

DATE: October 19, 2011

LOCATION: Regents Park III, Room 201

SUBJECT: HSF NSG MOVE Minutes

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INTRODUCTION

Mr. Dan Duffy convened the October 19, 2011, Human Spaceflight (HSF) Network Support Group (NSG) Mission Operations Voice Enhancement (MOVE) splinter meeting to provide a MOVE keyset retrofit plan overview (refer to the presentation, *MOVE Type D & DL Keyset Retrofit Implementation Plan*).

MEETING

- A. Background. Mr. Duffy provided a background of the issue. There is a fire hazard with the Type D & DL keysets. There is a potential for the electrical arcing to occur on the backlit power inverter board. This causes parts on the inverter board to burn which may cause the keyset housing to burn/melt. This problem seems to be occurring more frequently. A NASA Advisory was issued by NASA HQ and a Mishap Warning Action Response (MWAR) was issued by the NASA Safety Center. The MWAR describes the issue and provides recommendations. The MWAR recommends powering down the unit if left unattended for more than 10 minutes. (Editor's Note – during the splinter summaries at the NSG Main Forum, Mr. Duffy reported that after discussions with operations personnel, the 10-minute time frame is not practical. Mr. Duffy will work with investigation team and safety organizations to see if there is a solution other than the 10 minutes.) Mr. Duffy showed pictures of burn marks on the back of the keyset, speaker wire consumed by arcing, and housing inverter board mounting standoff consumed by arcing. These pictures were from a JSC failed keyset after 20 hours of arcing. He noted that once the arcing starts it does not stop.
- B. Failure Investigation. Mr. Duffy reported that three independent failure investigations were conducted. Investigations were conducted by FUSA, Technical University, and the Goddard Space Flight Center (GSFC) Mishap Investigation Team. The team is made up of representatives from the NASA Engineering and Safety Center (NESC) and NASA Safety Center (NSC). The most intensive of the investigations was conducted by the GSFC Mishap Investigation Team.
- C. Findings. It was found that arcing could be caused by or aggravated by the following: speaker wire routed too close to the high voltage side of the power inverter board, metal screw/washer used to secure the high voltage side of the power inverter board, and/or material (dust, dirt, etc.) on the high voltage side of the power inverter board.
- D. Solutions. The following recommendations were made and agreed to by FUSA:
 1. Reroute the speaker wire away from the high voltage side of the power inverter board and ensure it has an insulation $\geq 1,200$ v rated dielectric material.
 2. Replace the metal screw/washer nearest the inverter output pin with a fire retardant rated plastic screw/washer.
 3. Coat the entire power Inverter Board High Voltage section with an insulating conformal coating compound. This will prevent material (dust, dirt, etc.) from shorting. The areas to be covered are the transformer high voltage output pins, associated circuit tracks, associated capacitors, and the connector pins for the high voltage cable.
 4. Fuse the power inverter board input. This will ensure that even if the arcing were ever to reoccur, the inverter board will not be allowed to continue to arc because the fuse would blow.

- E. Retrofit. Mr. Duffy stated that the retrofit will be performed on all Type D and DL keysets. Mr. Duffy reviewed the retrofit keyset modifications. FUSA will travel to the centers to perform the retrofit (GSFC, Johnson Space Center [JSC], White Sands Complex [WSC], Jet Propulsion Laboratory [JPL], Wallops Flight Facility [WFF], Marshall Space Flight Center [MSFC], Kennedy Space Center [KSC], and Ames Research Center [ARC]). The retrofit can be done all at once or in phases if requested (traveling to the centers only twice probably).
- F. NASA's Role. NASA Centers will be required to support the retrofit effort with personnel and facilities to ensure that all keysets are upgraded in a short period of time thus minimizing NASA's risk of keyset inverter board arcing. NASA facilities will be required to provide an Electrostatic Discharge (ESD) work area where the retrofit and keyset testing can take place, provide a keyset interface cable to the MOVE switch for keyset testing, and provide a staging area where keysets can be temporarily stored prior to and after the retrofit. NASA personnel will be required to provide escorts for the FUSA technician (if required by the Center); provide adequate staff to ensure that operational keysets are replaced with retrofitted keysets so the FUSA technician is never waiting on NASA to supply them with Keysets to be retrofitted; and for centers with Voice over IP (VoIP) keysets, NASA personnel will also be required to configure keyset IP address prior to swapping out the Keysets. FUSA is willing to train NASA technicians to assist with the retrofit if the center is willing to make them available (not required but desirable). The NASA technicians will work under FUSA supervision.
- G. Retrofit Time. For estimation purposes assume that the keyset retrofit will take 45 minutes per keyset. Ten keysets will be retrofitted per day per technician. FUSA will provide one technician per site. Center personnel must be prepared to swap out 10 operational keysets per day to keep up. If NASA provides an additional technician to help with the retrofit, as many as 20 keysets per day may need to be swapped out. Mr. Duffy stated that there are 3,000 keysets to retrofit in the agency.
- H. Retrofit Status. The retrofit schedule is dependent on parts being available. The kits are being assembled. No soldering is required for the retrofit. There should be 250 inverter boards available by the end of October. Speaker wire production begins at the end of October. Mr. Ken Jones asked if the 250 board will be deployed to GSFC. Mr. Duffy replied that it has not been determined yet. It is hoped that while the 250 are being deployed, the parts pipeline will open up. FUSA is working to get vendor commitments. NASA is confident FUSA is making a good effort with the vendors.
- I. Other
 1. Mr. Gary Williamson asked what are the symptoms displayed. Mr. Duffy replied that there is a definitive odor. The display will go black as well.
 2. Mr. Steffes stated that the keysets have been deployed for a while and asked why this has only occurred since June. Mr. Duffy stated that there has been speculation that the speaker wire coating was impacted by temperature changes. There is also speculation that there has been time for there to be an accumulation of dirt, dust, and debris; therefore, establishing a conductive path.
 3. Mr. Jones stated that FUSA saw this in early testing. Mr. Duffy replied that FUSA first observed the problem while powering up a keyset. Their logic at the time was that if arcing didn't appear during power up it would not happen at all. An FUSA engineering change was approved to replace metal fasteners with plastic fasteners.

ACTION ITEMS

No action items were assigned at the October 19, 2011, MOVE status splinter meeting.

(Original Approved By)
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NASA MOVE PM