
DARPA
CONNECT
DISCOVER · COLLABORATE · CONTRIBUTE
Welcome
DARPAConnect@darpa.mil

Welcome Remarks

Jess Resig, Director of Solutions Innovation
Applied Research Institute

John Rosenthall, President
Tougaloo College Research and Development Foundation

Breaking Down Barriers to Entry for Nontraditional Performers

DARPAConnect is designed to broaden DARPA's reach and stimulate **growth and collaboration** between DARPA, businesses, and academia.

- Regional and Virtual Events
- Networking Opportunities
- Training and Development
- Customized Support and Mentoring

DARPAConnect@darpa.mil

Introduction to DARPA: DARPAConnect and the Innovation Ecosystem

Ben Griffin, Program Manager
DARPA Microsystems Technology Office

Breakthrough Technologies and Capabilities for National Security

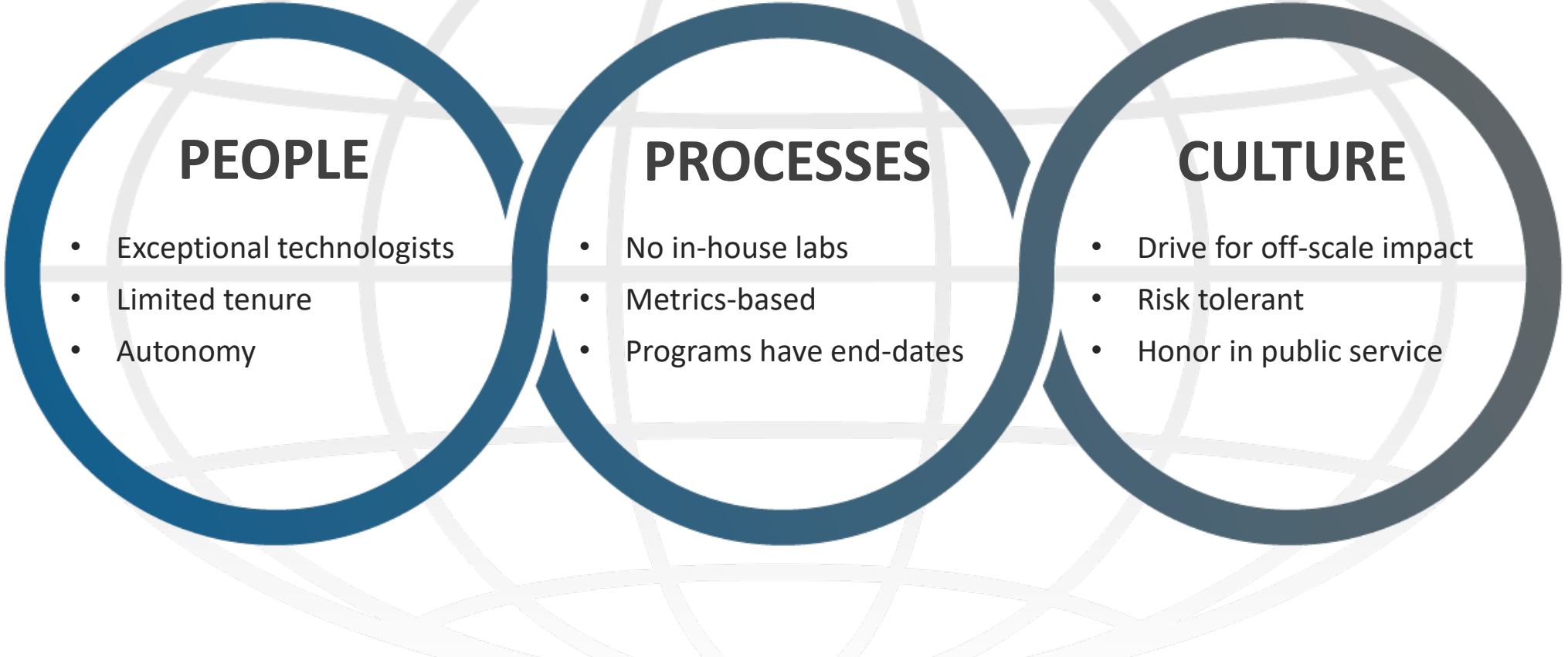
Create breakthrough, paradigm-shifting solutions

