Overview of Department of Defense (DOD) Early Career Awards for Research & Development

University of Memphis

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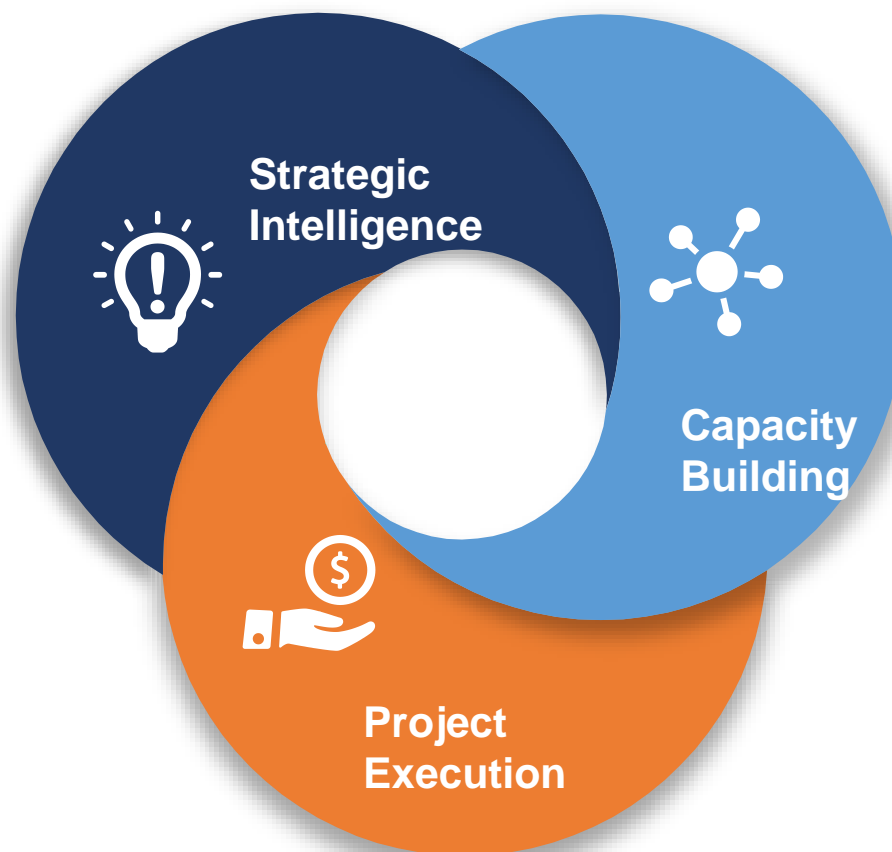# Who We Are

Washington, DC-based consulting firm

- Founded in 2004.
- Specialize in securing funding for a wide range of organizations.

Team of grants experts

- 40+ staff from Congressional and Executive branches, Academia, non-profits, & industry.
- 250+ grant writers, grant consultants & SMEs.

How We Work

Track and analyze advanced intelligence on the federal funding landscape.

Prepare the institution for competitiveness for current and future federal funding.

Assist in crafting competitive grant proposals.

Strategic Intelligence

Capacity Building

Project Execution

Objectives of Today's Session

- Explain the crucial steps needed to **proactively plan** for a DOD Young Investigator Program.

- Overview of the DOD **federal funding landscape** for early career research and development.

- Provide an understanding the **Young Investigator Programs** at the DOD.

- Determine how, and when, to start the **planning process**, so that you have the best chance of securing DOD Young Investigator research funding.

- **Best practices** for acquiring DOD Young Investigator research funding.

End Goals of this Session

- Faculty will know what kinds of research projects are funded by the DoD YIP/YFA programs.

- Faculty will know which YIP/YFA programs are relevant to their research concepts.

- Faculty will have the tools (DoD concept paper and quad chart) to submit a competitive DoD YIP/YFA proposal within the next 12 months.

DOD EARLY CAREER PROGRAMS
Young Investigator/Faculty Programs

Program Overview

DOD Early Career Funding Opportunities

Office for Naval Research (ONR)

Young Investigator Program

Air Force Office of Scientific Research (AFOSR)

Young Investigator Research Program

Army Research Office (ARO)

Young Investigator Program

Defense Advanced Research Projects Agency (DARPA) Young Faculty Award

Motivation to Apply for DOD Young Investigator Research and Development Awards

- **Multiple iterations of potential DOD funding**
  - ❑ Leverage Young Faculty funding for large funding mechanisms within the DOD.
  - ❑ Many of the basic research funding mechanisms have similar priorities.

