DARPA Tactical Technology Office

Dr. Bradford C. Tousley, Director

Briefing prepared for the National Academies

October 22, 2015

Mission

The Defense Advanced Research Projects Agency (DARPA) was established in 1958 to **prevent strategic surprise** from negatively affecting U.S. national security and **create strategic surprise** for U.S. adversaries by maintaining the technological superiority of the U.S. military.

To fulfill its mission, the Agency relies on **diverse performers** to apply multi-disciplinary approaches to both advance knowledge through basic research and **create innovative technologies** that address current practical problems through applied research.

As the DoD's **primary innovation engine**, DARPA undertakes projects that are finite in duration but that create **lasting revolutionary change**.

DARPA History

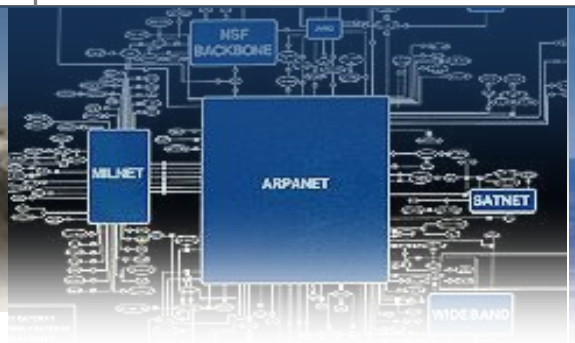
SATURN F1
Rocket Engine
1960

Speech Recognition
1971

Stealth Fighter
1983

Microelectromechanical Systems
(MEMS)
1991

1960 1970 1980 1990 2000



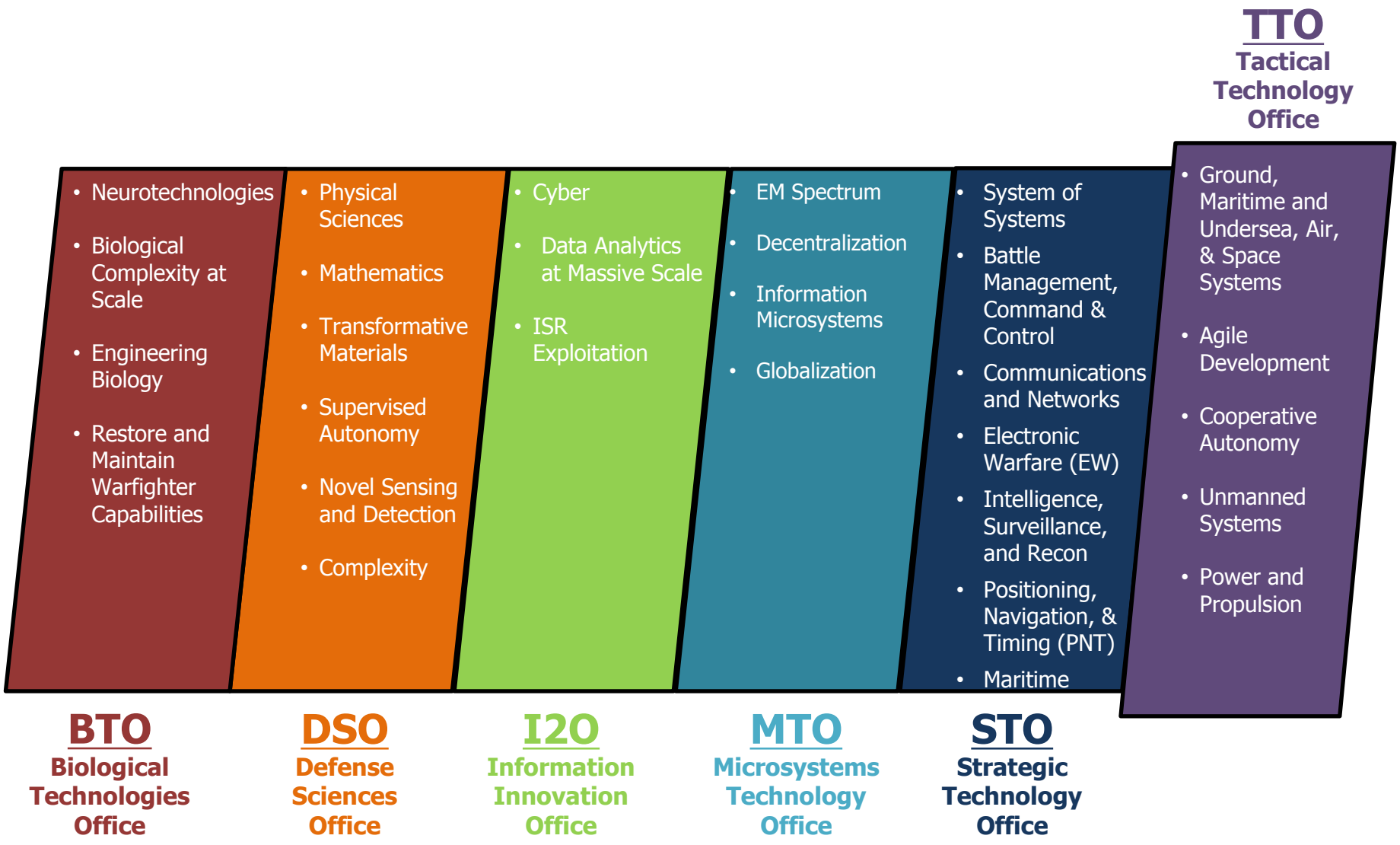
ARPA Established
1958

M16 Assault Rifle
1965

