MTO 101

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The Heilmeier Catechism

1. What are you trying to do (no jargon)?

2. How is it done today, and what are the limits of current practice?

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

4. Who cares? If you are successful, what difference will it make?

5. What are the risks? How much will it cost? How long will it take? What are the mid-term and final "exams" to check for success?
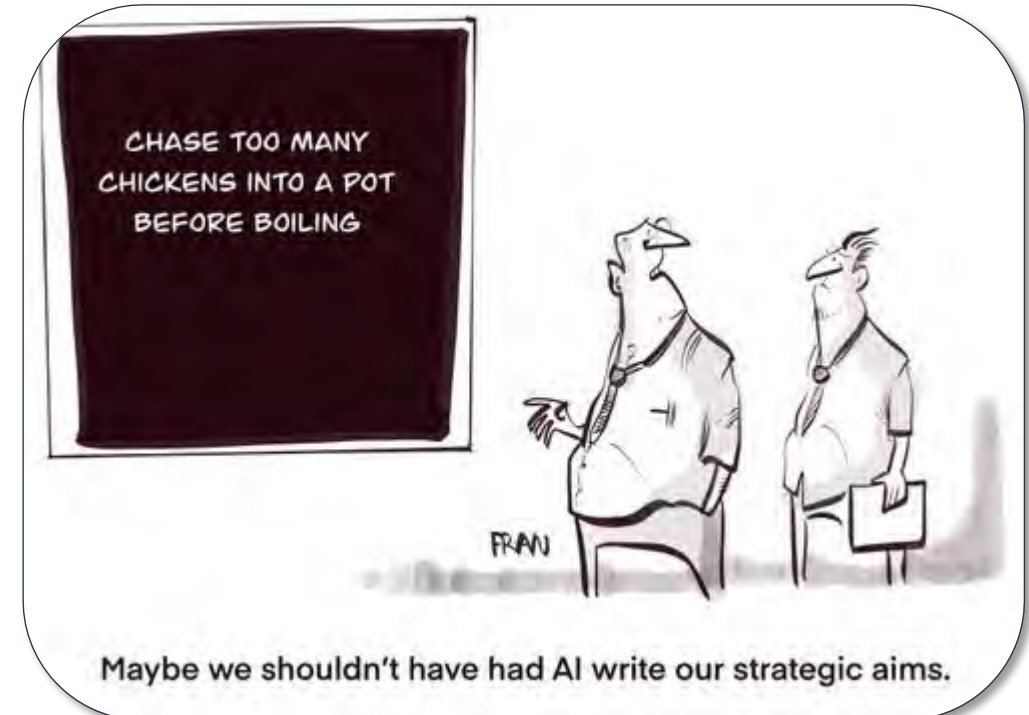
The question George Heilmeier wanted to ask: What is your business case?
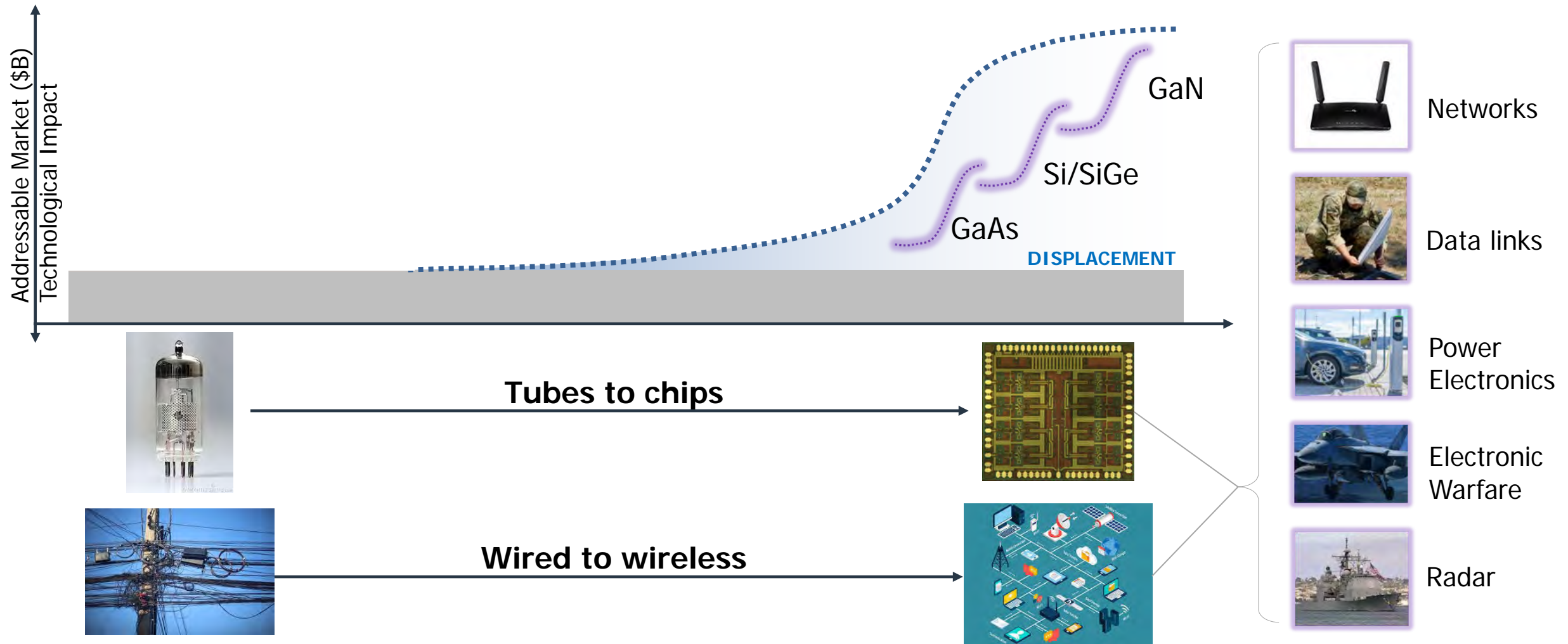
Weaknesses in defining and advancing SoA