- **Build a relationship with a DOD Program Manager**
  - ❑ The **four DOD Young Investigator programs** are designed to start early career researchers on this funding progression.
  - ❑ DOD Program Managers often have purview over multiple DOD funding mechanisms. For example, many of the Young Investigator Program Managers are the Program Managers for:
    - o the DOD long-range Broad Agency Announcements (BAAs); and,
    - o the Multidisciplinary University Research Initiative (MURI) program.

DOD Young Investigator Programs
General Information

- Each of the three service branches and DARPA have a Young Investigator funding mechanism.

- Typical annual funding per grant: $120K to $250K

- Total award amount: $360K to $1M

- Base period of performance: 3 years (DARPA's base period is 2 years)

DOD Young Investigator Programs
Overall Mission & Objectives

- Attract outstanding tenure-track faculty members from academic institutions.

- Foster creative basic research in science and engineering.

- Enhance early career development of outstanding young investigators.

- Increase opportunities for young investigators to recognize the DOD's research programs.

DOD Young Investigator Programs
Eligibility

	ARO	ONR	AFOSR	DARPA
Nationality	US Citizens, Nationals, Permanent Residents.	US Citizens, Nationals, Permanent Residents.	US Citizens, Nationals, Permanent Residents.	US Citizens, Nationals, Permanent Residents, **Foreign Nationals.**
Employment Status	Held their Ph.D., or equivalent, for fewer than 5 years.	Started first full-time position within past 5 years.	Full-time, permanent employee and received Ph.D., or equivalent, within past 6 years.	Assistant, Associate Professors, or recently tenured faculty.
Tenure-track	In a tenure-track position, unless institution doesn't have a tenure-track designation.	First or second full-time tenure-track appointment.	Hold a tenure-track, or career-competitive position.	Current tenure-track, or tenured faculty within 3 years of tenure date.
Eligible Institutions	Institutions of higher education.	Institutions of higher education.	Institutions of higher education, industrial laboratories, for-profit businesses, or non-profit research organizations.	Any US Institution, except researchers at FFRDCs, DoD and other Government Laboratories.

DOD Young Investigator Programs
Proposal Components

Attachments	Narrative Sections	Budget
Cover Page	Project abstract	Cost Volume / Proposal Budget
Table of contents	Projective Narrative / Technical Volume	Budget Justification
Current and Pending Support	Biographical Sketch	
Facilities, Equipment, and Other Resources	Bibliography / Reference List	

Military relevance

What is military relevance?
Talk the talk.

b. Engineering Sciences

Research in the Engineering Sciences is focused on basic research to discover, understand, and exploit new material systems, mechanical systems, electronics, and earth sciences that are expected to **create revolutionary capabilities for the Army.** Discoveries in this area are expected to **lead to capabilities in materials, the sciences for maneuver, the information domain, the sciences of lethality and protection, and Soldier performance augmentation, well beyond the limits facing today's Army**. (page 19)
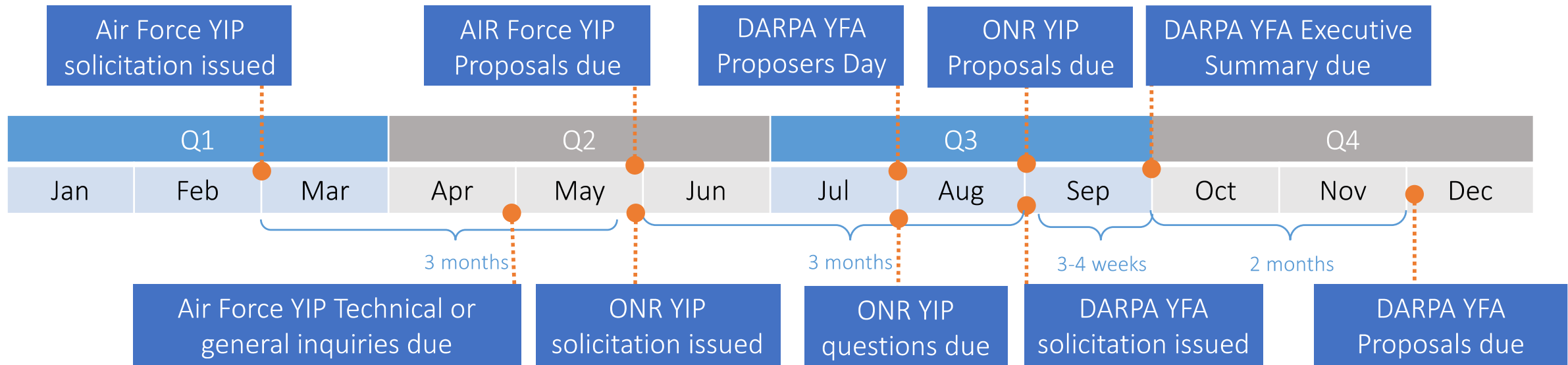
iii. Materials Science