ARPANET
1969

Global Hawk
1998

DARPA Technical Offices



TTO's History

Ground Systems

1967

M16
(Project Agile)

Tank Breaker

Army Tactical
Missile System
(Assault Breaker)

Talon

Boomerang

Netfires

Iron Curtain

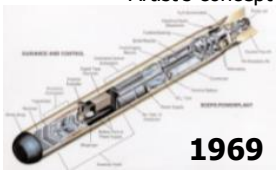
Legged
Squad
Support
System
(LS3)

Artist's concept

Persistent Close
Air Support
(PCAS)

Maritime and Undersea Systems

Artist's concept



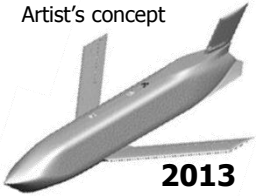
MK 50 Torpedo
Propulsion System

Sea Shadow

Unmanned
Undersea
Vehicle (UUV)

Submarine
Technology
(SUBTECH)

Artist's concept



Long Range
Anti-Ship Missile
(LRASM)

Air Systems

Have Blue

Tacit Blue

X-31

Global Hawk

X-45/46/47

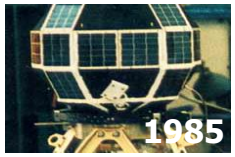
A-160

Damage Tolerant
Controls (DTC)

Artist's concept

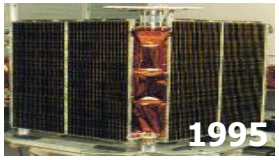
Falcon HTV-2

Space Systems



Global Low Orbiting
Message Relay
(GLOMR)

Pegasus

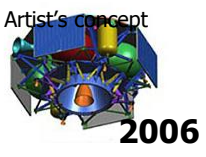


DARPASAT

Taurus

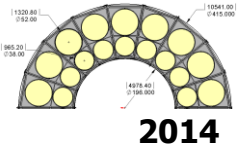
Falcon Small
Launch Vehicle

Artist's concept



MiTEX

Orbital Express (OE)



Membrane Optic
Imager Real-Time
Exploitation
(MOIRE)

