

# Fault Management Capabilities Roadmap

Integrating Fault Management capabilities into NASA missions



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# Why a Roadmap?

- ▶ A roadmap can provide guidance to the maturation of the Fault Management discipline
  - Identify critical capabilities and technologies
  - Identify capability and technology gaps
  - Identify ways to leverage R&D efforts
  
- ▶ Varied and competing interests in NASA missions
  - Capability development is not straight-forward
  - Prioritization of capabilities unclear
  - Limited technology/capability development funding



# Goals of Creating a Roadmap

- ▶ Connect and balance NASA's needs (pull) with Fault Management innovation (push)
  - Which envisioned NASA missions or systems will drive FM capability?
  - Which FM-related capabilities are needed to enable or enhance the envisioned NASA missions/systems?
  - Which FM technologies need to be developed to address the capability needs?
- ▶ Provide a clear framework for Fault Management innovation for
  - NASA policymakers
  - Mission/System Engineers
  - Researchers and Technologists
- ▶ Identify FM-related investment priorities for NASA Technology Programs, e.g., SBIR, OCT, ...



# Key Questions to Consider

- ▶ What are the key emerging types of fault management needs/ capabilities/technologies that we should focus on?
  - What is the current status of the key capabilities we are considering?
  - Where do they stand in terms of technology research, development, demonstration, and deployment?
- ▶ What technical/performance targets will the capabilities and technologies need to achieve in order to succeed?
  - Over what time frame?
  - What are current capability/technology TRLs?
  - What TRL do we need to go “live”?
- ▶ What level of cooperation or collaboration should we seek among the various domains?
- ▶ What are our key messages about fault management innovation?
- ▶ What questions have we raised that need further research to answer?



# Steps to Building a Roadmap

- ▶ **STEP 1: What are the driving needs (pull)?**
  - Why does NASA need FM capabilities?
  - What are the short and long term needs of NASA?
- ▶ **STEP 2: What capabilities are needed (domain)?**
  - What are the fault management domains?
  - Where is fault management used and how?
- ▶ **STEP 3: How do you do it (push)?**
  - What FM capability technology is currently being developed?
  - What challenges are there to developing FM technology?
- ▶ **STEP 4: How do we match capability development with NASA needs?**
  - Construct roadmaps



# Workshop Actions

- ▶ Define the “Pull”
  - Capture the upcoming NASA missions/systems being developed over the near, mid and long term time frames defined
  - These are efforts that make use of any FM capability
  - What NASA projects are enabled or enhanced by a FM-related capability?
- ▶ Define the “Push”
  - Capture the FM improvements going on at your center/org. that can be used to help NASA efforts succeed
  - These are FM specific efforts that may be associated with a project or some stand-alone research
- ▶ Domain knowledge capture
  - Organized around specific domains



# Domain Areas

- ▶ Aeronautics
- ▶ Launch vehicles
- ▶ Earth-orbiter human
- ▶ Earth-orbiter robotic
- ▶ Deep-space human
- ▶ Deep-space robotic
- ▶ Ground operations
- ▶ Mission operations

Note: this is an incomplete set of domains, but they represent the set we intend to target at this workshop. Other domains will be targeted post-workshop.