The Materials Science Division of the ARO seeks to **realize unprecedented material properties by embracing long-term, high risk, high-payoff opportunities for the US Army** with special emphasis on: Materials Design, Mechanical Behavior of Materials, Physical Properties of Materials, and Synthesis and Processing of Materials. Research supported by the Division seeks to discover the fundamental relationships that link chemical composition, microstructure, and processing history with the resultant material properties and behavior... (page 28)

i. Computing Sciences

Research in the Computing Sciences Division will reveal previously unexplored avenues for new Army capabilities while also providing fundamental results to **support ARL's (i) Information Sciences Campaign goal of algorithm design for object classification and scene understanding** from active and passive 3D scenes and full motion video through enhanced semantic object recognition;... (page 33)

Spotlight: DoD Young Investigator Programs

General key dates for DOD Programs

Air Force YIP solicitation issued	AIR Force YIP Proposals due	DARPA YFA Proposers Day	ONR YIP Proposals due	DARPA YFA Executive Summary due

Q1	Q2	Q3	Q4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

3 months   3 months   3-4 weeks   2 months

Air Force YIP Technical or general inquiries due	ONR YIP solicitation issued	ONR YIP questions due	DARPA YFA solicitation issued	DARPA YFA Proposals due

DOD EARLY CAREER PROGRAMS
Young Investigator/Faculty Programs

Research Overview

DOD R&D Definitions for Early Career Faculty: Technology Readiness Levels (TRLs)

- The DOD uses TRLs to grade/assess the maturity of technology

TRL Level	Descriptions	Type
Level 1	Basic principles observed and reported	Basic
Level 2	Technology concept and/or application formulated	Basic/Applied
Level 3	Analytical and experimental critical function and/or characteristic proof of concept	Applied
Level 4	Component and/or breadboard validation in a laboratory environment	Applied
Level 5	Component and/or breadboard validation in a relevant environment	Adv Tech Dev
Level 6	System/subsystem model or prototype demonstration in a relevant environment	Adv Tech Dev
Level 7	System prototype demonstration in an operational environment	System Dev/Demo
Level 8	Actual system completed and qualified through test and demonstration	System Dev/Demo
Level 9	Actual system proven through successful mission operations	Operational Dev

Research in academia falls primarily in TRL 1-4 range.

DOD Office of Basic Research

Overall Mission

- The DOD Basic Research Office works with **academia, industry, and government partners** to foster collaborations, shape priorities, and **forge pathways in scientific investment areas** that aim to establish new and strengthened alliances with international allies, insertion of new innovations into programs of record, and **long-term scientific and technological superiority**.

Primary DoD Basic Research Offices of Interest

As the basic research component of the Army Research Laboratory, the **Army Research Office (ARO)** funds extramural basic research in the engineering, physical, information and life sciences, supporting supports scientific and far reaching technological discoveries at educational institutions, non-profit organizations and private industry.

As the basic research component of the Air Force Research Laboratory, **Air Force Office of Scientific Research (AFOSR)** serves to support Air Force goals of control and maximum utilization of air, space, and cyberspace.

The **Office of Naval Research (ONR)** makes broad investments in basic and applied research that will increase fundamental knowledge, foster opportunities for breakthroughs and provide technology options for future naval capabilities and systems.

Through **DARPA**, the Defense Sciences Office (DSO) funds high-risk, high-payoff research across a broad spectrum of science and engineering disciplines. Objective is to develop game-changing technologies for U.S. national security.