Platform and System Focus Areas

Ground Systems

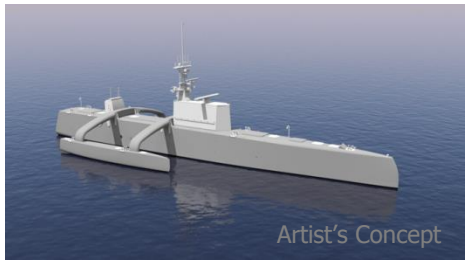
Deployable, mobile capable forces

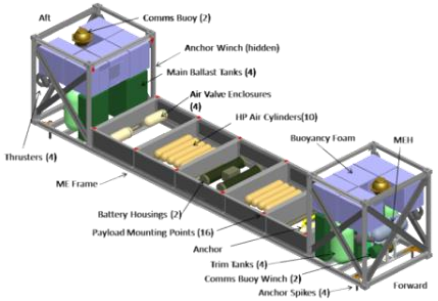
Artist's Concept

Artist's Concept

Maritime and Undersea Systems

Control the sea, influence events on land



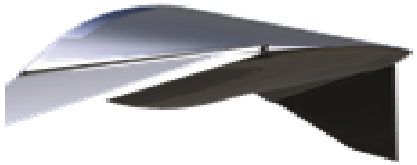


Artist's Concept

Air Systems

Extend range and minimize time

Artist's Concept



Artist's Concept

Space Systems

Resilient and flexible

Artist's Concept

Cross-Cutting Themes

Agile development approach, cooperative autonomy, unmanned systems, power and propulsion

Resilience in Space

- Affordable routine access
- Reduce escalating systems cost
- Enhanced survivability, reconstitution and autonomy
- Disaggregation and simplification
- Real-time space domain awareness
- New capabilities

Shaping the Present

Experimental Spaceplane (XS-1): Aircraft-like access to space

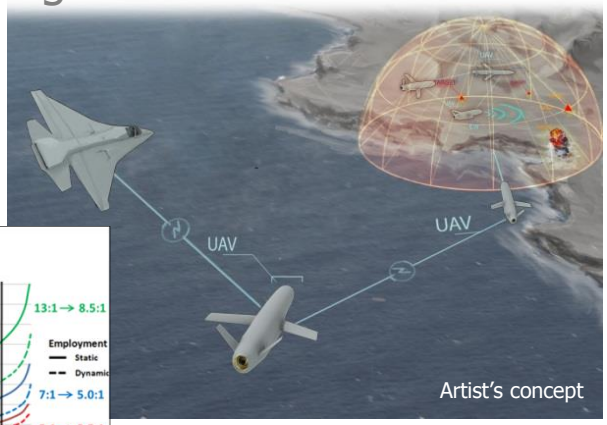
Creating the Future

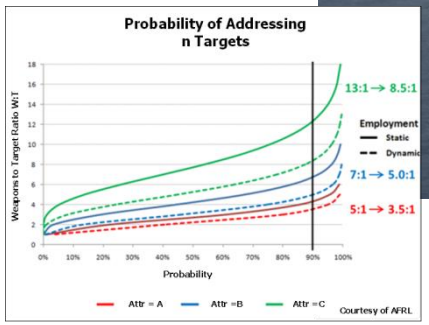
Hallmark: Real-time space domain awareness, command and control

Developing Advanced and Collaborative Autonomy

- Coordinated swarming to expand performance envelope – endurance, speed, range, payload, survivability:
  - Autonomy
  - High speed, collaborative precision strike and advanced munitions
- Improved capabilities to enable improved and new missions