Accept and manage significant technology risk

Disrupt or massively accelerate technology roadmaps

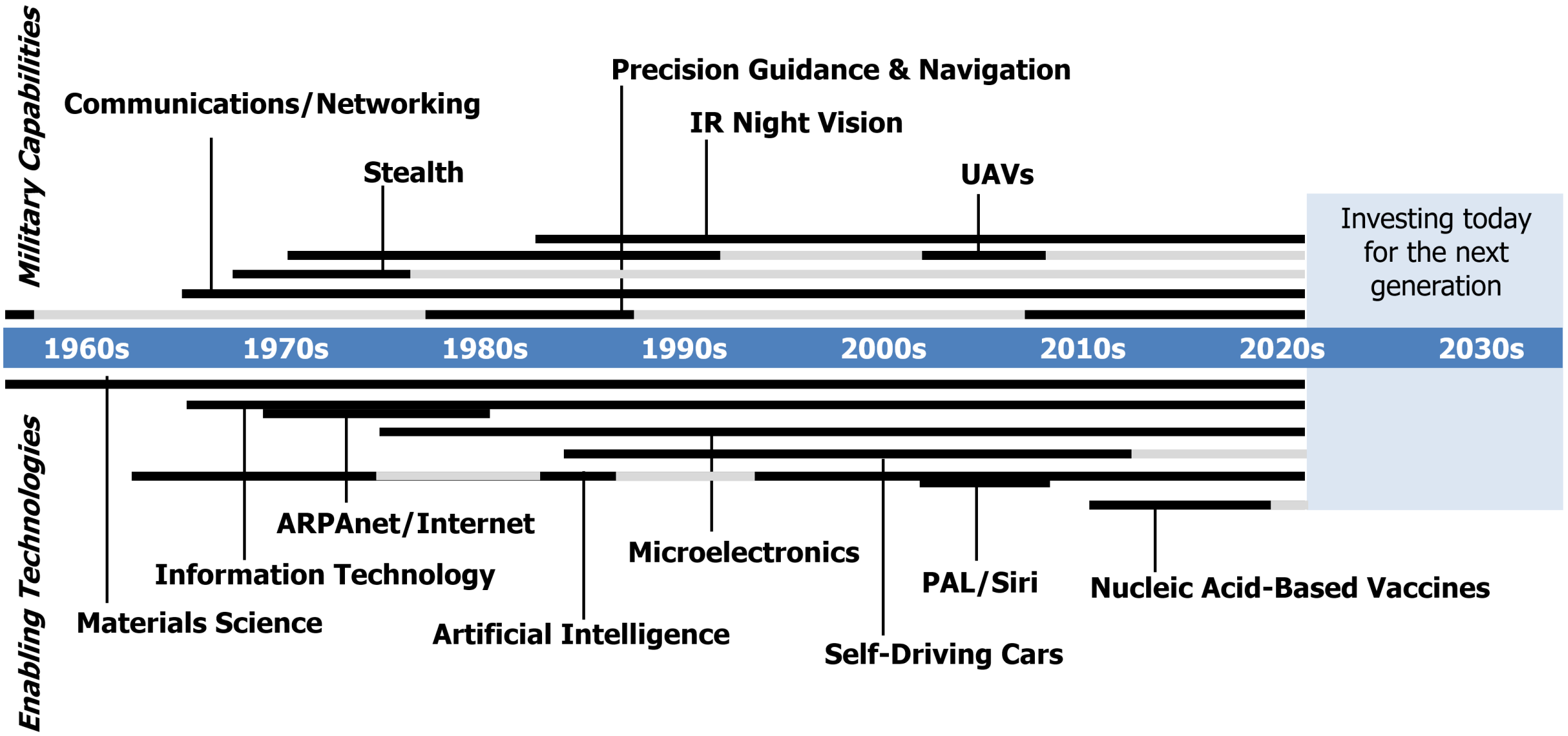



Breakthrough Technologies and Capabilities for National Security Contd.



DARPA's culture persists and the agency delivers

DARPA's Role: Pivotal Early Investments that Change What's Possible



DARPA Technical Offices

Biological Technologies Office

- Maintain force readiness
- Tactical warfighter care and functional restoration
- Operational resilience and logistical security
- Biosensors and novel methods and materials

Defense Sciences Office

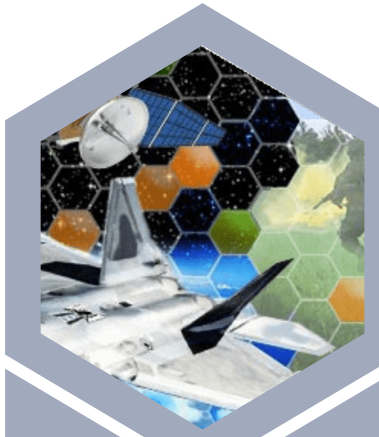
- Novel materials and structures
- Sensing and measurement
- Computation and processing
- Operations enablement
- Collective intelligence
- Emerging threats

Information Innovation Office

- Proficient AI
- Advantage in cyber operations
- Confidence in the information domain
- Resilient, adaptable, and secure systems

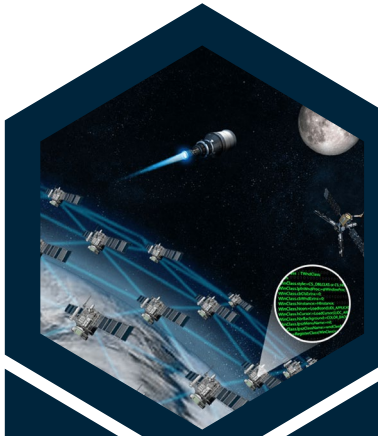
Microsystems Technology Office

- Disruptive microsystems
- Edge processing
- Microsystems manufacture



Strategic Technology Office

- Advanced sensors and processing
- Battlefield effects
- Command, control, and communications
- System of autonomous systems
- Empowered human decision making



Tactical Technology Office

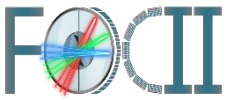
- Tactical systems
- Platforms, systems, and technologies that enable new warfighting constructs
- Reimagination of missions across maritime, ground, air, and space domains

Doing Business with DARPA

SBIR·STTR
POWERED BY INNOVATORS
MOVING TECHNOLOGY FORWARD

Programs

- Represent most of DARPA's funding opportunities
- Open to all capable sources
- Proposals solicited through specific program BAAs
- Often multi-year, multi-disciplinary efforts
- Technology development to move from "possibility" to "capability"