DOD Office of Naval Research (ONR)
Young Investigator Program (YIP)

ONR's Mission and YIP Objectives

ONR YIP Objectives

- To attract outstanding faculty members to the Department of Navy's research program.

- To support faculty's research and encourage their teaching and research careers.

ONR Mission

- To provide national and global science & technology-based solutions for current/future naval challenges.

- To foster cooperation with broad technical community in areas of mutual interest and to bring the full range of possibilities to the Navy and Marine Corps.

ONR Science & Technology Departments

❑ Expeditionary Maneuver Warfare & Combating Terrorism Department

❑ Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance

❑ Ocean Battlespace Sensing

❑ Sea Warfare and Weapons

❑ Warfighter Performance Department

❑ Naval Air Warfare and Weapons

ONR Research

ONR-sponsored research covers a broad spectrum of science and engineering disciplines.

❑ Aerodynamics, Artificial Intelligence/Machine Learning

❑ Biological and Physiological Monitoring and Modeling, Biomaterials and Bionanotechnology

❑ Cyber Security and Complex Software Systems, Computational Methods for Decision Making, Communications and Networking

❑ Power Generation and Energy Storage, Quantum Information Science

❑ Social Networks and Computational Social Science, Sensors and Signal Processing

ONR YIP Solicitation Overview

FY21 Submission Window:

- Solicitation Issued: Typically May

- Pre-application: Not applicable

- Full Proposals Deadline: Typically August

Budget and Award Information:

- Funding per award: Typical grants range from $510,000 to $750,000 over a three-year period.
- Total programmatic funding: $14M for the 2020 YIP
- Number of awards: 26 awards were made in 2020 YIP
- Number of applications received: Over 275 applicants

Other Caveats:

- Applicants are highly encouraged to contact ONR Program Manager ahead of time.
- White papers are not solicited and not accepted. Brief informal pre-proposals may be submitted to facilitate discussion with PO but not required.

ONR 2020 YIP Awardees

❑ Faculty from 19 academic institutions nationwide.

❑ Broad range of Naval-relevant research including thrust areas related to:

✓ Autonomy

✓ Wireless Communications

✓ Energetics

✓ Power and Energy

✓ Machine learning and Artificial Intelligence

✓ Sensors

✓ Bio-Tissue Repair

✓ Hypersonics

✓ Metamaterials and Nanomaterials.

DOD Air Force Office of Scientific Research (AFOSR)
Young Investigator Program (YIP)

AFOSR's Mission and YIP Objectives

AFOSR YIP Objectives

- To foster creative basic research in science and engineering.

- To enhance early career development of outstanding young investigators.

- To increase opportunities for the young investigator to recognize the Air Force mission and technical challenges.

AFOSR Mission

- To advance the state of the art in areas related to the technical problems the Air Force encounters in developing and maintaining a superior U.S. Air Force.

- To lower the cost and improve the performance, maintainability, and supportability of Air Force weapon systems

AFOSR Research

The focus of AFOSR is on research areas that offer significant and comprehensive benefits to our national warfighting and peacekeeping capabilities.

- ❑ **Engineering and Complex Systems:** Leads the discovery and development of the fundamental and integrated science that advances future air and space flight.

- ❑ **Information and Networks:** Leads the discovery and development of foundational issues in mathematical, information and network-oriented sciences

- ❑ **Physical Sciences:** Leads the discovery and transition of foundational physical science to enable air, space, and cyber power.

- ❑ **Chemistry and Biological Sciences:** Leads the discovery and development of innovative fundamental science addressing a broad spectrum of energy-related issues.

AFOSR Select Research Topics

❑ Dynamic Materials and Interactions

❑ Information Assurance and Cybersecurity

❑ Remote Sensing

❑ Dynamics and Control

❑ High-Speed Aerodynamics

❑ Quantum Information Sciences

❑ Human Performance and Biosystems

AFOSR YIP Solicitation Overview

FY21 Submission Window:

- Solicitation Issued: March 19, 2020

- Pre-application: Not applicable

- Full Proposals Deadline: July 14, 2020

Budget and Award Information:

- Funding per award: $150K per year for three years (a total of $450K)

- Total programmatic funding: $17.8M for the 2020 YIP

- Number of awards: 40 awards were made in 2020 YIP

- Number of applications received: Over 220 applicants

Other Caveats:

- Exceptional proposals may be considered individually for higher funding levels and/or a longer duration

- Proposals are reviewed by AFOSR Program Managers

AFOSR 2020 YIP Awardees

❑ Faculty from 30 research institutions nationwide.