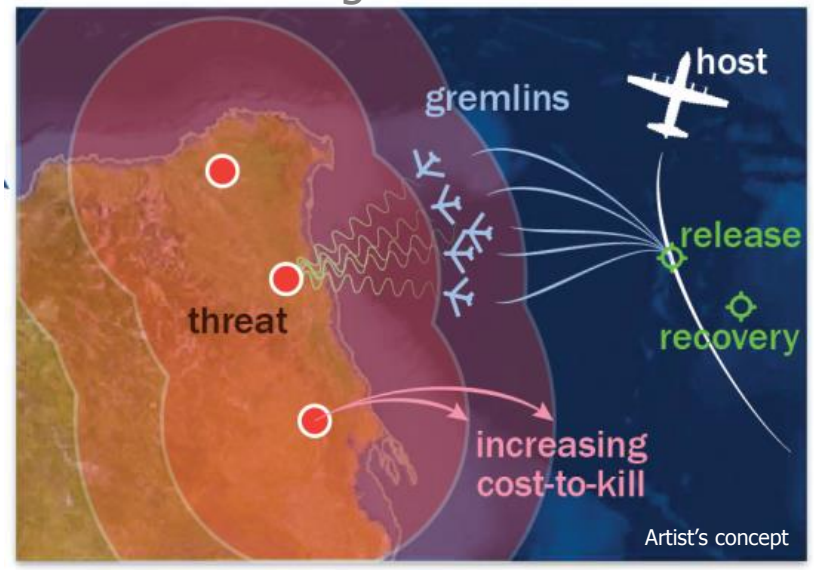
Shaping the Present





Collaborative Operations in Denied Environment (CODE): Reduction in salvo size using collaborative dynamic targeting

Creating the Future

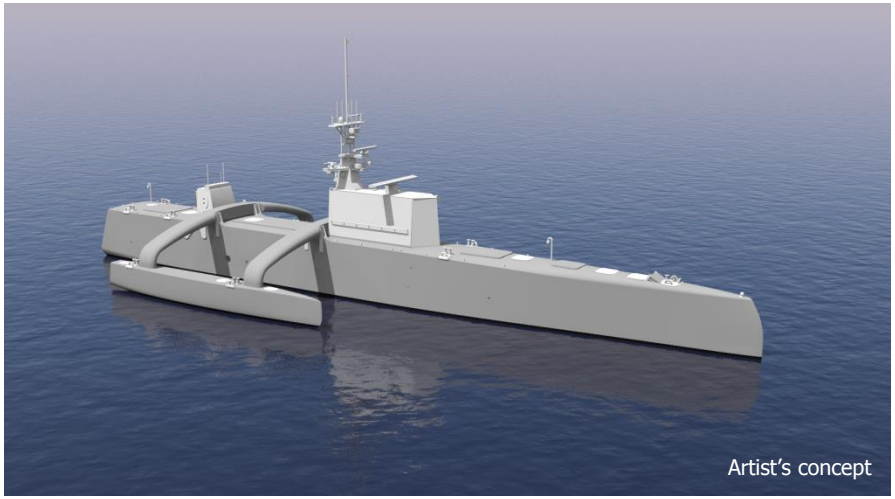


Gremlins: Distributed volleys of recoverable assets

Maritime Capabilities

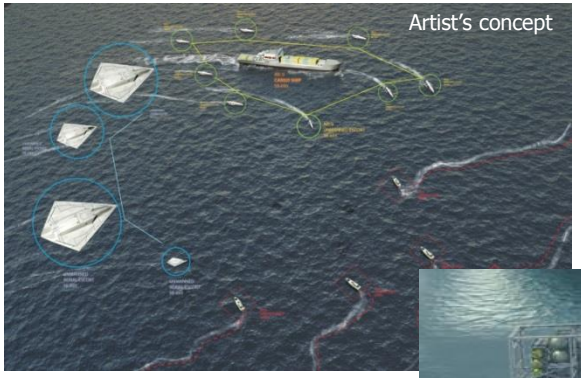
- Survivable and highly distributed systems to deliver effects from long distances
- Ability to perform vital missions without big platforms
- Flip measure/countermeasure cost imbalance in our favor
- Enhanced situational awareness and threat detection
- On the surface or under the sea

