Ground System Architectures Workshop
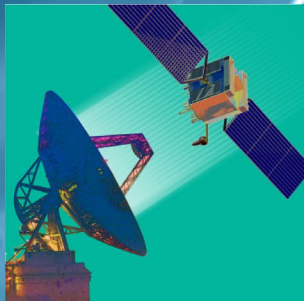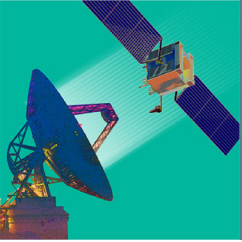*Opportunities in Data Exploitation*

March 2–5, 2020 | Renaissance Los Angeles Airport Hotel

Automation in Contested and Congested Space

Leads:
Donald Sather and Carlos Rexach,
The Aerospace Corporation
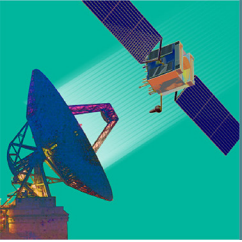
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- Discussion and suggestions to bring automation to the contested and congested environment of space

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- Dr. Suzanne Dawes, Senior Project Lead, Aerospace Corporation
- John Heskett, Engineering Lead & Systems Architect for KSATLite, KSAT
- Don Breaker, EGS Requirements Lead, Space Force
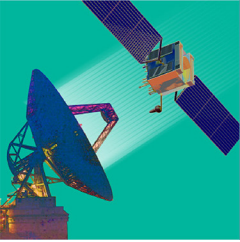
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- The ability to automate should be baked in as opposed to sprayed on
  - *Difficult to retrofit existing designs or systems that weren't designed to be automated in the first place*
- Trust in automation must be gained before acceptance or subsequent use
- Need to address human needs upfront as opposed to just hardware/software development
- Legal and regulatory restrictions can hamper automation
- Risk Management is a key component to determining appropriate level(s) of automation
- There are limitations on human capabilities that drive the need for machine speed
- Use of standards and common TTPs across programs facilitate the ability to automate
- Automation errors (bugs) easier to justify to humans than human errors
- Automation can provide artifacts that are useful in trending

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- Accept humans will make mistakes and automation will fail, architect accordingly
- Types of information & feedback the system is providing the human when automated is critical – human needs situational awareness at all times
  - *Does the operator have sufficient knowledge, skill, information and time to recover?*
- Humans need to be engaged by the system or distraction occurs (boredom) and skills degrade (longer term)
- High levels of automation may drive the need for higher skilled operators especially if the architecture cannot tolerate asset loss
  - *May also require higher skilled level software maintainers due to the complexity of the software*
- Automation that is "desired" but wasn't put into the requirements baseline results in automation not being implemented
- In a benign environment the level of sophistication can be low, however, in a contested environment the opposite is true

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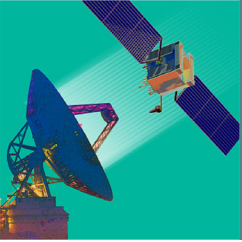
Overcoming "anti-automation" culture:

- Cutting budgets
  - *Should spur a thoughtful, structured approach to automation implementation*
  - *<u>Usually</u> results in poorly planned, reactionary execution with unintended consequences*
- Utilize strategies to incorporate the ops community into the acquisition, development, design, integration and test of systems
  - *Also develops trust*
- Incentivize automation evolution through the OPR process
- Acquisition provides a manual system with the mechanism and tools to automate and then let the operations group determine how to automate as they gain system and environment experience
- Don't call it "automation" – just say this is how the system works and train them that way
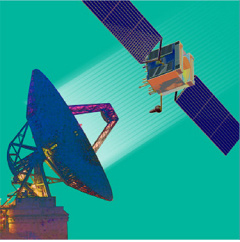
- Pathfinder program(s) required to demonstrate effective automation development methods
  - *Methods can then be used by other programs*
- Automation should be constantly evolving at the operation center as experience is developed and the environment becomes better understood
  - *Acquisition organization should be responsible for delivering tools and mechanisms to enable this*
- Anticipation of future environments that we may operate in (15-20 years in the future) and what might those demands might place on automation are required to develop tools and algorithms now
- On site software developers should be provided training/exposure to operational experiences to facilitate their system understanding

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