NASA Honor Award (Group) Details

Award Title:
Group Achievement Award

Group Name:	Funding Organization:
AIM FLIGHT OPERATIONS TEAM	DA000

Group Representative:
WELCH, DAVID

Citation:
For the AIM Flight Operations Team (FOT), for its exceptional engineering and innovative achievement enabling the AIM mission to continue operations without command uplink.

Justification:
The AIM (Aeronomy of Ice in the Mesosphere) spacecraft has now gone 1193 days without command uplink capability, lost early in this single-string, low-cost mission due to a defect in the command receiver exacerbated by spacecraft charging and radiation effects. As described below, the extraordinary innovation and dedication of the AIM Flight Operations Team (FOT) clearly saved this mission, enabling significant scientific advancements in understanding the coldest region on Earth. Their efforts have pushed the limits in spacecraft automation beyond anything accomplished before. They enabled science operations to continue despite an anomaly that could have ended the AIM mission prematurely, and significantly reduced the cost of operating the mission during the extended mission phase. AIM was launched on April 25, 2007 from Vandenberg Air Force Base. Ten days into the mission, AIM began having difficulty attaining lock on the uplink subcarrier. Since then, the AIM spacecraft experienced varying periods, from hours to weeks, between contacts with successful command uplink. The first extended outage of approximately four days occurred a couple of weeks after the problem surfaced. This drove the FOT to examine new ways of operating the spacecraft. The FOT made massive software changes while they could, to allow the spacecraft to operate autonomously for long periods without command uplink. The initial efforts focused on providing a system that was robust against extended command outages without making significant changes to the risk posture of the program. Then, the priority shifted to developing and testing groundbreaking techniques for the command and control of a deaf satellite. The first efforts focused on producing an expedited instrument commissioning sequence using stored commands and developing a stored command sequence to execute in the event of another extended outage. Next, the FOT increased the onboard command storage capability, improved the on-board orbit knowledge and provided for an autonomous downlink of recorded data when AIM passed over a scheduled ground station Then the FOT proceeded to fully automate the spacecraft to handle science observation sequences and to perform autonomous orbit maneuvers using the onboard telemetry monitors that are nominally used for onboard fault detection and correction sequences. This provided the AIM mission with a means for continuing science observations in the event of an extended command outage. Having achieved a level of autonomy that would meet mission requirements, the FOT worked on improving the science data quality and the robustness of the system. This involved incorporating the ground based mission-planning software into flight software. In parallel, the FOT developed a process to modulate the RF signal through the TDRSS link in ways that are observable to the flight software (a.k.a. Morse code commanding), without requiring the receiver to lock onto the subcarrier. This allows the operations team to trigger pre-loaded stored command sequences to perform emergency recovery operations. The capability to build custom command sequences is enabling new science as the AIM orbit evolves during extended mission operations. The AIM spacecraft will be reconfigured to perform science during upcoming years of "full-sun" condition when the autonomous state vector routine and the on-board mission planning software will no longer function due to lack of sunrises and sunsets. These innovative modifications continue to enable robust ongoing spacecraft operations with no loss of science data quality or quantity. The FOT implemented extensive, opportunistic and highly creative operational changes to both the spacecraft and science instruments, resulting in the ongoing return of over 98% of the science data on a continuous basis after accomplishing 100% of the science return for the mission. Their accomplishment has enormous potential for the future conscious implementation of spacecraft autonomy, potentially requiring fewer operators and lower cost to NASA. This was all accomplished with no change of funding from NASA and resurrected a mission that could have been a total loss extending it into years of spectacular science results.

Comments:

Initiator:	Nominator:	Approver:	Effective Date:
MACKALL, JACQUELINE	TALAAT, ELSAYED	WOODS, DANNY	
Date Created:	**Reviewer:**	**Approval Date:**	**Current Status:**
11/10/2015	NONE REQUIRED	11/18/2015	CENTER AWARDS OFFICER FINALIZE

Group Award Nominees

Nominee Name	Nominee Organization	Amount
CHAPPELL, STEVE Charge Code Information:	UNIVERSITY OF COLORADO, LASP	
AMBROSE, LESLIE Charge Code Information:	4501	
ANDERSON, DAVID Charge Code Information:	UTAH STATE UNIVERSITY, SPACE DYNAMICS LABORATORY	
BAIRD, GRACE Charge Code Information:	ORBITAL ATK	
BIELUCKI, MICHAEL Charge Code Information:	4520	
CHEN, JUNDA Charge Code Information:	ORBITAL ATK	
COOK, JAMES Charge Code Information:	UTAH STATE UNIVERSITY, SPACE DYNAMICS LABORATORY	
CUEVAS, OSVALDO Charge Code Information:	5840	
DAO, VINH Charge Code Information:	ORBITAL ATK	
DAVIS, KELBY Charge Code Information:	UTAH STATE UNIVERSITY, SPACE DYNAMICS LABORATORY	
DELAHAYE, DERRICK Charge Code Information:	ORBITAL ATK	
FABER, JACK Charge Code Information:	UNIVERSITY OF COLORADO, LASP	
FISH, CHAD Charge Code Information:	UTAH STATE UNIVERSITY, SPACE DYNAMICS LABORATORY	
FRANCHEK, RICHARD Charge Code Information:	4530	
FULMER, JOHN Charge Code Information:	ORBITAL ATK	
GAGNARD, SAMUEL Charge Code Information:	UNIVERSITY OF COLORADO, LASP	
GATHRIGHT, DAVID Charge Code Information:	UNIVERSITY OF COLORADO, LASP	
GLASSCOCK, DAVID Charge Code Information:	450.S	
GORDLEY, LARRY	GATS, INC	