AI usage → no statistical impact in success rate

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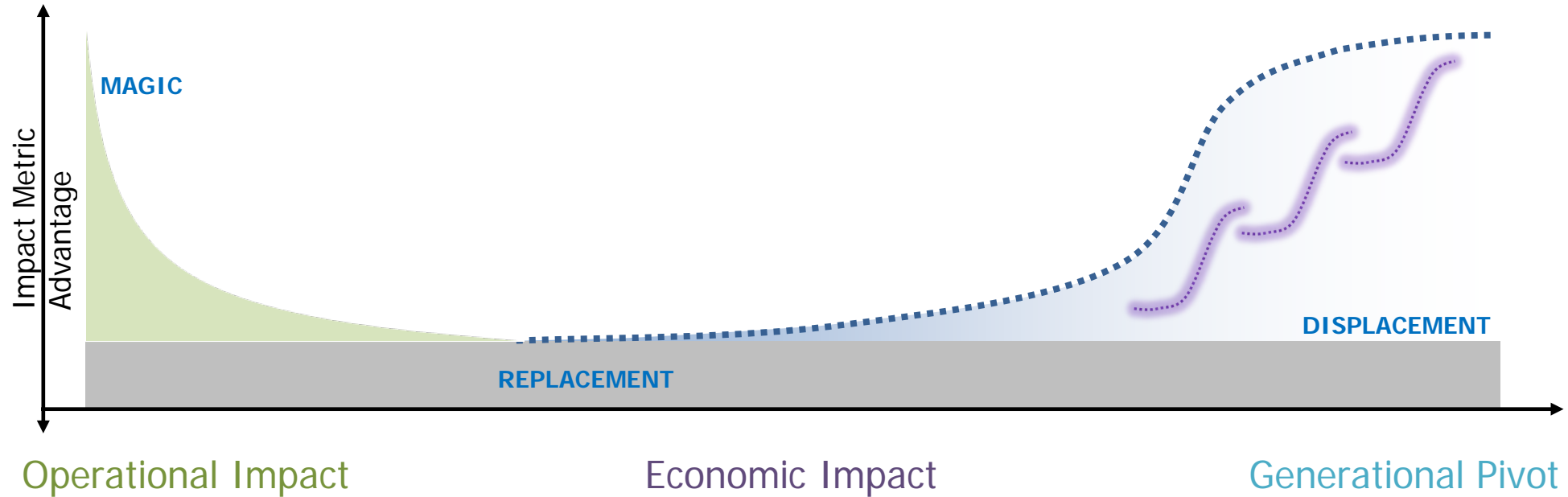Cartoonstock

