An Introduction to the 2012 NASA FM Workshop:
Background, Logistics, Scope, Goals
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California Institute of Technology
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Acknowledgements

• **Venue arrangements:** Pauline Burgess and Michelle Hensen, NRESS
• **Steering Committee**
  • Lindley Johnson, HQ/SMD – sponsor for this workshop and FM Handbook
  • Neil Dennehy, GSFC/NESC – co-sponsor of FM Handbook
  • Steve Scott, GSFC/OCE
  • Brian Muirhead, JPL/OCE
  • George Cancro, APL
  • Pat Martin, HQ/OSMA
  • Tim Crumbley, MSFC/OCE and Standards Office Manager
  • Ken Ledbetter, HQ/OCE
  • Carlos Garcia-Galan, JSC/MOD
  • Jeri Briscoe, MSFC/DNF
  • Frank Groen, HQ/OSMA
• **FM Architecture Trade Session Leads:** Kevin Barltrop (JPL), David Garlan (CMU), John Day (JPL)
• **FM Capabilities Roadmap Session Leads:** Ken Costello (IV&V Facility), Mitch Ingham (JPL)
• **Facilitators:** Daria Topousis, Chris Eng, Alex Kadesh (JPL)
Welcome to the 2012 NASA Spacecraft Fault Management Workshop!

• ~120 attendees
• >30 organizations from government, industry, academia
• 4 NESC Technical Fellows and members of the SE TDT
• Media
  – Photos by NESC
  – Video capture by NSC, to be posted on NASA Engineering Network (nen.nasa.gov)
  – Webcast by NSC (welcome, NSC STEP participants and ESA colleagues!)
• Now, a word from our Sponsor, Lindley Johnson, NASA SMD/PSD Discovery Program Executive
2012 Scope

- FM, ISHM, FP, IVHM, SHM, FDIR, RM, HUMS
- HSM and OSMA focus this year
- Aeronautics, GS, MS next on the list
Recent FM Developments

2006-2008: FM causes cost overruns and schedule slips on multiple missions

Apr ’08: SMD/PSD sponsors S/C FM Workshop (J. Adams)

Mar ’09: FM Workshop White Paper published

Jul ’08: Constellation (CxP) identifies FM as potential risk; forms FM Assessment/Advisory Team (FMAAT) (B. Muirhead)

Dec ’09: CxP publishes FMAAT Position Papers addressing key FM issues

Jan ’10: CxP establishes FM Team within Level 2 SE org (M. Goforth)

Apr ’10: NESC/SMD launch FM Handbook – robotic focus (L. Johnson/N. Dennehy)

Oct ’10: FM CoP established on OCE’s NEN website – nen.nasa.gov (L. Fesq)

Jul ’11: FM Handbook Draft delivered to NESC/SMD and NTSPO and Centers for review. OCE directs to “coordinate robotic, HSF and OSMA concepts next”

Jul ’09: NASA OCE endorses white paper; directs to “Coalesce the field” (M. Ryschkewitsch)

Apr ’12: SMD/PSD sponsors 2nd S/C FM Workshop (L. Johnson)

*
FM Handbook: Draft 2 – 4/9/12

http://www.nasa.gov/offices/oce/documents/2012_fm_workshop.html

1. SCOPE
2. APPLICABLE DOCUMENTS
3. ACRONYMS AND DEFINITIONS
4. PROCESS
5. REQUIREMENTS DEVELOPMENT
6. DESIGN AND ARCHITECTURE
7. ASSESSMENT AND ANALYSIS
8. VERIFICATION AND VALIDATION
9. OPERATIONS AND MAINTENANCE
10. REVIEW AND EVALUATION
11. APPENDIX A: REFERENCES
APPENDIX B: FMCONCERNS WITHIN NASA
APPENDIX C: FM FUNDAMENTAL CONCEPTS AND PRINCIPLES
APPENDIX D: CONTENT GUIDE FOR MANAGEMENT STRUCTURE
APPENDIX E: WORK TEMPLATE (TBS)
APPENDIX F: RELEVANT NASA LESSONS LEARNED
APPENDIX G: ACKNOWLEDGMENTS
A community of practice is...

A group of people who “share a concern, a set of problems or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis.”

-Etienne Wenger
NASA Communities of Practice on the NEN website
NASA FM Community of Practice
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<td>7:00 AM</td>
<td>QB Registration</td>
<td>QB Invited Speaker: Dr. Werner Dahm - Director, Security and Defense Systems Initiative</td>
<td>QB Invited Speaker: Dr. Algirdas Avizienis - Distinguished UCLA Emeritus Professor</td>
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<td>8:15 AM</td>
<td>Welcome - Lindley Johnson</td>
<td>“ISMH: Applications and Challenges on the Horizon”</td>
<td>JPL/CalTech - Steve Jenkins, “FM Ontology”</td>
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<td>9:45 AM</td>
<td>QB Focus Area: “Assessing FM architectures”</td>
<td>Break</td>
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<td>12:15 PM</td>
<td>Lunch - Invited Speaker: Michael Aguilar</td>
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<tr>
<td>1:15 PM</td>
<td>QB Focus Area: “Developing a FM Capabilities Roadmap”</td>
<td>Break</td>
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<td>1:30 PM</td>
<td>NASA/ARC - Mark Schwabacher, “Human Spaceflight ISHM Technology Development”</td>
<td>Break</td>
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<td>2:30 PM</td>
<td>JPL/CalTech - Mitch Ingham, “No more Band-Aids: Integrating FM into the Onboard Execution Architecture”</td>
<td>JPL/CalTech - Dan Overok, “Model-Based Systems Engineering (MBSE) and Goal-Based FM”</td>
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<td>3:00 PM</td>
<td>JPL/CalTech - Dan Overok, “Model-Based Systems Engineering (MBSE) and Goal-Based FM”</td>
<td>JPL/CalTech - Lui Wang, “Modeling Failure Modes with SysML”</td>
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<td>4:45 PM</td>
<td>AFRL/W-P - Mark Derriso, “AFRL’s ISHM Journey and Future Plans”</td>
<td>QB Breakout Session</td>
<td>QB Capabilities Roadmap Report &amp; Discussion - US Persons only</td>
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Logistics

• Agenda is color-coded to indicate locations
• Every day, start in Queen Anne Ballroom
• Day 1 schedule is tight – I will be holding speakers to their allotted time.
• Day 1 presentations prepare us for Day 2 activities
• Day 2 plan: Split into 2 parallel Breakout Sessions
  – Go to one Session and stay there for the day. Discourage traveling
  – Introductions to each Session will be provided on Day 2
• Day 3 focuses on FM Handbook issues
Day 3: Handbook Issues

- Terminology!
- What is the “science” that lies beneath FM?
- Confusion about FM vs OSMA responsibilities
- How does FM fit within a mission?
  - Part of SE’s responsibilities?
  - Separate subsystem like power, ACS and thermal?
  - Additional duty for subsystem engineers?
Goals

• Bring FM LL and BP alive to benefit future missions
• Establish a vision for FM technology development
• Expose the different views/roles of FM on current missions
• Work toward consensus on key issues
• Plans for the next 3 days
  – Collect and Assess past FM Architectures
  – Develop a FM Capabilities Roadmap
  – Discuss via a panel the role of FM on a Mission
  – Mature the contents of the NASA FM Handbook
Final announcements

- Online survey for you to take at the end of this Workshop
- At the end of today, all FM architecture session Case Study leads please meet with John Day