Charge Code Information:	
GRIEST, KENNETH Charge Code Information:	UNIVERSITY OF COLORADO, LASP
GRITZMACHER, DONALD Charge Code Information:	UNIVERSITY OF COLORADO, LASP
GROSZKIEWICZ, JOSEPH Charge Code Information:	ORBITAL ATK
HOOPER, DALE Charge Code Information:	UTAH STATE UNIVERSITY, SPACE DYNAMICS LABORATORY
JOUCHOUXH, ALAIN Charge Code Information:	UNIVERSITY OF COLORADO, LASP
KELLEY, MICHELLE Charge Code Information:	UNIVERSITY OF COLORADO, LASP
KINNA-CUDDAHEE, ROBIN Charge Code Information:	ORBITAL ATK
KOMINEK, JAY Charge Code Information:	UNIVERSITY OF COLORADO, LASP
LILLY, THERESA Charge Code Information:	GATS, INC
LUNBECK, SPENCER Charge Code Information:	
MCCABE, DEBRA Charge Code Information:	UNIVERSITY OF COLORADO, LASP
MCGRATH, MICHAEL Charge Code Information:	UNIVERSITY OF COLORADO, LASP
MILLER, MICHAEL Charge Code Information:	ORBITAL ATK
MOFFATT, JEREL Charge Code Information:	UNIVERSITY OF COLORADO, LASP
MONK, STEVE Charge Code Information:	UNIVERSITY OF COLORADO, LASP
NELSEN, JOEL Charge Code Information:	UTAH STATE UNIVERSITY, SPACE DYNAMICS LABORATORY
OBERG, DAVID Charge Code Information:	ORBITAL ATK
ODENDAHL, STEPHEN Charge Code Information:	5840
OSBORNE, DARREN Charge Code Information:	UNIVERSITY OF COLORADO, LASP
PACKARD, MICHAEL Charge Code Information:	UNIVERSITY OF COLORADO, LASP
PAXTON, GREGORY	GATS, INC.

Charge Code Information:

PILINSKI, EMILY — UNIVERSITY OF COLORADO, LASP
Charge Code Information:

PRATT, PAMELA — UTAH STATE UNIVERSITY, SPACE DYNAMICS LABORATORY
Charge Code Information:

REDICK, MICHELLE — UNIVERSITY OF COLORADO, LASP
Charge Code Information:

REITER, JENNIFER — UNIVERSITY OF COLORADO, LASP
Charge Code Information:

RINGROSE, PATRICK — UNIVERSITY OF COLORADO, LASP
Charge Code Information:

ROMANELLI, CHRISTOPHER — ORBITAL ATK
Charge Code Information:

RUSPOLI, JAMES
Charge Code Information:

RUSSELL, JAMES — HAMPTON UNIVERSITY
Charge Code Information:

RYAN, SEAN — UNIVERSITY OF COLORADO, LASP
Charge Code Information:

SALCIDO, CRYSTAL — UNIVERSITY OF COLORADO, LASP
Charge Code Information:

SCHONBRUNNER, ALAN — 450.S
Charge Code Information:

SMITH, PATRICK — UNIVERSITY OF COLORADO, LASP
Charge Code Information:

TEAGUE, KELLY — 472.0
Charge Code Information:

WALKER, JON — CG000
Charge Code Information:

WANG, XUNHUI — ORBITAL ATK
Charge Code Information:

WELCH, DAVID — 450.0
Charge Code Information:

WENTLAND, KENNETH — 450.S
Charge Code Information:

WESTFALL, JAMES — UNIVERSITY OF COLORADO, LASP
Charge Code Information:

WILKINSON, MARK — UTAH STATE UNIVERSITY, SPACE DYNAMICS LABORATORY
Charge Code Information:

WITHNELL, PETER — UNIVERSITY OF COLORADO, LASP
Charge Code Information:

ZOLLINGER, LORIN

UTAH STATE UNIVERSITY, SPACE DYNAMICS LABORATORY

Charge Code Information: