

CLASSIFIED MESSAGE

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EXT: 4252
DATE: 19 NOVEMBER 1968

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FROM: Declassified and Released by the N R C
CONF: In Accordance with E. O. 12958
INFO: on NOV 26 1997

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REFERENCE: [REDACTED]

Performance

1. DURING ON-ORBIT OPERATIONS OF THE SECOND BUCKET OF STATION 104B, A MALFUNCTION WAS INDICATED BY THE FOLLOWING:

- A. T/M COMMUTATOR (STATUS DATA) FAILED TO START ON REV. 175 THRU REV. 223. STARTED ON REV. 224 AFTER MAIN WATER SEAL CLOSED.
- B. REV. 182 [REDACTED] INDICATED A CONTINUOUS ELECTRICAL LOAD OF 1.2 AMPS REGULATED POWER AND 3.5 AMPS UNREG POWER. ELECTRICAL LOAD WAS EQUIVALENT TO A SINGLE PAN CAMERA OPERATING.
- C. REV. 183 [REDACTED] VERIFIED REGULATED POWER LOAD WAS FROM PAYLOAD SYSTEM. FORWARD CAMERA UNIT INPUT METERING CONTROL WAS IN 99 PERCENT SHOWING SHUTTLE [REDACTED] HAD BEEN ON OUTPUT SIDE AT LAST CONTROL CHANGE.

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D. REV. 190 [REDACTED] VERIFIED FORWARD UNIT HAD FAILED. THE LENS DRIVE LINKAGE AND THE METER/CONTROL LINKAGE WERE BOTH INOPERATIVE. S/I UNIT WAS NOT CYCLING. S/I CONTROL AND POWER LOAD INDICATED THE INTERNAL OPERATE COMMAND FOR THE FORWARD UNIT WAS ENERGIZED BUT FAILURE OF THE FORWARD UNIT PREVENTED UNIT FROM SHUT DOWN.

E. REV. 224 [REDACTED] AND REV. 231 VERIFIED THE FORWARD UNIT DRIVE MOTOR AND TACH WERE OPERATING AND APPEARED NORMAL. SYSTEM TEMPERATURES WERE NORMAL. CYCLE COUNTER ON FORWARD UNIT INDICATED THE CONTROL LINKAGE HAD STOPPED AFTER THE "CENTER-OF-FORMAT" COMMAND ON THE 71ST FRAME ON REV. 181. THE OPERATIONS WERE PROGRAMMED FOR REV. 181, THE FIRST WAS 46 FRAMES AND THE SECOND WAS 49 FRAMES FOR A TOTAL OF 94 FRAMES.

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2. IMMEDIATE FILM ANALYSIS AT [REDACTED] AFTER 1048-2 WAS RECOVERED

REVEALED:

- A. TAIL OF FORWARD UNIT FILM WAS TORN (NOT CUT) AND CONTAINED APPROXIMATELY 6 INCHES OF THE FORMAT FROM FRAME 70 OF REV. 181.
- B. BINARY TIME FROM FILM SHOWED A CONSISTENT CYCLE PERIOD OF 2.290 SECONDS. THE CYCLE PERIOD BETWEEN FRAMES 68 AND 69 CHANGED TO 2.230 SECONDS OR A RATE INCREASE OF 2.8 PERCENT.
- C. RAIL SCRATCHES ON THE PARTIAL 70TH FRAME OF REV. 181 INDICATES THE FILM WAS IN-THE-RAILS AT THE TIME OF EXPOSURE.
- D. LAST 43 FEET OF FILM FROM FORWARD UNIT WAS DAMAGED.
- E. FILM SPLICE WAS LOCATED 402 FEET PRIOR TO TORN END OF FORWARD UNIT FILM.
- F. APT UNIT FILM SUPPLY WAS DEPLETED ON FRAME 20 ON A 92 CYCLE OPERATION OF REV. 216.