Shaping the Present

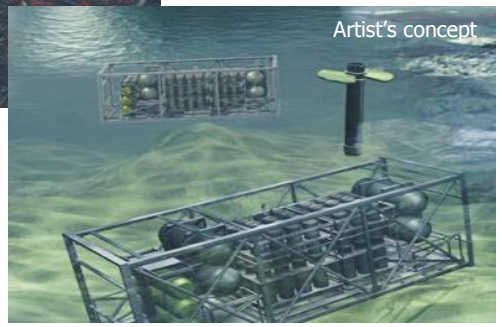


ASW Continuous Trail Unmanned Vessel (ACTUV): Global Hawk for the high seas

Creating the Future



Swarm Challenge: Testing the technologies scale for a swarm of unmanned vehicles

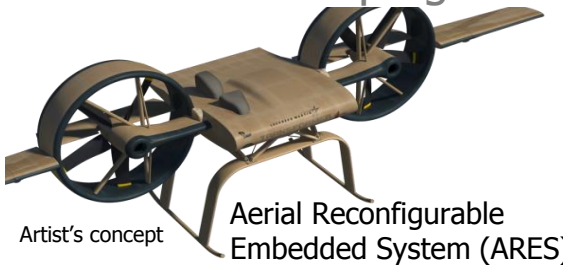


Hydra: Affordable, delivery of unmanned aerial and undersea payloads

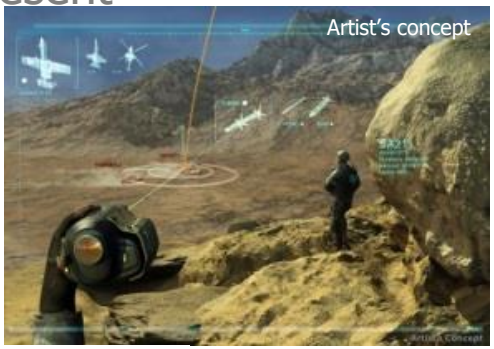
Enabling Light, Mobile Forces

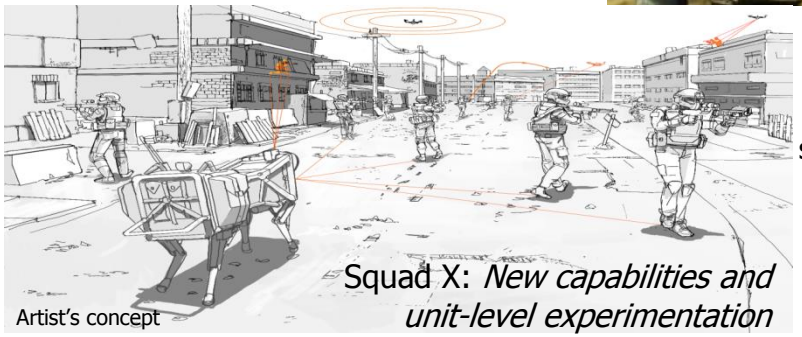
- Extend and enhance the situational awareness of small units
- Enable rifle squads to shape and dominate their battlespace (kinetic and non-kinetic)
- Modular unmanned logistics and transport to the tactical edge
- Improved detection range, accuracy and robustness
- Unit level improvements for all operations phases

Shaping the Present


Artist's concept

Aerial Reconfigurable Embedded System (ARES): *Enhance the effectiveness of small-units*


Artist's concept


Artist's concept

Squad X: *New capabilities and unit-level experimentation*

Persistent Close Air Support (PCAS): Shared real-time situational awareness for rapid, precise close air support combining ground and air support

Creating the Future

Ground Experimental Vehicle Technologies (GXV-T): Significantly improving mobility without sacrificing survivability


Artist's concept

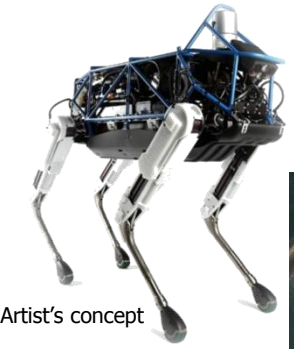

Artist's concept

Mobile Infantry: Mixed mounted/ dismounted warfighters and semi-autonomous variants of small off-road platforms

Robotics and Autonomy

- Improved autonomy, mobility, speed, cost and energy efficiency
- Untethered operation using battery pack for mixed-mission operation
- Onboard perception to support autonomy
- Carrying the load to aid the warfighter
- Rapid commercial growth

