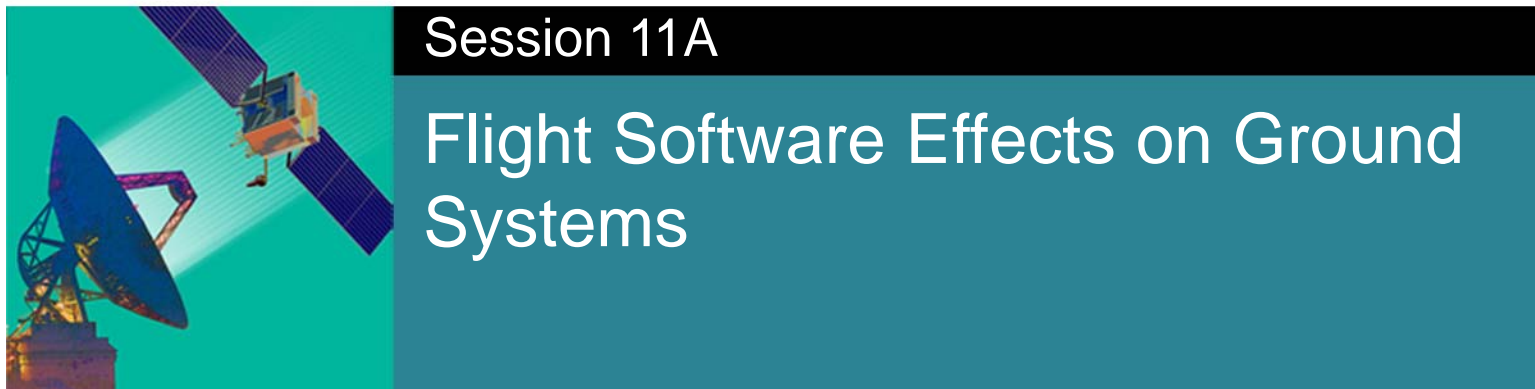


Working Group Outbrief

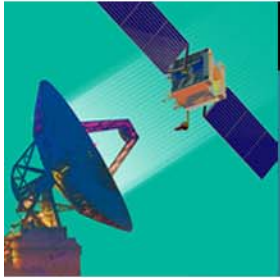
Ground System Architectures Workshop



Session 11A

Flight Software Effects on Ground
Systems

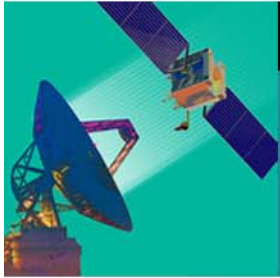
Alan Unell, The Aerospace Corporation



Session Goals

- There are significant areas where flight software impacts the ground and vice versa.
- The session attempts to identify areas that create conflict between space and ground and to elicit techniques that could foster more collaboration and smoother development and operations.

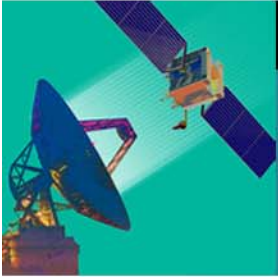
Ground System Architectures Workshop



Presenters/Panelists

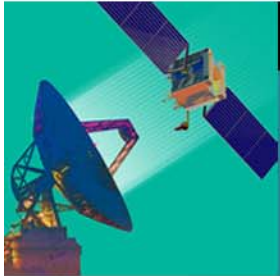
- Suzanne Dawes is a Senior Project Leader at the Aerospace Corporation specializing in human factors
- Lawrence Miller is Principal Scientist in the Computers and Software Division at the Aerospace Corporation and has been a flight software chief engineer
- Nathaniel Parsons is flight software engineer at the Applied Physics Laboratory of Johns Hopkins University
- Nestor Peccia is head of the Data Systems Infrastructure Division, department of Engineering at the Operations Centre of the European Space Agency (ESA/ESOC), Darmstadt, Germany

Ground System Architectures Workshop



Key Points

- Common Services on space vehicles and in ground systems that are mandated to be used can save significant cost and schedule.
- Many OPS issues are attributed “pilot error”.
 - Where is the panic button/slow moving telemetry that goes unnoticed can kill a vehicle
 - Operator overload is an indicator of FSW/GSW design problems.
 - Fixing OPS problems by adding more procedures makes the system more complicated and increases OPS risk instead of reducing it.
- Flight software and ground software are often developed without much interaction
 - Lack of communication and cooperative testing leads to disconnects
- What operator’s need to do their jobs is not often considered until very late in development
- Cross-pollination between FSW development and OPS is a valuable improvement.



Conclusions

- ESA has chosen to standardize a significant portion of space vehicle and ground system software to save cost and schedule.
 - Heavy initial investment that is now paying dividends.
- Bringing OPS into the picture very early will reap benefits in a more supportable system
 - Easier anomaly resolution
 - Funding issues
- Increased exercising of FSW and GSW in common frameworks can make for easier OPS
 - Early development of a prototype GS that operates with simulated vehicles to test out procedures can help make flight and ground software more cooperative.
 - There are COTS tools that can help.
 - Robust failure/anomaly testing with ops personnel early in development can positively influence both operations and flight software.