Tubes to chips

Wired to wireless

GaN

Si/SiGe

GaAs

DISPLACEMENT

Addressable Market ($B)
Technological Impact

Networks

Data links

Power Electronics

Electronic Warfare

Radar

Achieved operational impact over 30 years

Impact Metric Advantage

MAGIC

REPLACEMENT

DISPLACEMENT

Operational Impact

Economic Impact

Generational Pivot

DARPA OPTIMA performer, EnCharge AI, developed compute-in-memory array processing and secured $100M VC funding

DARPA ACT and MIDAS performer, Jariet Technologies, grew from a small start-up to over 100 employees in 10 years and secured $150M in commercial investment

DARPA TEAM and SMART programs led to commercial satellite communications

OPTIMA: Optimum Processing Technology Inside Memory Arrays
VC: venture capital
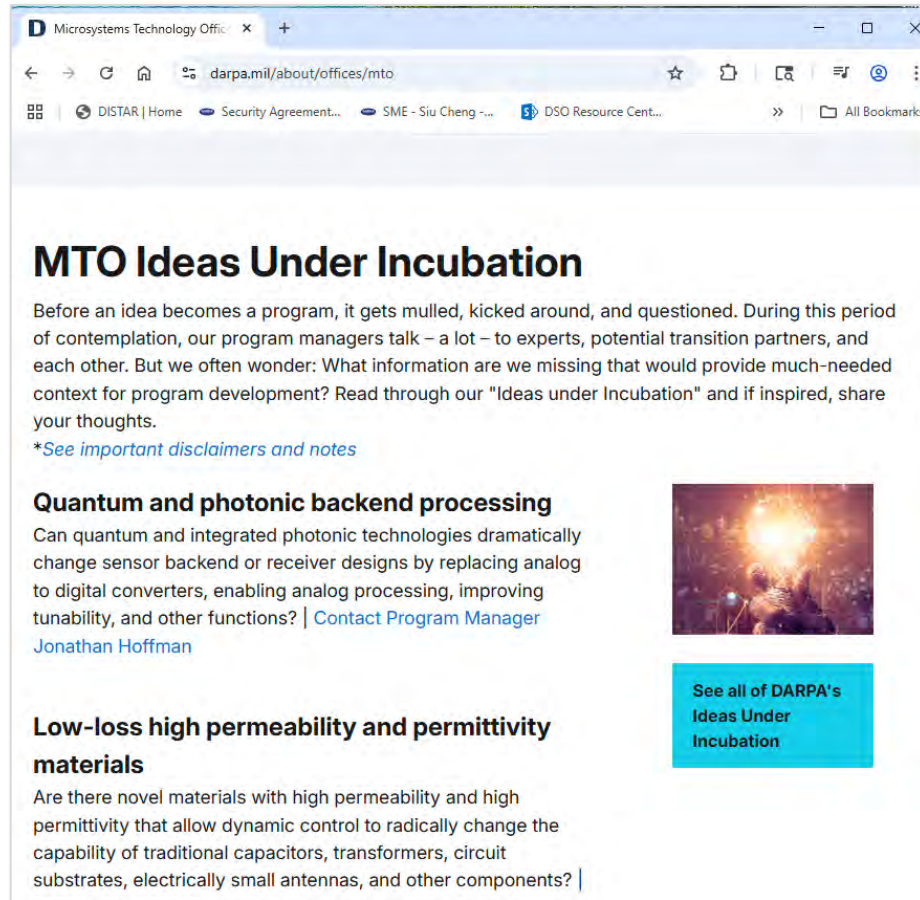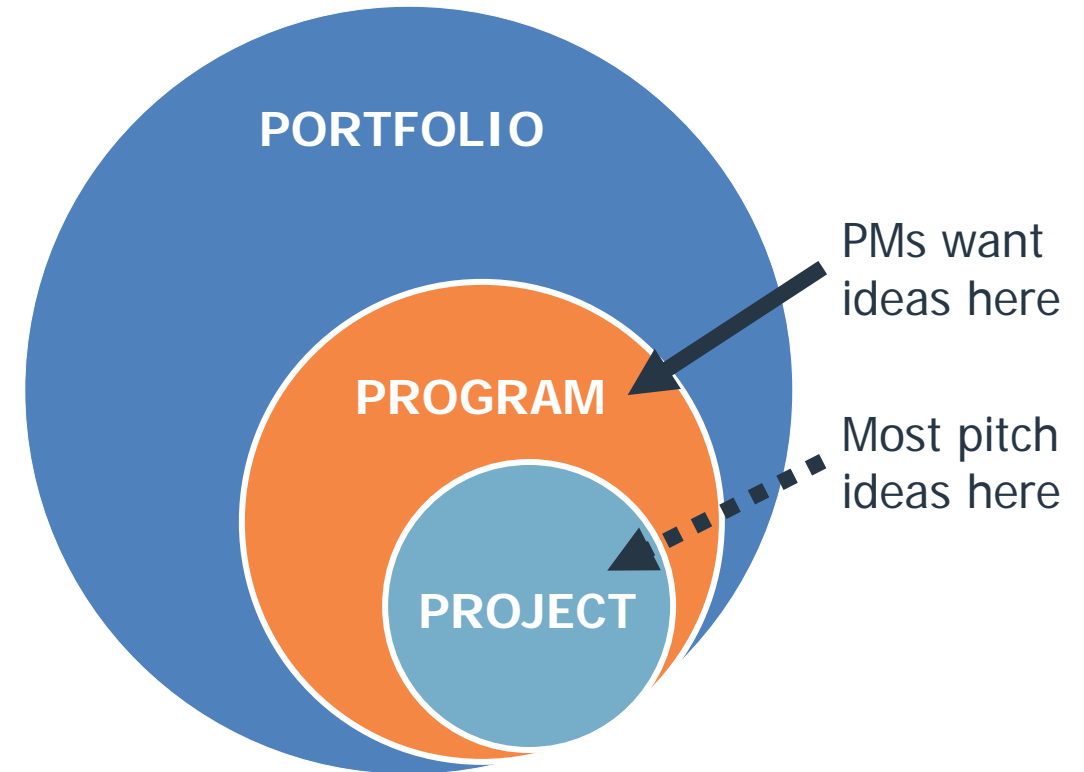ACT: Arrays at Commercial Timescales
MIDAS: MIllimeter wave Digital ArrayS