Shaping the Present



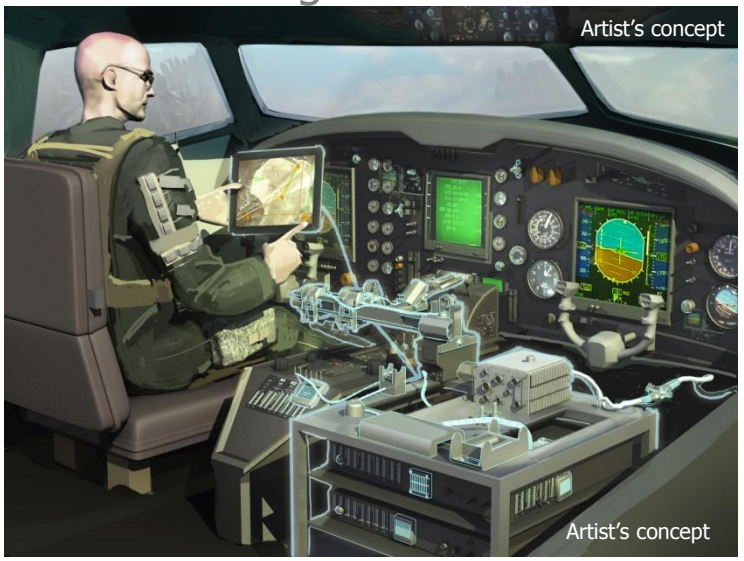
Artist's concept

Spot (Legged Squad Support System (LS3)): Smaller, quieter, more reliable next generation robotic platform

DARPA Robotics Challenge (DRC): Human-level mobility and dexterity in austere human environments

DRC Finals: June 5-6, 2015 in Pomona, California

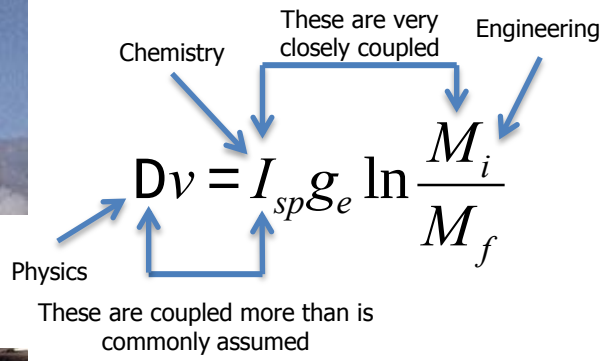
Creating the Future



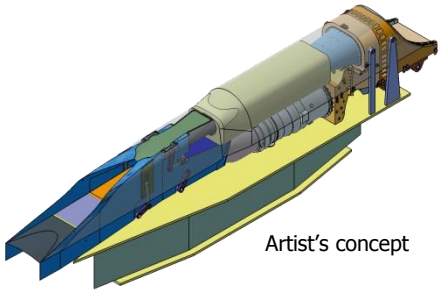
Aircrew Labor In-cockpit Automation System (ALIAS): Enable variably reduced onboard crew for existing aircraft

Topics to Consider

- Long-range precision fire
- Advanced rocket propulsion
- Strategic mobility and automation
- Swarm and counter-swarm
- New engines



Artist's concept



Artist's concept

Why are we here today?

- We want to make sure that you understand our approach, which includes:
  - The areas we are focusing on and why, so that you can be more effective in what you propose
  - Our process and the realities about the way TTO BAA-15-27 works
- We want to answer your questions:
  - During the sidebars, tell us your ideas for truly revolutionary technologies that are aligned with the program managers' vision for their programs
  - Tell us your thoughts on how we can tap into new ideas that can strengthen our existing programs
- The interchange of ideas between DARPA and industry has always been at the heart of TTO's approach to developing revolutionary technologies:
  - Many programs have started as seedlings from BAA submissions

Our Engine is Made Up of Our PMs' Visions

- PMs are the ones who execute seedlings and programs:
  - Office director and deputy director can help you locate the right PM

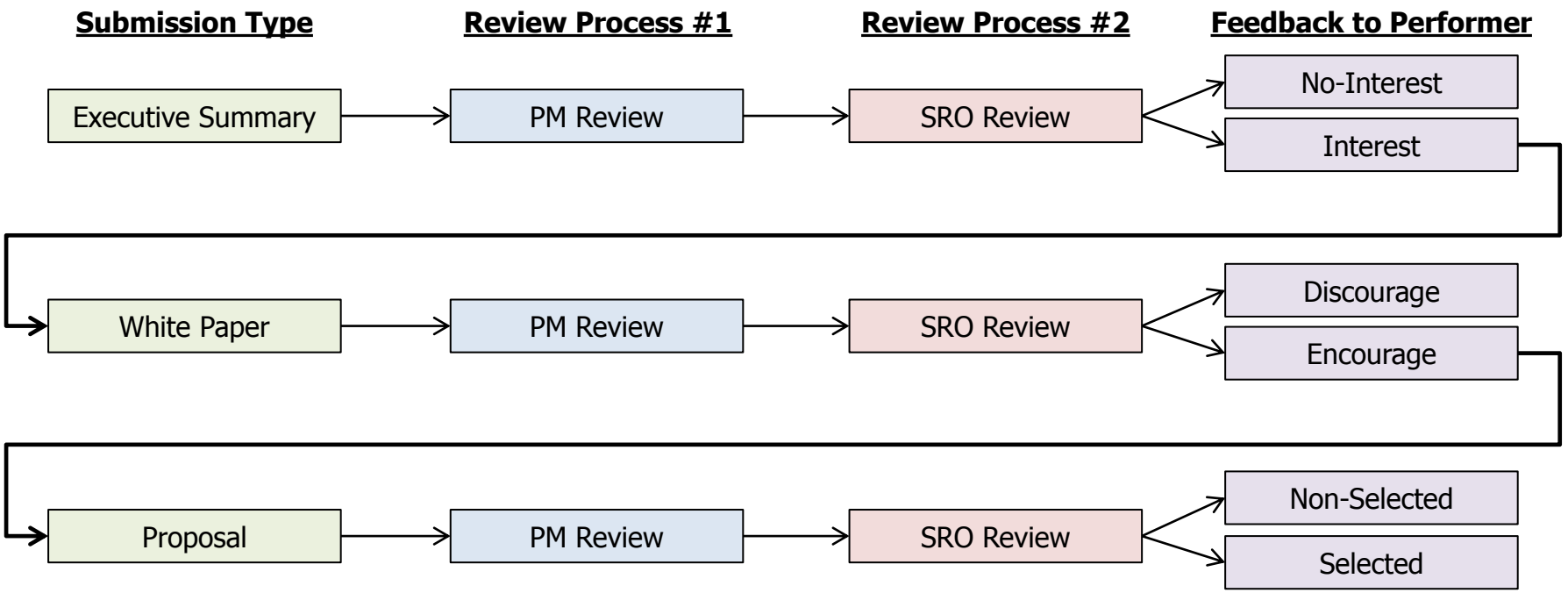
- You may have a good idea, but if it's not aligned with someone's interest area, then it won't happen

- Feedback for executive summaries and white papers can steer you in the right direction before submitting a proposal

How does it work?

- One (1) year-long BAA:
  - Designated BAA coordinator and email address
  - Does not supersede program BAAs

- Executive summaries, white papers, and proposals



How to submit?

- DARPA's BAA website https://baa.darpa.mil
  - NEW as of September 2014 – TFIMS is no longer active
  - NEW – There is no longer a separate deadline for executive summaries, white papers, and proposals
  - Visit the website to complete the two-step registration process
  - First time submitters will need to register for an extranet account (https://baa-registration.darpa.mil/):
    - Wait for two separate e-mails containing a username and temporary password
    - After accessing the Extranet, create an account for the DARPA BAA website via the "Register your Organization" link along the left side of the homepage
    - View submission instructions; all submissions must be submitted as zip files (.zip or .zipx) and be no larger than 50 MB
  - If an account has already been created it may be reused

- Proposers requesting grants or cooperative agreements may submit proposals through one of the following methods:
  - (1) Hard copy mailed directly to DARPA
  - (2) Electronic upload at http://www.grants.gov/applicants/apply-for-grants.html.