Challenges

- Compete on unique DARPA R&D problems
- Tend to include phases with culminating events where winners win monetary or other prizes
- May result in a prize with up to a $10M fair market value

Seedlings, SBIR/STTR, Explorations

- Open to all capable sources
- Smaller, shorter projects
- From "disbelief" to "doubt"
- Inspire new program ideas

Seedlings

Submitted to each technical office

SBIR/STTR

darpa.mil/work-with-us/for-small-businesses/participate-sbir-sttr-program

Explorations

Talk to a Program Manager

- Start with: www.darpa.mil
- Identify (if you can) the right PM
- Then, contact them (web page, email, visit)

Some Advice

- PMs are motivated by finding new and highly disruptive problems that will be the basis of new programs
- Generally, you should discuss ideas that might lead to new programs, not present your approaches for ongoing programs

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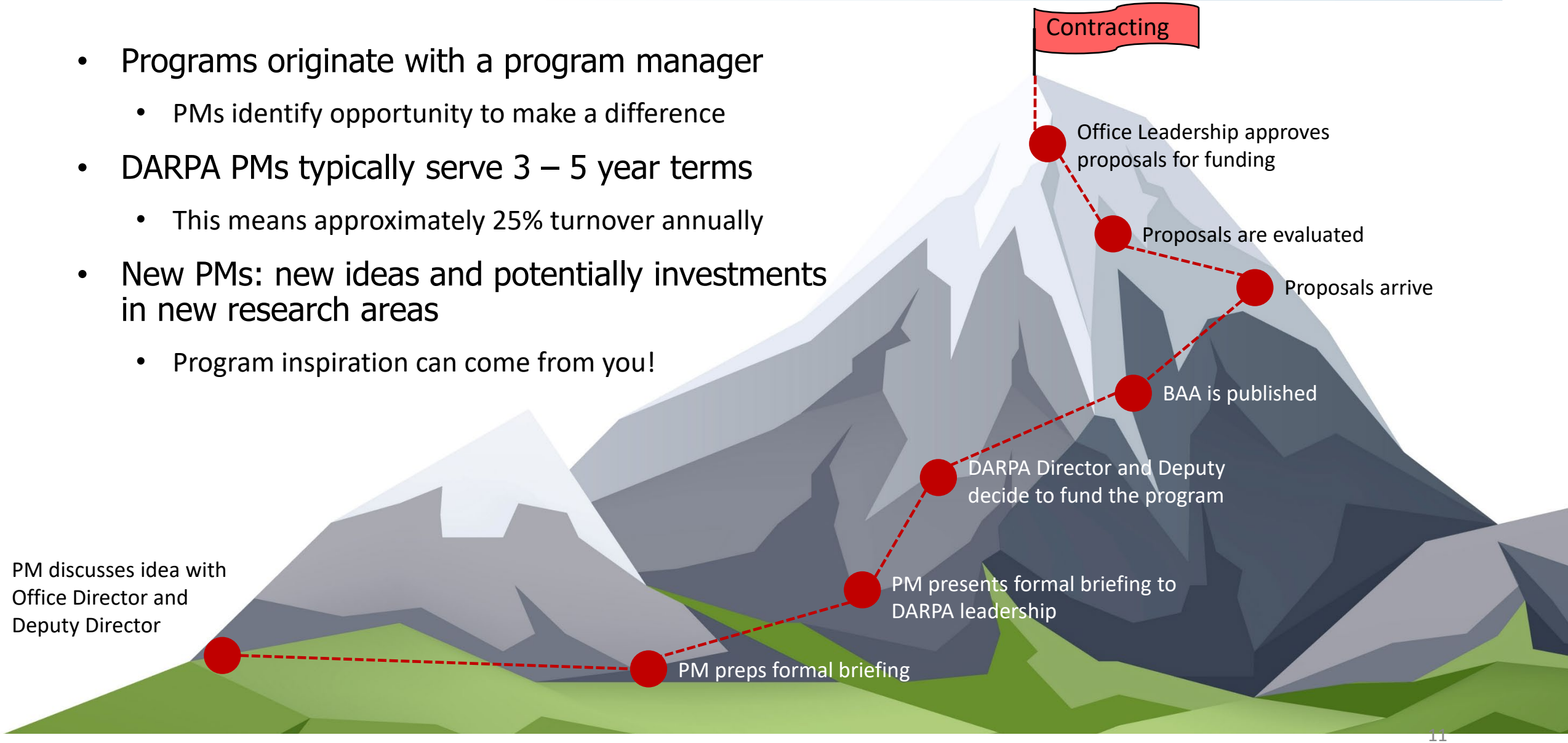
- PMs will be thinking about the Heilmeier catechism…so you should, too
- PMs are most receptive when you do their homework for them
- Listen to them!

