto.mil/pe/fct/***
  - *Additional background information on FCT - No CAC needed – for thispage*
- ***Contact the Security Cooperation Office / Attachés in the U.S. Embassy in your country***
- ***Contact your Embassy in DC – Defense Attaché or the Trade / Science & Technology organization***

- ***Contact FCT Program directly – either the main office or Service/SOCOM specific contacts given in this brief (slide 13)***

Strengthening Partnerships - Delivering Operational Capability

Key Points of Contact

OSD	FCT Office		571-372-6803
	Col Corey Beaverson	corey.beaverson@us.af.mil	571-372-6825
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	Rino Imperiale	rino.imperiale.civ@army.mil	410-306-4828
Navy/USMC	Arthur Webb	arthur.webb@us.navy.mil	202-404-2552
	Mark Stoffel	mark.stoffel.ctr@us.navy.mil	571-227-6905
	Lilia Ramirez	lilia.l.ramirez.ctr@us.navy.mil	703-405-1311
Air/Space Force	William "Bill" Reed	william.reed.11.ctr@us.af.mil	571-215-8926
SOCOM	Gail Kemeliotis	gail.m.kemeliotis.ctr@socom.mil	813-826-0192

HISTORICAL EXAMPLES

Green Pulsed Lasers for Optical Communications

Resilient undersea communications capability

Technology

- Undersea platforms rely on very low frequency (VLF) radio waves, which operate at low data rates of hundreds of bits/sec and leave the platform susceptible to detection

History

- OCOMMs addresses these problems with increased data rates of up to 100 times that of VLF and enables undersea platforms to communicate at operationally relevant depths. Current TRL: 7 Expected TRL: 7
- Country of Origin: Lithuania

Cost

- FCT funds: $0.678K; Sponsor (Navy) funds: $1.7M

Schedule

- Project approved on October 2022
- Testing will continue through 2024

Testing

- Green pulsed lasers (GPL) allow high bandwidth optical communications (OCOMMS) links through water and air
- Air-cooled GPL with low size, weight, power, (SWaP) have the potential to increase performance and reduce cost of OCOMMs terminals on air and sea vehicles
- Investigate Quantum Light Instruments GPL for performance improvements over current American GPL for OCOMMS

Transition

- Transition Strategy: PMW 770 is exploring an OCOMMS transitions plan for a current JCTD capability to a middle tier acquisition project.

Benefits

- Fills a capability gap for the Navy's Resilient undersea communications

Other

- Secondary Component: Army, Air Force – share results of testing to enable a low-SWaP all-weather resilient comm path

Unmanned Military Vehicle Mobility in Arctic Environments

Current state

Inadequate payload

Immobilized

Immobilized in Arctic environments

Proposed state

Arctic mobility

Medevac

Resupply

Defense

INCREASED MOBILITY FOR ARCTIC COMBAT

Technology

- Small Unit Support Vehicle (SUSV) was the last manned Arctic capable military vehicle, no longer in active duty.
- Military vehicles immobilized in Arctic conditions, too heavy, insufficient traction.
- No identified lightweight reconnaissance vehicle to scout and provide advanced knowledge of terrain.

History

- There currently are no identified manned or unmanned Arctic specific vehicles within the U.S. Army.
- Estonia has been at the forefront of Unmanned Arctic vehicles

Cost

- FCT funds: $0.685M; Sponsor (Army and Partners) funds: $1.8M

Schedule

- Project approved October 2022
- Scheduled to be completed in FY-23

Testing

- Conduct a quantitative technical evaluation of THeMIS UGV Arctic mobility
- Field tests for tractive force, and maneuverability on snow and ice surfaces.
- Field tests for slope climb on snow
- Compare THeMIS performance against existing Arctic mobility metrics
- Tests to be conducted at facilities near to CRREL in NH and VT

Transition

- Transition to U.S. Army through Army Futures Command Next Generation Ground Combat Vehicle CFT Robotic Ground Vehicle program or through a group or command with an Arctic focus and interest in the outcome of the FCT effort such as USASOC/SOCOM or USARAK

Benefits

- "U.S. Arctic deterrent will require agile, capable, and expeditionary forces".

Other

- R&D savings of at least $20M by adopting this technology over new platform development*
- $5.8M manufacturing facility (300 units per year) plus wages for 53 full time employees.*
- $64M O&S Life-Cycle Cost Avoidance using 80 THeMIS UGV's instead of manned CATV. *based on numbers from Milrem Robotics

Naval Strike Missile (NSM)

Technology
- Highly survivable, anti-surface missile with a range of 100+ nm
- State-of-the-art design with low observable features
- Imaging Infrared seeker and onboard database capable of independent target detection, recognition, and discrimination
- Multi-purpose warhead with intelligent fuze

History
- The Norwegian Naval Strike Missile's initial serial production contract was signed in June 2007. It was chosen by the Royal Norwegian Navy for its new frigates and patrolboats
- In 2008 the NSM was selected by the Polish for land-based missiles

Cost
- FCT funds: $0.100M; Sponsor (Navy) funds: $3.9M

Schedule
- Project approved on 3 September 2014
- Littoral Combat Ship (LCS) Demonstration occurred on 23 September 2014

Testing
- On 23 September 2014, a single NSM was successfully fired from the flight deck of the USS Coronado(LCS-4)
- The test validated assumptions including targeting accuracy, range, and system operability

Transition
- In May 2018, the Navy awarded a $14.8M contract for the initial procurement of NSM missiles and launchers for fielding on LCS and Future Frigates

Benefits
- Fills a capability gap for the Navy's Over-the-Horizon Weapon System (OTH-WS)

Other
- In response to emerging operational needs, additional FCT funds ($2.550M) were provided to the Army for another successful demonstration of the NSM fired from a ground vehicle during the Rim of the Pacific Exercise in May 2018

Soldier Borne Sensor Systems

On-demand Situational Awareness for the Squad

Technology

The Squad currently does not have a UAS capability to develop Situational Awareness. Currently this is done through binoculars or sending a fire team to gain the Situational Awareness.

The SBS capability will allow the Squad to develop Situational Awareness in a variety of conditions on an ad hoc or preplanned basis reducing risk and increasing mission success.

How Found?

Comparative testing and demonstration of six-vendor Systems tested for over the Hill Observation and Reconnaissance Recon. At the conclusion of the evaluation, the FIIR Black Hornet 3 met or exceeded all requirements and DEVCOM Soldier Center retained for additional research.

Cost

FCT funds: $180K; Sponsor Army funds: $180K

Schedule

August 2016 initial test
Operational experimentation and demonstrations
May 2018 initial buy

- Technical performance across a number of domains including range, endurance and camera performance
- Operational experimentation to characterize the systems operational performance in representative environments including operational suitability and human factors issues

Transition: Natick Soldier Research, Development and Engineering Center (NSRDEC) will work with identified stakeholders to draft relevant technical and operational test plans. NSRDEC will then execute these test plans and write up reports. The knowledge products and hardware will be transitioned to Army Product Manager Soldier Maneuver Sensors (PdM SMS) as well as stakeholders from other interested services.

Benefits: By transitioning not only the hardware from this effort, but also our lessons learned, the PM executing the SBS PoR will be much better prepared to mitigate costs over the lifecycle of program.

High Pressure Pure Air Generator

Technology

- Integrated pure air compressor and filtration system which was designed to replace rechargeable gas bottles on aircraft for cryogenic missile seeker cooling
- Draws in atmospheric air to provide a continuous supply of high pressure pure air, which results in unlimited mission duration and eliminates the logistics burden associated with gas bottles
- Generates gas within the launcher and reliably purifies it to the very highest standards
- Gas is always available 'on-demand' and the potential sources of contamination are eliminated

Cost

- FCT funds: $4.239M (FY87-FY00)

Schedule

- Selected for FCT in 1986
- Demonstrated on USMC AH-1 Helicopter in 1987
- Demonstrated on Canadian CF-18 Aircraft in 1989
- Qualified for Navy Aircraft in 1994
- In service on USMC AV-8B Aircraft in 1997
- In service on Marine Corps AH-1 Helicopter in 1999
- In service on USMC F/A-18 C/D Aircraft in 2000
- In service on Navy F/A-18 E/F Aircraft in 2001

Transition

- 3000+ HiPPAG 320 systems delivered to US Navy from 1997- 2018 for Sidewinder AIM-9 L/M missiles on US Navy and Foreign Military Sales aircraft including: AV-8B, F/A-18 C/D, F/A- 18 E/F, AH-1 and F-35

Benefits

- Reduced maintenance and logistics costs by removing requirement for cryogenic cooling bottles
- Successful FCT tests led to other DoD Programs leveraging HiPPAG, replacing explosive cartridges for weapons ejection systems with improved safety and lower cost
- Over 9,000 HiPPAG systems delivered Worldwide, including: Small Diameter Bomb Rack F-15 & F-16 F-35 Weapons Ejection Systems

APPENDIX

Technology Readiness Levels*

Technology Readiness Level	Description
1. Basic principles observed and reported.	Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Examples might include paper studies of a technology's basic properties.
2. Technology concept and/or application formulated.	Invention begins. Once basic principles are observed, practical applications can be invented. Applications are speculative and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies.
3. Analytical and experimental critical function and/or characteristic proof of concept.	Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
4. Component and/or breadboard validation in laboratory environment.	Basic technological components are integrated to establish that they will work together. This is relatively "low fidelity" compared to the eventual system. Examples include integration of "ad hoc" hardware in the laboratory.
5. Component and/or breadboard validation in relevant environment.	Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so it can be tested in a simulated environment. Examples include "high fidelity" laboratory integration of components.
6. System/subsystem model or prototype demonstration in a relevant environment.	Representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high-fidelity laboratory environment or in simulated operational environment.
7. System prototype demonstration in an operational environment.	Prototype near, or at, planned operational system. Represents a major step up from TRL 6, requiring demonstration of an actual system prototype in an operational environment such as an aircraft, vehicle, or space. Examples include testing the prototype in a test bed aircraft.
8. Actual system completed and qualified through test and demonstration.	Technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental test and evaluation of the system in its intended weapon system to determine if it meets design specifications.
9. Actual system proven through successful mission operations.	Actual application of the technology in its final form and under mission conditions, such as those encountered in operational test and evaluation. Examples include using the system under operational mission conditions.

** Department of Defense, Technology Readiness Assessment (TRA) Guidance dated April 2011, Prepared by the Assistant Secretary of Defense for Research and Engineering, revised on 13 May 2011, pp 2-13, 2-14*

Questions

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