

MF/Colonel Harry B. Allen

November 18, 1966

MG/John A. Edwards

Inflight corrective actions taken by the Mercury and Gemini crews

Per your request the following list of corrective actions have been compiled.

MERCURY

MA-6

- a. Two of the one-pound attitude thrusters malfunctioned due to clogging. The astronaut controlled a large part of the flight manually using the remaining thrusters. Basically the same thing happened on MA-5 with respect to the thrusters, however, since there was not a man on board, no corrective action could be taken and the mission was terminated early.

MA-7

- a. Spacecraft true attitude and indicated attitude in pitch were in disagreement. Probable cause was the horizon scanner circuitry. The astronaut provided manual attitude control, using the window and horizon as the attitude reference, for the retrofire maneuver.

MA-9

- a. The automatic control system latched into the reentry mode prior to retrofire. The alternating current power supply for the control system also failed. These malfunctions were caused by short circuiting in the automatic control system due to moisture. The astronaut had to perform a manual retrofire and reentry.

GEMINI

GEMINI IV

- a. Computer anomaly prior to retrofire; crew switched reentry mode to rolling zero-lift reentry.

GEMINI V

- a. Fuel cell reactant supply pressure drop; crew shut down as much as possible and actively managed fuel cells for an extended period, resulting in a successful reentry.

GEMINI V (Continued)

- b. Attitude thruster anomalies: crew compensated for thruster losses, pretty well maintaining spacecraft attitudes as required.
- c. Crew recognized erroneous reentry bank angles computed on the ground and flew backup commands through reentry.

GEMINI VI-A

- a. Abort cues were received by crew on first launch attempt (plug drop out and thrust chamber pressure decline indicate thrust failure after lift-off): crew felt sure lift-off had not occurred and did not abort, saving mission for another attempt. An automatic system would probably have aborted.

GEMINI VII

- a. Fuel cell warnings late in mission: crew managed system so that warnings could be circumvented.
- b. Attitude thruster anomalies: same as Gemini V - b (above).
- c. Moisture in suit inlet hose: crew repositioned switches and valves, rolled spacecraft to throw water out of vent. Gemini VI-A crew directed and monitored exterior for effectiveness.

GEMINI VIII

- a. Thruster failure in open position: crew troubleshooting isolated cause, then stopped high roll rate.

GEMINI IX-A

- a. Shroud separation failure on ATDA: crew maneuvering for close inspection provided essential data for ascertainment of cause of failure.

GEMINI X

- a. Excessive propellant usage for first rendezvous: crew adapted to modified flight plan which called for more extended usage of Agena in the docked configuration before leaving it.

GEMINI XI

- a. During the terminal rendezvous phase, the radar transponder on Agena XI malfunctioned. The crew successfully completed the rendezvous, however, using manual backup procedures.

MISSION LOG

- a. Unable to use Agena main propulsion in docked configuration; crew adapted to modified flight plan, abandoned high altitude flight and used Agena SPS to adjust phasing to get solar eclipse photos.
- b. During the terminal rendezvous phase, the radar system malfunctioned. As in the Gemini XI case, however, the crew successfully completed the rendezvous using manual backup procedures.

[Handwritten Signature]
John A. Edwards

INTurner/VNHuff:cmd (11/18/66)
MGS Ext. 20631

POSSIBLE APPROACH CONCERNING
CORRECTION OF RETROPACK VTI.

<p>14-5/Reopfer</p>	<p>5/20/62</p>	<p>New attitude control jet bonded (1# thruster)</p>	<p>Abandoned automatic system and used manual electrical fly-by-wire system & manual mechanical system during last two orbits</p>	<p>Uncontrollable spacecraft & subsequent failure to meet objectives</p>
<p>14-5/Schirra</p>	<p>5/20/62</p>	<p>Panel switch indicated that heat shield clamp had been prematurely released</p>	<p>Manually controlled reentry & retention of retropack for safety</p>	<p>Ejection of retropack & heat shield with subsequent loss of spacecraft and valuable data</p>
<p>14-5/Reopfer</p>	<p>10/3/62</p>	<p>Failure of pitch horizon scanner circuitry</p>	<p>Manually controlled reentry using window reference, periscope, & attitude displays</p>	<p>Uncontrolled reentry resulting in complete destruction of spacecraft and valuable data</p>
<p>14-5/Schirra</p>	<p>5/15 & 16/63</p>	<p>Elevated suit temperatures during first two hours</p>	<p>Increased setting on the coolant flow control valve</p>	<p>Early termination of mission & loss of val. data</p>
<p>14-5/Reopfer</p>	<p>5/15 & 16/63</p>	<p>0.05G green telelight appeared on panel (normally lights during reentry) on 19th rev</p>	<p>Manual retrofire was selected because of suspected malfunction in automatic control system amplifier - calibrator (autopilot) unit. Astronaut verified condition in spacecraft & manual retrofire checklist was performed.</p>	<p>Would not have been aware of possible malfunction in critical control system</p>
<p>14-5/Reopfer</p>	<p>5/15 & 16/63</p>	<p>AGCS inverter failed and stand-by inverter would not start - necessitated manual reentry roll rate control</p>	<p>Astronaut performed revised retro checklist & performed manually controlled reentry.</p>	<p>Uncontrolled reentry with resultant loss of spacecraft and valuable data.</p>