TEAM: Technology for Efficient, Agile Mixed Signal Measurements
SMART: Scalable Millimeter-wave ARray Technology

MTO Ideas Under Incubation

Before an idea becomes a program, it gets mulled, kicked around, and questioned. During this period of contemplation, our program managers talk – a lot – to experts, potential transition partners, and each other. But we often wonder: What information are we missing that would provide much-needed context for program development? Read through our "Ideas under Incubation" and if inspired, share your thoughts.

*See important disclaimers and notes

Quantum and photonic backend processing

Can quantum and integrated photonic technologies dramatically change sensor backend or receiver designs by replacing analog to digital converters, enabling analog processing, improving tunability, and other functions? | Contact Program Manager Jonathan Hoffman

See all of DARPA's Ideas Under Incubation

Low-loss high permeability and permittivity materials

Are there novel materials with high permeability and high permittivity that allow dynamic control to radically change the capability of traditional capacitors, transformers, circuit substrates, electrically small antennas, and other components? |

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PORTFOLIO

PROGRAM

PROJECT

PMs want ideas here

Most pitch ideas here

A program is a group of related projects managed together to achieve a larger strategic goal, while a project is a temporary endeavor with a specific objective

Do the homework for PMs

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The "D" stands for Defense

Revolutionary, not evolutionary

"If I had asked people what they wanted, they would have said faster horses."
—Henry Ford
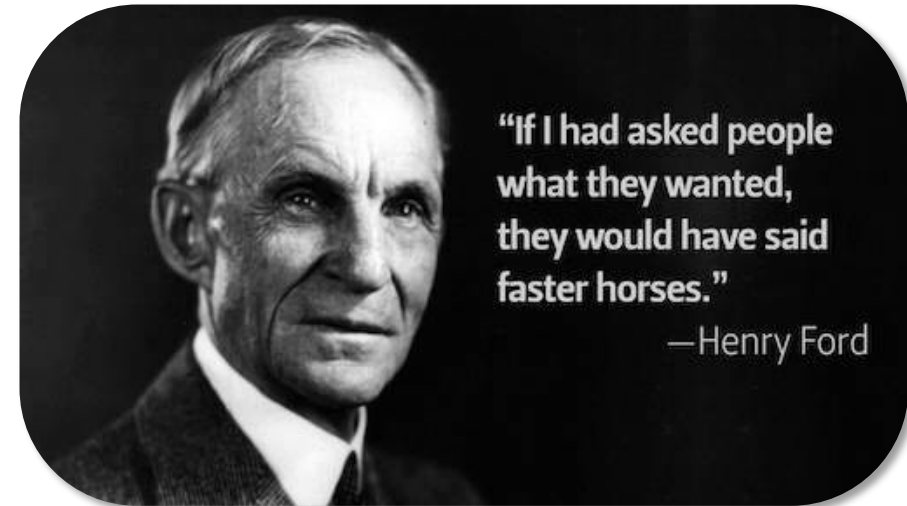
Listen to and respond to feedback

So, what do you think of my project idea?

It's interesting, but its not clear what the _____ is

That's fair, let me do some homework and follow up

- Program idea
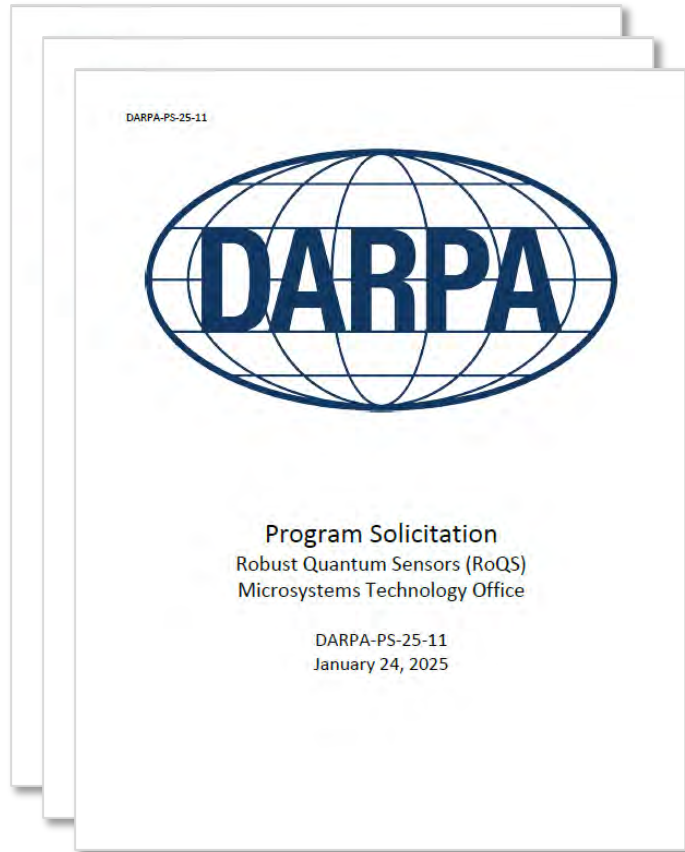- New insight
- Technical disruption
- Military advantage
- ...

Read the BAA, then read it again

DARPA-PS-25-11

Program Solicitation
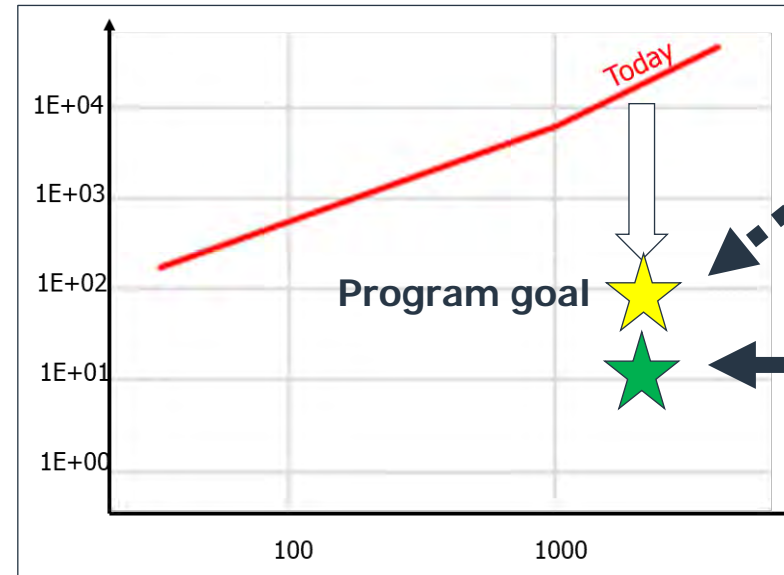Robust Quantum Sensors (RoQS)
Microsystems Technology Office

DARPA-PS-25-11
January 24, 2025

The more that you read, the more things you will know.
The more that you learn, the more places you'll go.

- Dr. Seuss

Don't just parrot the BAA

95% of proposals will say, "I can meet the metrics"

The best proposals say, "I can beat the metrics" and here is my detailed technical substantiation

RFIs are a bat-signal for engagement!

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MTO leadership can help

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