❑ Broad range of Air Force relevant research including thrust areas related to:

✓ Aerospace Materials for Extreme Environments

✓ Dynamic Data Driven Applications Systems

✓ Biophysics and Complex Networks

✓ Dynamic Data Driven Applications Systems

✓ High Speed Aerodynamics

✓ Human Performance and Biosystems

✓ Mechanics of Multifunctional Materials and Microsystems

✓ Quantum Information Sciences

DOD Army Research Office (ARO)
Young Investigator Program (YIP)

ARO's Mission and YIP Objectives

ARO YIP Objectives

- To attract outstanding young university faculty members to pursue fundamental research in areas relevant to the Army

- To support their research in these areas, and to encourage their teaching and research careers.

ARO Mission

- To drive cutting-edge and disruptive scientific discoveries that will enable crucial future Army technologies and capabilities through high-risk, high pay-off research opportunities.

- To manage extramural basic research for the Army Research Laboratory (ARL).

ARO Research

ARL Science and Technology Campaigns

- ❑ Computational Sciences

- ❑ Materials Research

- ❑ Sciences-for-Maneuver

- ❑ Information Sciences

- ❑ Sciences-for-Lethality and Protection

- ❑ Human Sciences

- ❑ Assessment and Analysis

ARO YIP Solicitation Overview

FY21 Submission Window:

- Solicitation Issued: April 1, 2017

- White Paper Deadline: March 31, 2022 (up to 7 pages)

- Full Proposals: Invite only (Page limits not specified)

Budget and Award Information:

- Funding per award: $120K per year for three years (a total of $360K)

- Total programmatic funding: Not specified

- Number of awards: Not specified

- Number of applications received: Not specified

Other Caveats:

- ARO recommends to contact the relevant Program Manager prior to submitting

- YIP proposals will be selected for award on a competitive basis after a peer scientific review.

- Outstanding YIP projects may be considered for a Presidential Early Career Award for Scientists and Engineers (PECASE).

Defense Advanced Research Projects Agency (DARPA)
Young Faculty Award (YFA)

DARPA's Mission and YFA Objectives

DARPA YFA Objectives

- To develop the next generation of scientists and engineers in the research community.

- To develop scientists and engineers who will focus a significant portion of their future careers on DoD and National Security issues.

DARPA Mission

- To make pivotal investments in breakthrough technologies for national security.

- DARPA works within an innovation ecosystem that includes academic, corporate and governmental partners, with a constant focus on the Nation's military services

DARPA Research & Development

DARPA Technology Offices

❑ Biological Technologies Office (BTO)

❑ Defense Sciences Office (DSO)

❑ Information Innovation Office (I2O)

❑ Microsystems Technology Office (MTO)

❑ Strategic Technology Office (STO)

❑ Tactical Technology Office (TTO)

DARPA Select Research Topics

❑ Artificial Intelligence

❑ Bio-Systems

❑ High-Performance Computing

❑ Neuroscience

❑ Spectroscopy

❑ Photonics

❑ Quantum

DARPA YFA Solicitation Overview

FY21 Submission Window:

- Solicitation Issued: Typically in August
- Executive Summary Deadline: Typically in September
- Full Proposals: Typically in November

Budget and Award Information:

- Funding per award: Funding per award: $250K per year for the first two years, plus an optional $500K for an extra year.
- Total programmatic funding: Not specified
- Number of awards: Not specified
- Number of applications received: Not specified

Other Caveats:

- DARPA conducts a scientific/technical review of each conforming proposal.
- If necessary, panels of experts in appropriate areas will be convened.