ACTUALS	ACTIONS	POSSIBLE AVERAGE CONSEQUENCE OF PREVENTION
Primary DC to AC converter failure	Rapidly assessed the situation and reactivated the secondary system	Early termination of mission and loss of valuable data
Hatch closing and latching difficulty	Working with handle, moving it back and forth several times, the crew finally closed the hatch	Early termination of mission and inability to pressurize spacecraft
Computer-IGS power sequence incorrect, computer failure light "on"	A manual back-up reentry technique was elected	Errors in automatic reentry program with possible loss of spacecraft and valuable data
Faulty connector in blood pressure measuring device on Command Pilot	Command Pilot was able, thru persistence and great effort, to pump up his blood pressure cuff	Loss of valuable medical data
Drop in Percentant Supply System (PSS) oxygen pressure	Crew observance of pressure drop led to a check of heater & circuit breaker. Circuit breaker was found to be tripped. Pilot reset circuit breaker & continued to trouble shoot the system. After evaluation, flight was continued.	Incomplete data to permit adequate analysis of re functioning system
Damaged O-ring seal on blood pressure hub and loose suit fitting	Pilot replaced seals and tightened fitting	Loss of valuable medical data

Command Pilot
8/21/65

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AMERICAN

LOGBOOK

RECORDED IN THE LOG BOOK

<p>10/11/55</p>	<p>10/11/55</p>	<p>Residue on Viscosity</p>	<p>Observation for first couple of days before was a residue of some sort on the side with staining</p>	<p>Have knowledge of residue could have resulted in both time and effort had in attempting to find cause</p>
<p>10/11/55</p>	<p>10/11/55</p>	<p>Hold-kill in CIV</p>	<p>Over quickly evaluated situation and elected to remain in place - draft in spite of CIV hold-kill</p>	<p>An ordered system would probably have allowed a full response which would have destroyed the vehicle</p>
<p>10/11/55</p>	<p>10/11/55</p>	<p>Pressure in salt inlet hose</p>	<p>The crew performed several checks and valve positioning functions & set up a 10°/sec roll-rate to ensure water out the water boiler vent</p>	<p>Excessive build-up of water and possible early mission termination</p>
<p>10/11/55</p>	<p>10/11/55</p>	<p>Fuel cell HSS O₂ pressure low</p>	<p>Crew opened cross-feed valve to transfer oxygen to HGS tank. The action corrected the situation</p>	<p>Loss of fuel cell and early termination</p>
<p>10/11/55</p>	<p>10/11/55</p>	<p>Rapid roll & yaw rates caused by IG character failure in open position</p>	<p>Crew held necessary no-align in stabilizing the attitude. Stabilizer cycled, roll rates maintained within allowable limits</p>	<p>Uncontrolled spin occurred with subsequent loss of vehicle & associated data obtained during random recovery</p>

AGENCY

FORM

FORWARD ADVISORY CONCERN
 NUMBER OF THIS FORM REPORTS

<p>Serial 1</p>	<p>1. Type Description of the item should</p>	<p>Procedure of delivery type being recorder</p>	<p>Procedure of delivery type being recorder</p>
<p>Serial 2</p>	<p>2. Type Description of the item should</p>	<p>Procedure of delivery type being recorder</p>	<p>Procedure of delivery type being recorder</p>
<p>Serial 3</p>	<p>3. Type Description of the item should</p>	<p>Procedure of delivery type being recorder</p>	<p>Procedure of delivery type being recorder</p>

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Date

ABNORMALY

ACTION

POSSIBLE ADVERSE CONSEQUENCES OF UNMANNED VEHICLES

02 Sept.

Thrust degraded chamber accelerates

Necessary action taken to accomplish maneuvers using alternate thrusters

Dependent upon redundancy as to the amount of control that could have been obtained.

Loss of Agena I-Band transponder

Use optical and alternate methods for rendezvous

Continuous loss of lock-on and unable to accomplish rendezvous objective

Fuel cell stock 20 ingersolve

Crew took the cell off-line and was aware of electrical load required.

Dependent upon electrical load analysis certain equipment would be only partially able to be operated. Also, have to wait for station contacts to end proper comments.

Excessive perspiration of EVA pilot

Early termination of EVA. Pilot instructed to stop all activities.

None