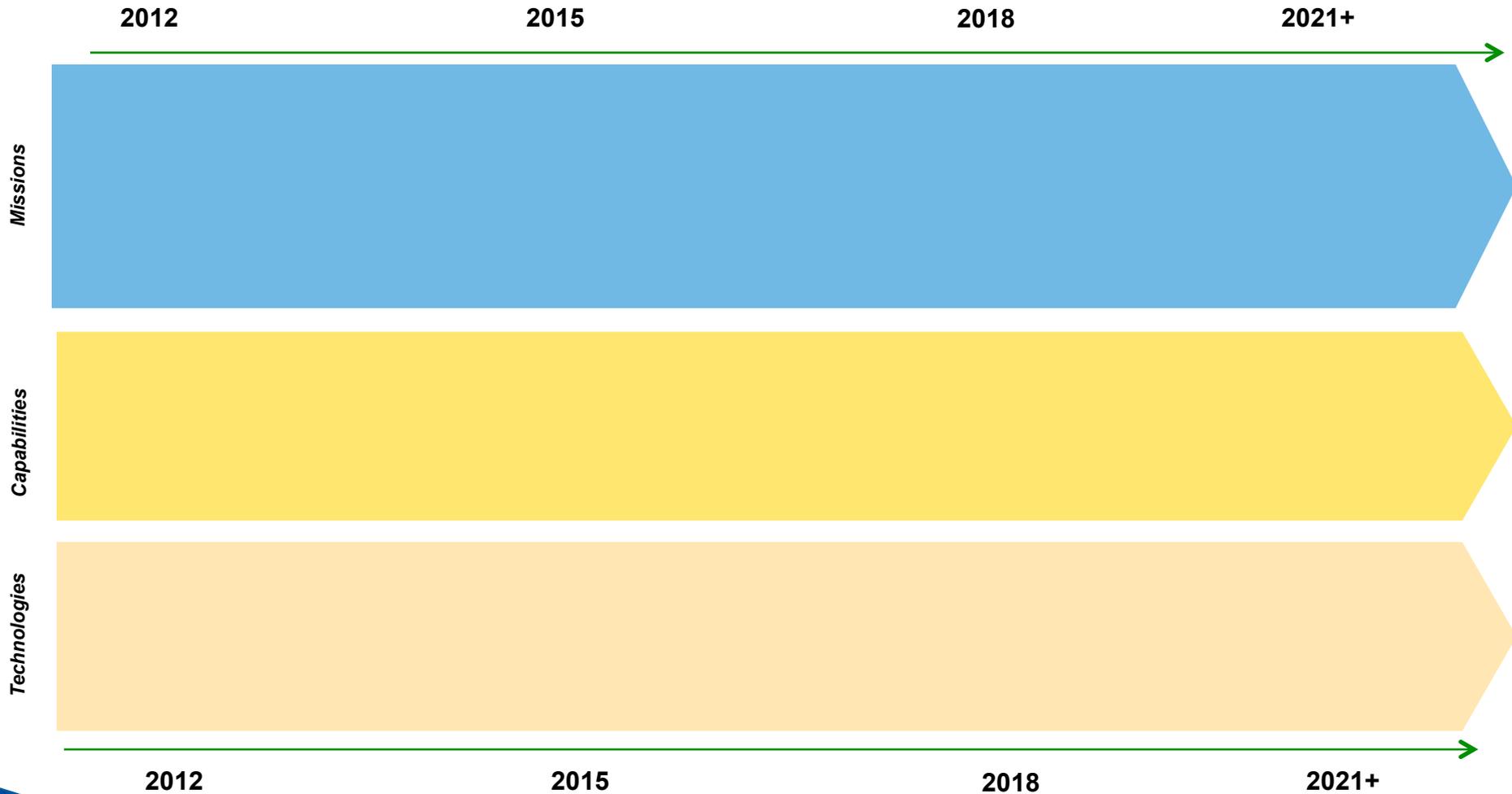


# Breakout schedule

- ▶ 1030–1100 Opening discussion and guidance
- ▶ 1100–1230 Separate breakouts to work on actions per domains
- ▶ **1230–0115 Lunch**
- ▶ 0115–0245 Cross-pollination session
- ▶ **0245–0300 Break**
- ▶ 0300–0400 Back to separate breakouts to finish any remaining actions
- ▶ 0400–0500 Overall review



# Sample Roadmap Format



# Team Members

- ▶ Stephen Andrews
- ▶ Brian Bauer
- ▶ Louis Breger
- ▶ Barbara Brown
- ▶ George Cancro
- ▶ Kenneth Costello
- ▶ John Day
- ▶ Lorraine Fesq
- ▶ Fernando Figueroa
- ▶ Carlos Garcia-Galan
- ▶ Kai Goebel
- ▶ Gary Hunter
- ▶ Mitch Ingham
- ▶ Stephen Johnson
- ▶ William Maul
- ▶ Kevin J. Melcher
- ▶ Jonathan Patterson
- ▶ Ann Patterson-Hine
- ▶ Daria Topousis
- ▶ Jonathan Wilmot



# Questions?

2012 Fault Management Workshop  
Fault Management Capability Roadmap

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