DOD Young Investigator Programs
General Guidelines & Best Practices

DOD Young Investigator Application Process

Applications Requirements		DOD Research Offices or Agencies			
		ARO	ONR	AFOSR	DARPA
	Pre-Application	**White papers** requested, but not required. Email directly to Program Manager. Max length is 7 total pages.	**Not required.** White Papers are not accept, although ONR strongly encourages applicants to contact the PMs.	**Not required.** Proposal questions are encouraged within the first 2 months after the solicitation is released.	**Executive Summary** is due a month after solicitation is posted. Upload to DARPA Submission. Max length is 1 page, excluding cover sheet.
	Submission Platform	Proposals are to be submitted through Grants.gov.	Grants.gov.	Grants.gov.	Proposals are to be submitted through Grants.gov.
	Time between Solicitation and Full Proposal Deadline	**N/A (submission window is rolling).**	~3 months.	~3 months.	~3 months
	Full Proposal Length Limits	- Project Abstract (1 page max) - Technical Proposal (no limit)	- Abstract (4000 characters) - Technical Proposal (20 pages max)	- Abstract (300 words max) - Project Narrative not more than 20 pages.	- Abstract (1 page max) - Technical and Management Volumes (8 pages max)

DoD Program Managers
Importance and Roles

Building a relationship and rapport with the relevant Program Manager is an important step in writing a successful DoD proposal.

Program managers enjoy **broad autonomy** in awarding research dollars.

Program Managers are generally the **first reviewers** of any proposal and/or white paper.

PIs **are "strongly encouraged" to contact the Program Managers** prior to the submission deadline.

Building relationships with Program Managers will not only **facilitate dialogue with the DOD**, but also **vet a research idea** prior to the proposal deadline.

The Quad Chart

The DOD uses quad charts to communicate research ideas quickly to technical officials.

Purpose: Quad charts are analogous to an "elevator speech." Proposers have minimal time to inform a non-technical audience about the merits of the proposal and create interest in the DOD.

Format: 1-page document divided into four sections:

- Research Objectives
- Graphical Depiction of the Concept, or Prototype
- Technical Approach & DOD Impact
- Cost & Deliverables Schedule

Note: Some branches do NOT solicit White Papers but do encourage PIs to contact Program Managers. Make it clear that the Quad Chart is not intended to be a White Paper.

What is the DoD trying to accomplish?

How can your research help them accomplish it?

Tailor your research to meet the military's interests

Understand what the targets are for each program.
- Read the announcement.
- Understand who makes funding decisions.
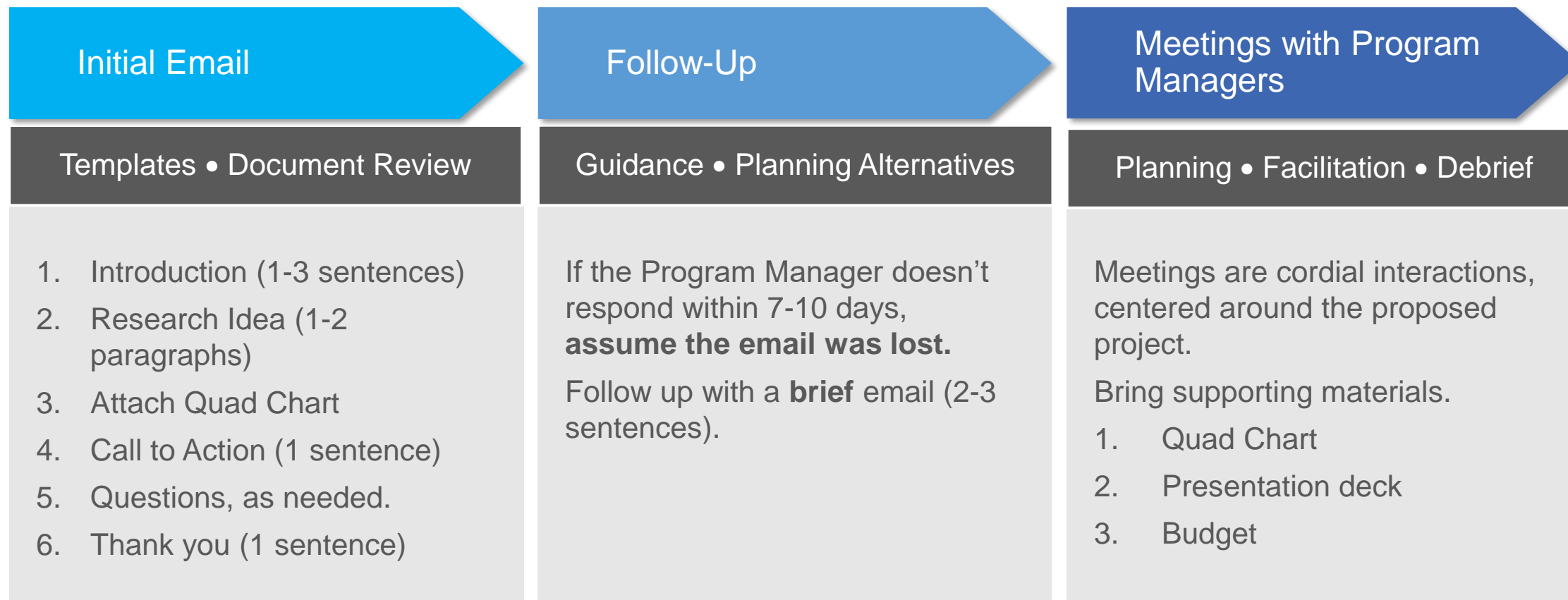
Understand the military environment.
- What is the military interest in your research area?

Understand your competition.
- Who is already receiving awards in your area?
- Does your team or do any of your collaborators have current awards from the DOD?

Contacting Program Managers

Initial Email	Follow-Up	Meetings with Program Managers
Templates • Document Review	**Guidance • Planning Alternatives**	**Planning • Facilitation • Debrief**
1. Introduction (1-3 sentences) 2. Research Idea (1-2 paragraphs) 3. Attach Quad Chart 4. Call to Action (1 sentence) 5. Questions, as needed. 6. Thank you (1 sentence)	If the Program Manager doesn't respond within 7-10 days, **assume the email was lost.** Follow up with a **brief** email (2-3 sentences).	Meetings are cordial interactions, centered around the proposed project. Bring supporting materials. 1. Quad Chart 2. Presentation deck 3. Budget

Guidelines for Crafting a Quad Chart

Introduction: A quad chart is a letter-sized page divided into four sections describing **the concept, goals, research cost and schedule, along with a figure or diagram**. The DOD uses quad charts to communicate research ideas quickly to technical officials.

Purpose: Quad charts are analogous to an "elevator speech." Proposers have minimal time to inform a non-technical audience about the merits of the proposal and create interest in the DOD.

Focus of each Quadrant:

- ❏ Research Objectives
- ❏ Graphical Depiction of the Concept, or Prototype
- ❏ Technical Approach & DOD Impact
- ❏ Cost & Deliverables Schedule

Insert Project Title and PI Name/Department

- **Objectives:**

- **Graphic Representation of Scientific Approach**

- **DoD Benefit/Impact**

- **Expected Performer:**

- **Requested Budget and Schedule:**

- **Research Outcomes:**

- **Deliverables:**

McALLISTER & QUINN

"Revolutionary Additive Manufacturing Techniques w/ Novel Materials"
Lead PI: Deji Akanbi, University of Memphis

■ **Objectives:**

Design a manufacturing solution that will combine the advantages of additive manufacturing with the capabilities and characteristics of novel and exotic materials.

- Additive manufacturing solution capable of fabricating freeform parts from wire feedstock of novel and exotic materials.

- Using heat induction as the lower cost energy source in comparison to lasers or electron beams

- Design prototype capability that is not commercially available that enables the ability to additively manufacture component parts using a wider range of material compositions.
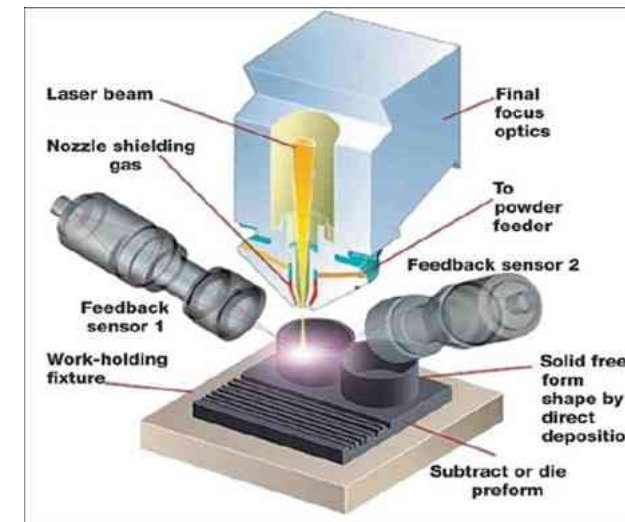
EXAMPLE

■ **DoD Benefit/Impact**
- Building an additive manufacturing solution that can use materials that will allow for higher performance and longer lifespan of component parts to increase Warfighter capability.
- Enable the ability to produce intricate parts for the Warfighter that cannot be manufactured with currently available technology.

■ **Research Outcomes:**
- Mature technology from TRL 2 to TRL 4.
- Findings will confirm the technical feasibility of research idea of creating new device with capabilities of additively manufacturing exotic materials.
- Will develop prototype to be demonstrated by the end of the funding timeline.
- This work will enable further investigation into the various specific applications the technology can be deployed to manufacture spare parts for the Warfighter.

■ **Expected Performers:**
- Deji Akanbi, Asst. Professor, University of Memphis
    - 10+yrs on additive manufacturing/material processing, >50 journal papers, 20+ speaking engagements
- Cam Clemence, Additive Mfg Lead, Additive Innovations, Inc.
    - 20+yrs Senior Materials Science Engineer

■ **Requested Budget and Schedule:**
- $1.2M for 3 years; $400k per year

■ **Deliverables: *assume 01/01/21 start***
- Task 1: Design induction heating device for deposition of melted wire (3/31/2021)
- Task 2: Develop motion control architecture for device (1/01/2022)
- Task 3: Develop processing parameters for exotic alloys (7/01/2022)
- Task 4: Characterize material structure and mechanical properties (6/01/2023)

MCALLISTER & QUINN

Cross-Cutting Review Criteria

Overall scientific and technical merits of the proposal.

- Degree of innovation; ability to advance state-of-the-art.

- Soundness of technical concept; ability to produce results.

- Awareness, understanding of the scope of the problem.

- Investigators' Capacities, expertise, environment.

Responsiveness to the topic, relevance to service branch, DoD research needs.

Cost, funding availability.

Fit

Capacity

Impact
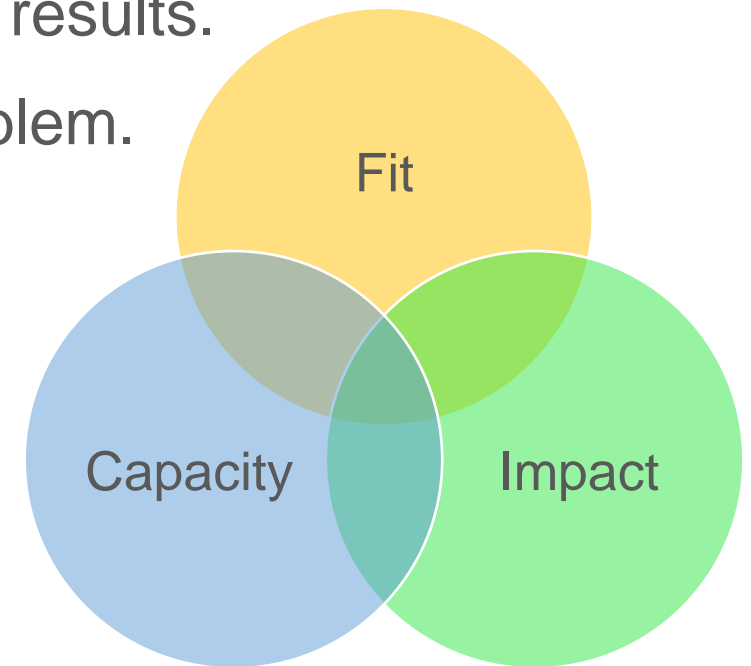
What Defines A Successful DoD-Funded Project?

What is the relationship of the proposed research and development to Department of Defense missions (**military relevance**) ?

Is basic research able to **transition into defense-related applied research and advanced technology**?

Is applied research able to **transition into commercial markets**?

Does the funded research show a **pathway to continued development** with industry, defense labs/DoD entities?

Key Takeaways

- The DOD's Young Investigator Programs are not impenetrable.

- Every branch of the DOD conducts their Young Investigator Programs differently.

- Make sure to follow the solicitation guidelines when contacting the Program Manager with your concept.

- Know your audience and read through the review criterion. A well structured proposal that aligns with review specifications makes it easier for the reviewers to score.

Next steps

- Develop your ideas – develop quad charts from your concept paper

- Determine which DOD branches best fit your research and schedule

- Reach out and engage with the resources available

- Quad chart templates and presentation slides will be made available

Questions

McAllister & Quinn

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