Using Command File Error Metrics to Prepare for Critical Events

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Command File Error Working Group Purpose

- Examine the project's Command file errors (CFEs) in 2011 and 2012
  - Each flight team to update and discuss their particular CFEs with a focus on emphasizing best operational processes and additional process improvements as we prepare for our next critical operations phase.

Anomaly Resolution Standard
DocID 35506, Rev. 5 Appendix B, Para. 2.11

**A command file error is defined as one of the following, regardless of the effect on the spacecraft:**

– an error in a command file that was sent to the spacecraft;

– an error in the approval, processing, or uplink of a command file that was sent to the spacecraft;

– the omission of a command file that should have been sent to the spacecraft.

STORED SEQUENCES

- **Typical Stored Sequence Process Flow Chart**
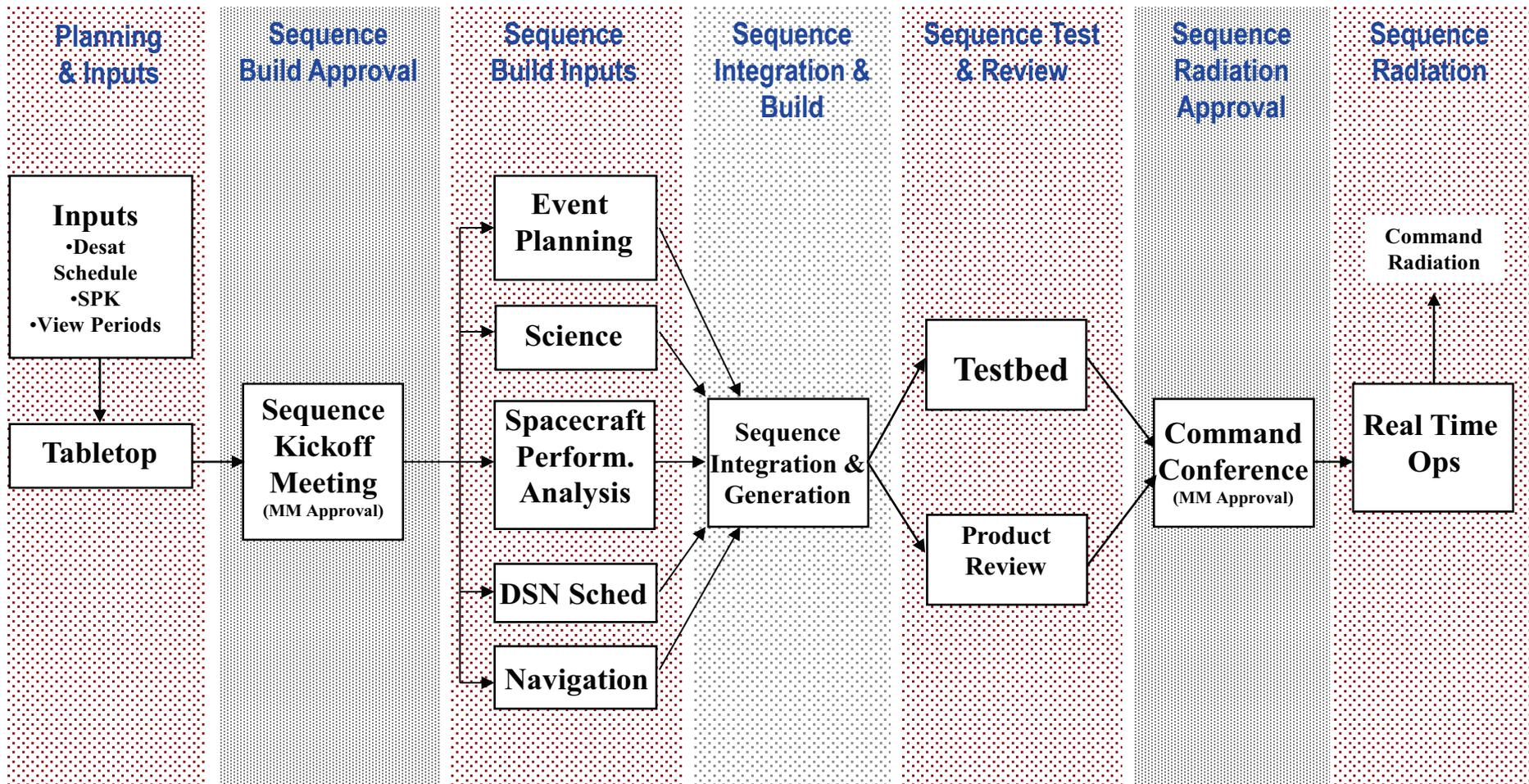
Example Command File Errors
by Criticality per Year

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
CRIT 1							1	1	0	0	0	0
CRIT 2							2	1	1	0	4	3
CRIT 3							7	1	2	4	4	7
CRIT 4							0	0	0	0	0	0
Total Cmd File Errors							10	3	3	4	8	10
Total Cmd Files =							2036	964	631	450	1172	774
Cmd File Error Rate =							0.49%	0.31%	0.48%	0.89%	0.68%	1.29%

30 Apr - 01 May 13

Proximate/Root Causes

- *Loss of rigor*
  - *Inattention to detail, complacency, inadequate review, procedures not followed, miscommunication, distraction, multi-tasking*

- *Situational Awareness*
  - *Inadequate knowledge of the spacecraft state as a function of time*

- *Flight Team work overload*
  - *Stress, fatigue, rush in getting tasks done*

- *Non-standard activities*
  - *Doing activities in different ways, first time events on the spacecraft*

COMMAND FILE ERROR REPORTING TEMPLATE

Project:	ISA # XXXXX	Incident Date: xx/xx/2011	Command File Error Location: Testing	Command File Error Criticality: X
Command File Error Description (Undesired outcome) including a generic and more detailed description.	Safemode entry was due to sequence commands requesting a slew that the S/C could not keep up with. As the slew executed the attitude fell behind producing a attitude error, this condition lasted long enough for the attitude error to exceed the FP threshold.			
Proximate Cause (The event(s) that occurred, including any condition(s) that <u>triggered the undesired outcome</u>.)	Inadequate review of SoftSim results			
Contributing Cause (The event(s) or condition(s) that may have contributed to the occurrence of an undesired outcome but, if eliminated or modified, <u>would not by itself have prevented the occurrence</u>.)	Time pressure to review the simulation results			
Root Cause (The event(s) or condition(s) that led to the proximate cause and subsequent undesired outcome and, if eliminated, or modified <u>would have prevented the undesired outcome</u>.	Infrequent use of the SoftSim tool			
Corrective and Preventive Actions (include immediate and long-term), and Recommendations across projects.	SoftSim review process has been modified to make review of the basic telemetry quick and less susceptible to error. Produced a generic set of plots that summarizes the overall performance of the run. Modifications to qSTAT were made to provide insight earlier in the process if a thrust design is likely to induce the type of cheby profile that caused the high rate commands in the turn that cause the safing. Reviewed the ACS sequence review process with section oversight to identify an holes or places improvement could be made.			