The Path from Idea to Program

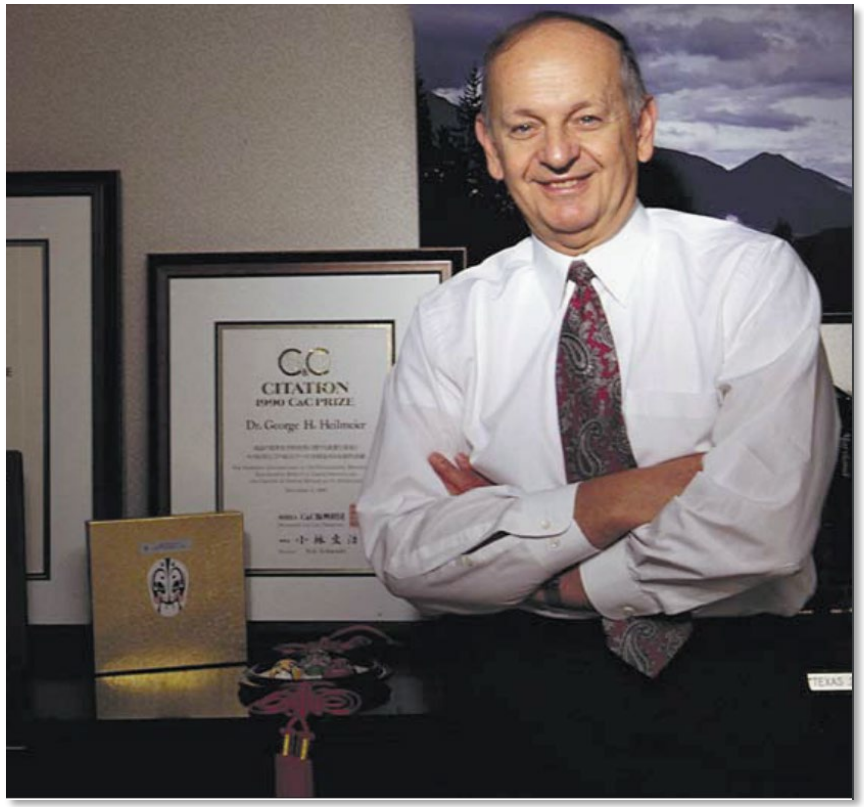
- Programs originate with a program manager
  - PMs identify opportunity to make a difference
- DARPA PMs typically serve 3 – 5 year terms
  - This means approximately 25% turnover annually
- New PMs: new ideas and potentially investments in new research areas
  - Program inspiration can come from you!



Heilmeier Catechism: Understanding Effective DARPA Communication

Reggie Cooper, Program Manager
DARPA Strategic Technology Office

The Heilmeier Catechism



George H. Heilmeier, Director of ARPA (1975-1977)
IEEE Spectrum, June 1997

H1: What are you trying to do? Articulate your objectives using absolutely no jargon.

H2: How is it done today, and what are the limits of current practice?

H3: What is new in your approach and why do you think it will be successful?

H4: Who cares? If you are successful, what difference will it make?

H5: What are the risks?

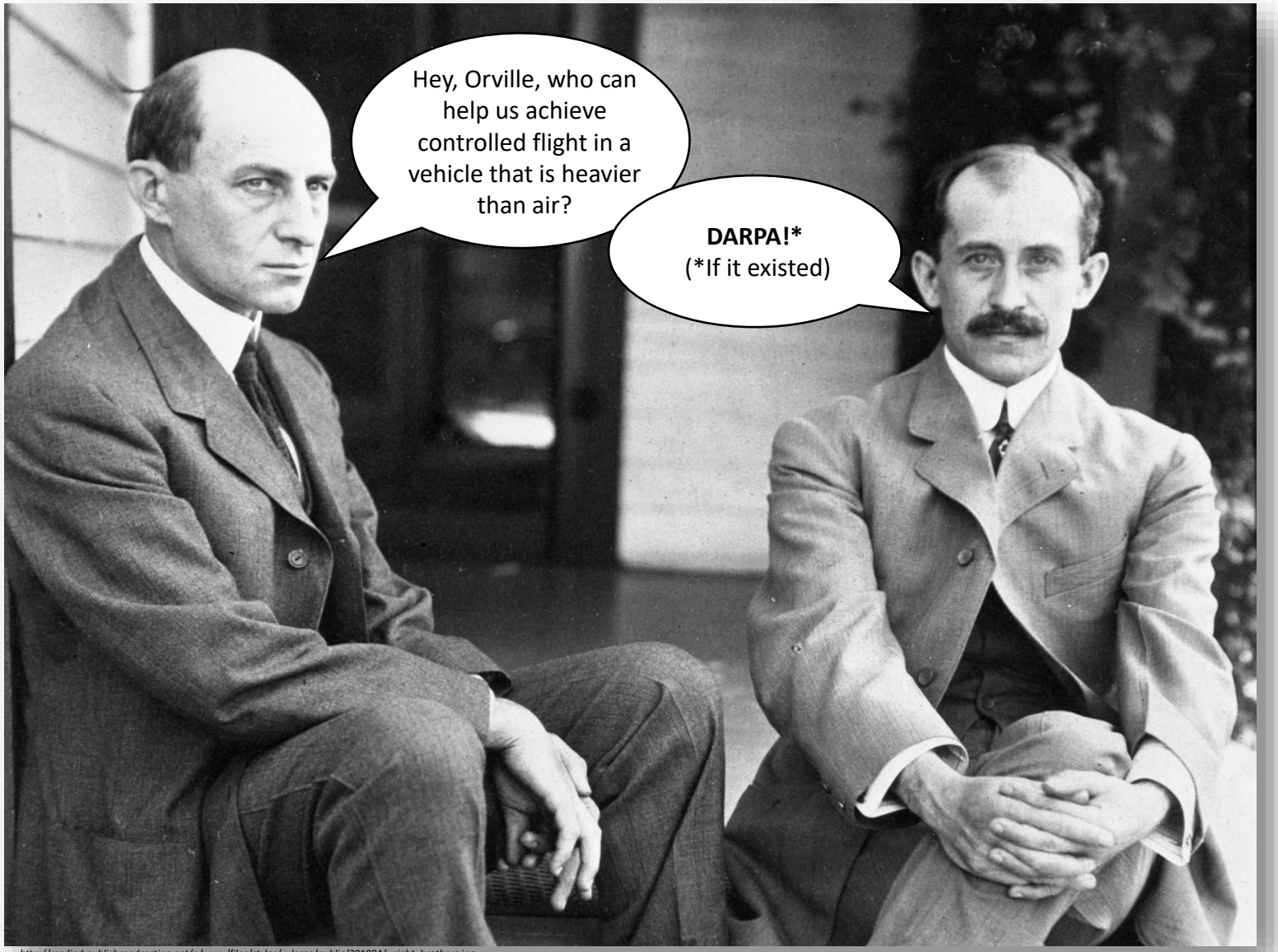
DARPA Program Outline

Heilmeier Question	Description
H1: What are you trying to do? Articulate your objectives using absolutely no jargon.	• (or, "What desired/needed capability are you trying to achieve?") • Explicitly state the problem – not the technical approach to solve the problem • Propose well-defined, quantitative program goals • The problem is usually explained best in a chart or graph that shows current state-of-the-art, any known limits, *and* the (key) program goal(s)
H4: Who cares? If you are successful, what difference will it make?	• Quantifiable impact related to emerging or future DoD mission need • Should be disruptive, not incremental • The potential impact must be commensurate with the level of investment • Who would use the technology both inside and outside the DoD?
H2: How is it done today, and what are the limits of current practice?	• Provide key insight(s) into the problem • Avoid "engineering" challenges – those that have known solutions, regardless of their cost or complexity • A list is necessary, but this alone is not sufficient • Beware of challenges that only pertain to a single approach
H3: What is new in your approach and why do you think it will be successful?	• Emphasis should be on the new idea or capability which explains why the challenges can be overcome today (the "why now?" story) • A high-level summary of the potential solution

These four questions establish the framework of a DARPA program

Example DARPA Program Outline

A Program Pitch, c. 1899

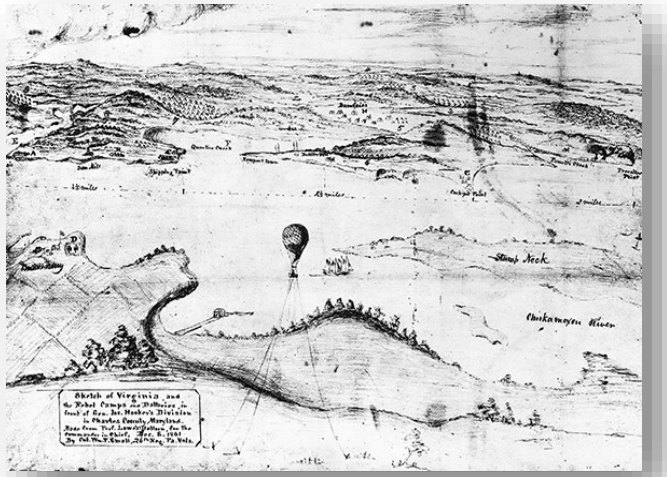


http://mediad.publicbroadcasting.net/p/wvxu/files/styles/x_large/public/201804/wright_brothers.jpg

The Vision, c. 1899

ISR Today

Hand drawn sketch from a balloon, c.1861



http://www.slate.com/content/dam/slate/articles/news_and_politics/history/2013/11/131115_HIST_sketch.jpg.CROP.promo-mediumlarge.jpg

British observation balloon, c.1908

https://en.wikipedia.org/wiki/Observation_balloon#/media/File:Observation_balloon_RAE-O982a.jpg

ISR Future

Aerial photography

http://dronecenter.bard.edu/files/2014/01/49741939_vlcsnap-100965.jpg

ISR: intelligence, surveillance, and reconnaissance

Program ORVILLE

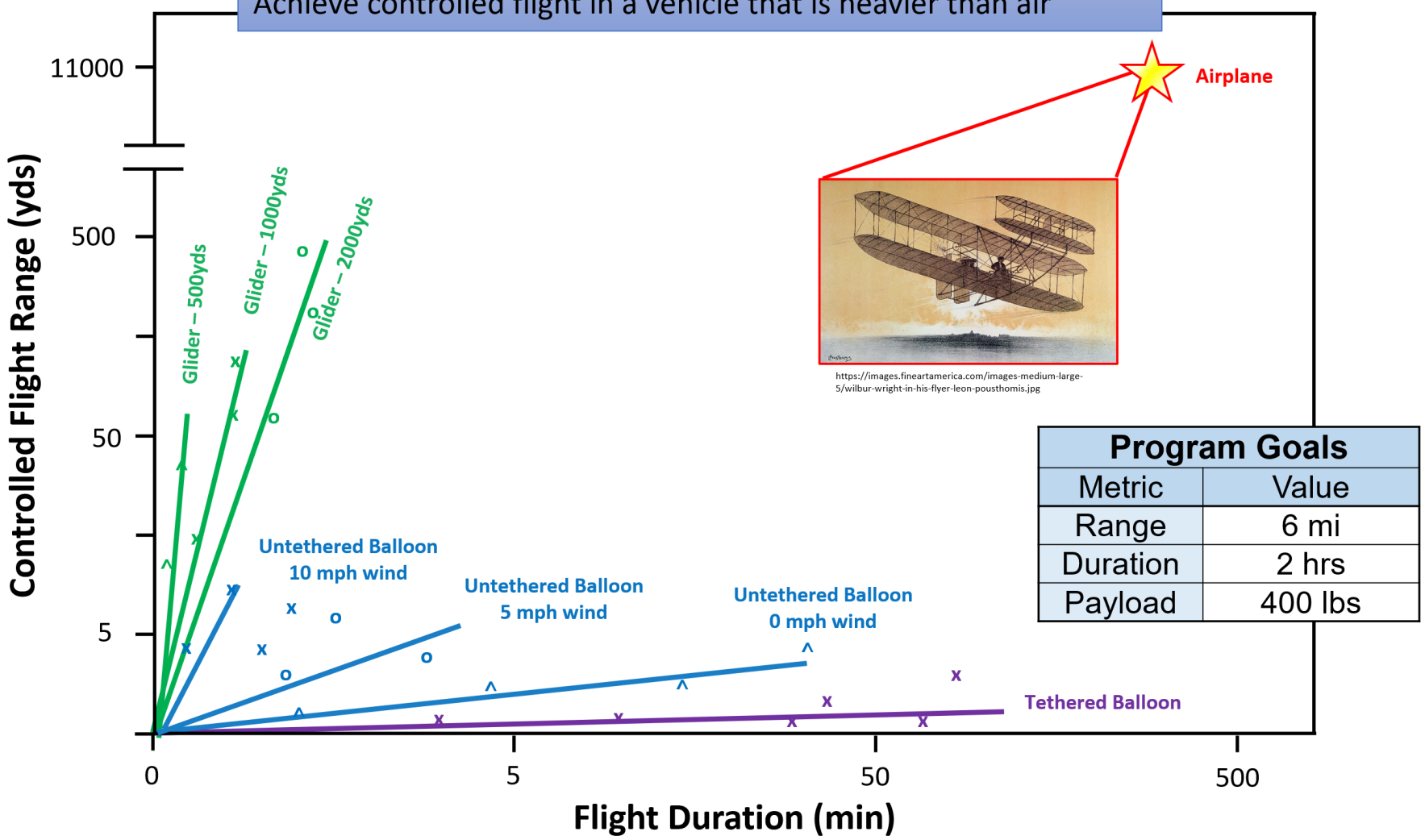
W. Wright

Tech Council

Monday

The Problem ORVILLE Will Solve

Problem:
Achieve controlled flight in a vehicle that is heavier than air

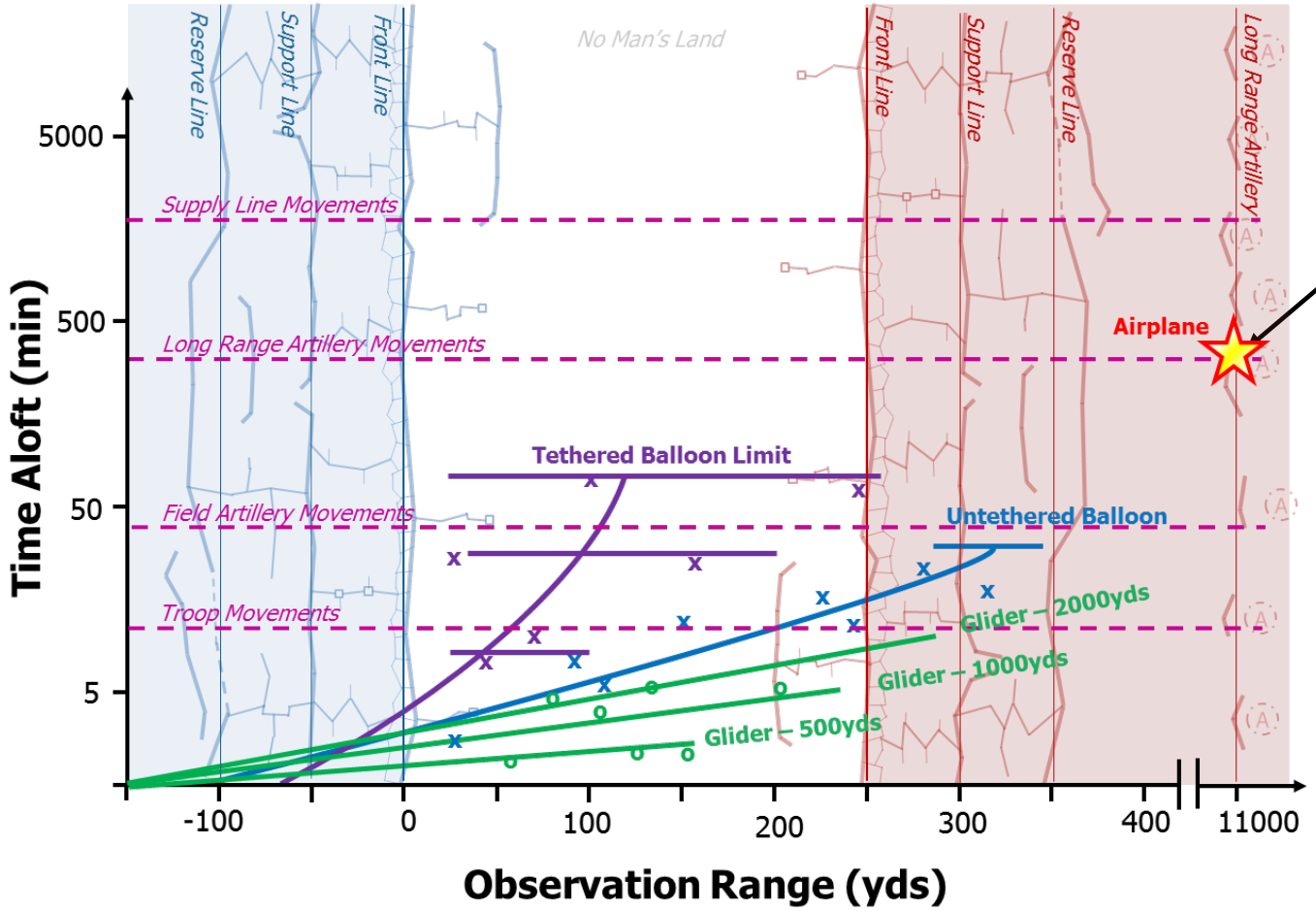


https://images.fineartamerica.com/images-medium-large-5/wilbur-wright-in-his-flyer-leon-pousthomis.jpg

Program Goals	
Metric	Value
Range	6 mi
Duration	2 hrs
Payload	400 lbs

ORVILLE Impact

H4



Heavier-Than-Air Flight Security Applications

- Battlefield ISR
- Ordinance Delivery
- Naval Reconnaissance
- Critical Logistics Delivery

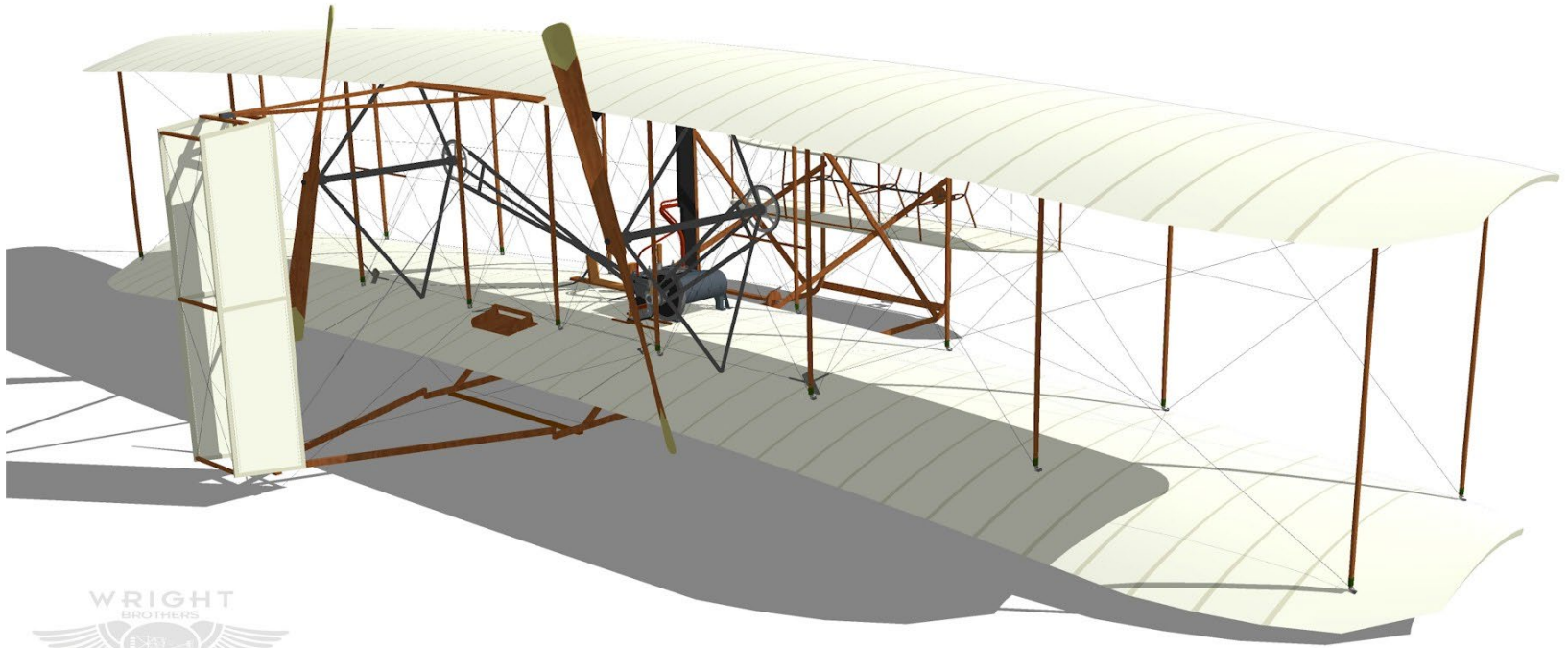
ORVILLE will enable ISR of artillery movements over tactically relevant ranges and timescales

ISR: intelligence, surveillance, and reconnaissance

Technical Challenges

1. **Increasing lift-to-weight ratio**
   - Lift increases with wing area
   - But weight scales with wing area, and greater weight increases drag

2. **Increasing power-to-weight ratio**
   - Lift scales with speed
   - More power needed to increase speed, but weight scales with engine size



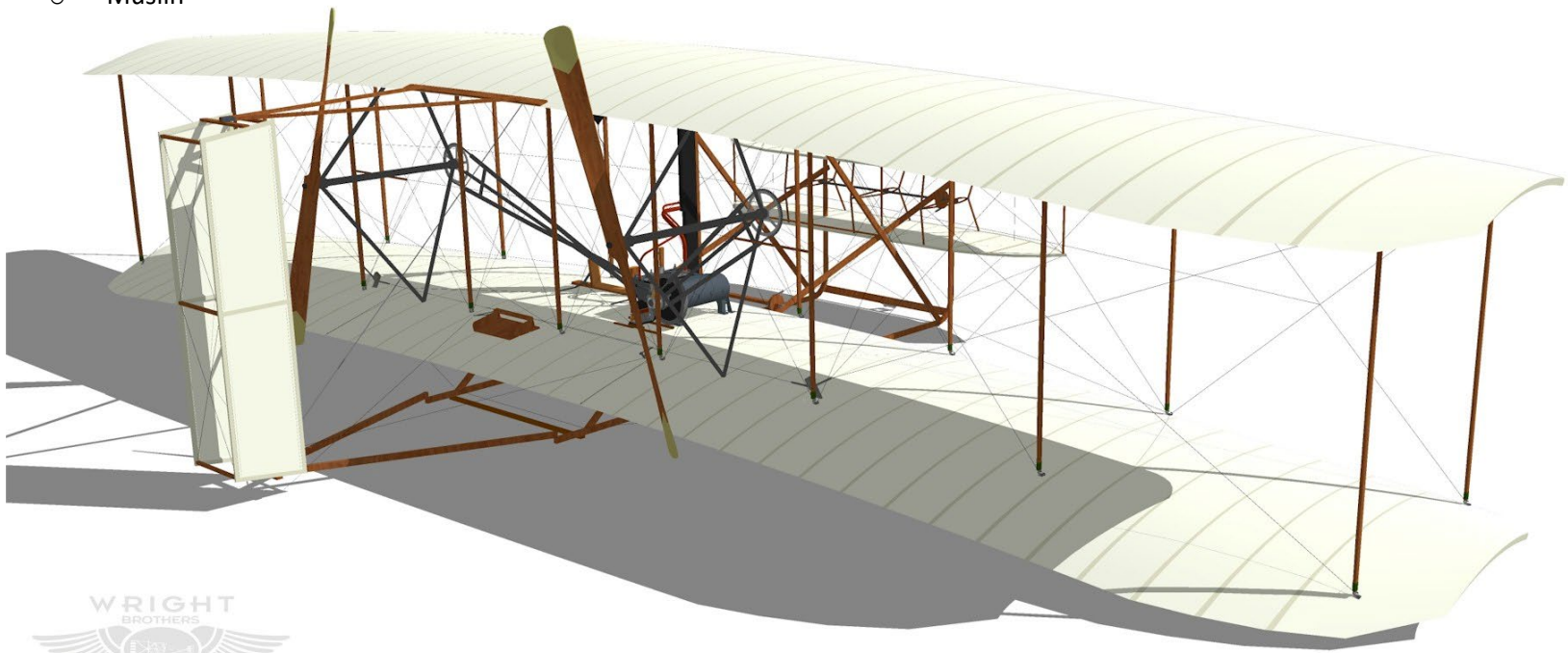
http://www.wright-brothers.org/

3. **3D controls**
   - Move from 2D control (bicycle, auto) to 3D axis control (roll, pitch, and yaw)
   - Pilot interface

4. **Lightweight integration**
   - Integrate advanced components into a flight-worthy structure without adding extra weight or drag

1. **Increasing lift-to-weight ratio**
   - Stacked wings for increased wing area and to maintain structural stiffness
   - Advanced lightweight materials
     - Spruce
     - Muslin

2. **Increasing power-to-weight ratio**
   - Aluminum gasoline engine
   - Multiple smaller propellers to reach speed faster



http://www.wright-brothers.org/

3. **3D controls**
   - Wing warping for roll
   - Elevator for pitch
   - Rudder for yaw

4. **Lightweight integration**
   - Minimize weight through material selection and efficient design
   - Prototyping design and evidence-based selection of best balance of components
   - Mitigate risks by wind tunnel testing of full prototype

Building Effective Teams and Partnerships

John Rosenthall, President
Tougaloo College Research and Development Foundation

TCRDF

HBCU
Research and Innovation Network

Tougaloo College Research and Development Foundation

The mission of the Tougaloo College Research and Development Foundation is to support the research and development mission of Tougaloo College and that of other Historically Black colleges and Universities (HBCUs).

TCRDF

How We Assist

HBCU
Research and Innovation Network

Partnerships and Long-term Engagement Strategies

- Faculty/student teams with paid summer engagements at DOD facilities and R1 DOD labs
- DOD personnel on loan to HBCU to build new programs in areas of national need
- HBCU consortia to focus on specific issues – HBCU UARC awarded to Howard was a great beginning

Capacity Building Grants Focused on the University Pain Points

- Contract and research compliance assistance and infrastructure - build sponsored programs offices and/or support shared sponsored program services
- Initial funding for facilities, equipment, and personnel for research and curricula in areas of national defense need

Upcoming Regional Pop-Up Events

September 19, 2023

Greensboro
North Carolina

Email
DARPAConnect@darpa.mil
to join our mailing list and
receive event updates

November 3, 2023

Hattiesburg
Mississippi

DARPA

CONNECT

DISCOVER · COLLABORATE · CONTRIBUTE

Summary

DARPAConnect@darpa.mil