Classified Submissions

- Prior to sending any classified submissions, performers must provide advance notification to the BAA coordinator via DARPA-BAA-15-27@darpa.mil
- Proposers choosing to submit classified executive summaries, white papers or proposals from other classified sources must first receive permission from the respective Original Classification Authority in order to use their information in replying to this BAA
  - Applicable classification guide(s) should also be submitted to ensure the proposal is protected at the appropriate classification level
- Classified submissions shall be appropriately and conspicuously marked with the proposed classification level and declassification date. Before transmitting the material, contact DARPA CDR (C/S/TS), SAPCO (SAP) or Special Security Office (SCI)
  - **Confidential and Secret Collateral Information:** Classified information at the Confidential and Secret level may be submitted via ONE of the two following methods:
    - Hand-carried by an appropriately cleared and authorized courier to the DARPA CDR
    - Mailed via appropriate U.S. Postal Service methods (e.g., (USPS) Registered Mail or USPS Express Mail)
  - **Top Secret materials:** Top Secret information should be hand carried by an appropriately cleared and authorized courier to the DARPA Classified Document Registry
  - **Special Access Program (SAP) Information:** SAP information must be transmitted via approved methods
  - **Sensitive Compartmented Information (SCI):** SCI must be transmitted via approved methods

Things to Keep in Mind (1 of 3)

- No-Interest/Discourage means:
  - In the form you submitted, we are not interested in your idea because:
    - The submission does not present an approach to developing technology that is aligned with the DARPA/TTO focus areas and interests
    - The submission is not important to TTO's areas of responsibility as outlined in the BAA
    - The submission is not suitably structured to produce a TTO systems-level demonstration or product
    - The submission does not substantiate a revolutionary military capability within the TTO portfolio
    - The proposed approach does not clearly identify current limitations that would be overcome
    - The submission does not identify barriers to implementing new operational concepts and postulate solutions
    - The submission does not convey technology significantly beyond the state of the art
    - The submitted work does not provide sufficient information to assess the technical performance claims
  - It does NOT mean that you cannot submit a full proposal... BUT chances of success are extremely slim

Things to Keep in Mind (2 of 3)

- Common misunderstandings:
  - You can submit any time in the period, not just at the due date
  - Make sure it is relevant to TTO – your idea may be more relevant for another DARPA technical office
  - Please explain how your technology works and how it enables a new capability
  - We will not be developing your idea – you will have to do the work
    - Are you proposing a study? A demo? Tell us what you would deliver and how you would deliver it
  - Do your homework – how is the task accomplished today and how much would your technology compare in cost, performance and operations?
  - Not all this detail is needed in an Executive Summary, but you should have considered all of it when submitting

Things to Keep in Mind (3 of 3)

- Interest/Encourage means:
  - We find your idea interesting and we would like to know more
  - It does NOT mean that you are funded or that a full proposal will be accepted

- Funding and seedling length expectation:
  - Intent is to fund seedlings at <$1M
  - Typically, seedlings are 12-18 months in duration unless there is valid justification for a longer effort
  - Efforts larger than seedlings are likely to be handled as a program – options or through a program BAA
  - Okay to propose options for a larger follow-on program
    - You may submit a cost proposal with various options (1, 2…n) so that you have a phased approach, but this would only be one volume

Do and Don’ts

- DO read the TTO BAA-15-27 document in its entirety
- DO use the executive summary and white paper process
- DO forward any questions related to the DARPA/TTO BAA-15-27 to DARPA-BAA-15-27@darpa.mil

- Do NOT recirculate proposals rejected from program BAAs
- Do NOT hand-carry paper copies to the DARPA building
- Do NOT email/fax in your executive summary, white paper, or proposal to the TTO BAA-15-27 mailbox
- Do NOT call to check on the status of your submission

Questions?

- Is the feedback in the letters useful?

- How can we improve the process?*

*...please don't ask us to change the Federal Acquisition Regulations!

DARPA Wait, What? Technology Forum

DARPA held the innovative Wait, What? Future Technology Forum in St. Louis, MO from September 9-11, 2015, featuring speakers, breakout sessions, technology demonstrations, and a welcome by Secretary of Defense Ash Carter.

Videos from the event can be found at: www.darpawaitwhat.com

www.darpa.mil