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3. ANALYSIS OF THE 1048-2 TAKE-UP RESULTS ARE:

- A. AFT UNIT FILM SEVERELY TANGLED IN FORWARD UNIT SPOOL AND IN S/I TAKE-UP/PUCK - AEM ASSEMBLY. LOOPS OF FILM AROUND BOTH TAKE-UP SPOOLS.
- B. BOTH TAKE-UPS JAMMED.
- C. ALL RESISTANCE CHECKS ON THE SPOOL VERIFIED.
- D. VERIFIED BRAKE RELEASE AND TAKE-UP MOTION WAS NORMAL ON BOTH UNITS.
- E. AFT UNIT WRAPS FELT SNUG EXCEPT FOR TOP FEW WRAPS.
- F. FORWARD UNIT WRAPS FELT SOFT AND LOOPS OF FILM PROJECTING TRANSVERSELY FROM UNDER OUTER WRAPS.
- G. S/I TAKE-UPS WERE OFF-SPOOLED.
- H. AFT FILM WAS CUT AT A POINT FARTHEST FROM SMOOTH WRAP.
- I. MAJORITY OF AFT FILM WAS THEN REMOVED FROM TAKE-UP SPOOL AND PROCESSED IN NORMAL MANNER.
- J. FORWARD UNIT TAKE-UP SPOOL REMAINED JAMMED.

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- K. PUCK-ARM ASSEMBLY WAS REMOVED BUT REQUIRED FILM TO BE UNTANGLED FROM AROUND THE FORWARD UNIT PUCK-ARM.
- L. FOUND TAIL END OF AFT UNIT FILM AND HAND-OFF-SPOOLED BACK TO CUT CREW PARS IN ABOVE THIS SEGMENT OF FILM MEASURED 50 FEET.
- M. TORN END OF FORWARD UNIT FILM WAS THEN FOUND WITH 3 TO 4 FEET OF UNSPOOLED FILM.
- N. OFF-SPOOLING OF THE FORWARD UNIT FILM WAS STARTED AND A SOFT, IRREGULAR WRAP WAS NOTED. FORTY-THREE FEET OF DAMAGED FILM WAS OFF SPOOLED BEFORE THE TAKE-UP WRAP FELT ACCEPTABLE. THIS DAMAGED SEGMENT WAS CUT AND REMOVED.
- O. NORMAL DEFILMING WAS THEN UTILIZED FOR THE REMAINING FORWARD FILM.
- P. THE 43 FOOT SEGMENT CONTAINED SEVERE SCRATCHES AND DISTORTIONS ALONG THE SIDE WHICH THE PUCK-ARM

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TRAVELLED. THE LAST 3 TO 4 FEET OF THE FILM CONTAINED A VARIETY OF CREASES.

Q. INSPECTION OF THE EMPTY CAPSULE REVEALED:

1. NO TORN OR LOOSE PIECES OF FILM
2. SCORING OF THE FORWARD UNIT SPOOL FLANGE BY THE PUCK-ARM.
3. FORWARD UNIT PUCK-ARM WAS BENT, HOWEVER, SOME OF THE BENDING MAY HAVE OCCURRED WHILE ATTEMPTING UNTANGLE OF THE FILM.

4. THE 1048 PET ANALYZED SEVERAL FAILURE MODES IN AN EFFORT TO ESTABLISH THE CAUSE OF THE FORWARD LOOKING INSTRUMENT FLIGHT FAILURE. CONSIDERABLE WEIGHT WAS GIVEN TO THE BELIEF THAT AN ABRUPT STOPPING OF EITHER INSTRUMENT SHOULD HAVE BEEN DETECTED ON THE VEHICLE GUIDANCE TELEMETRY. IT WAS ALSO ASSUMED THAT THE INSTRUMENTATION WOULD RESPOND IN THE SAME MANNER AS IT HAS IN THE PAST DURING SIMILAR GROUND TEST EXPERIENCE. A SUMMARY FOLLOWS:

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<u>CAUSE</u>	<u>SUPPORTING</u>	
1. FILM TRANSPORT	A. TORN FILM B. CAMERA NON-FUNCTIONING C. REPETITIVE NICK AND CREASE PATTERN ON FILM (VERY REMOTE)	

NON-SUPPORTING

- A. VEHICLE GUIDANCE T/M INDICATES NO ABNORMAL PERTURBATION.
- B. NORMAL CURRENT LOADS (NO FUSES BLOWN)
- C. SHUTTLE IN 99% POSITION
- D. NO T/M INDICATION ON TWO CONTINUOUS CHANNELS (LENS ROTATION AND CENTER FORMAT)

MINIMUM FILM METERED - 37 INCHES
 MAXIMUM FILM METERED - 62 INCHES
 FILM TEAR APPEARS TO HAVE TAKEN PLACE BETWEEN I.R. ASSEMBLY AND THE AIR TWIST AFTER THE SHUTTLE.

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CAUSE

2. PIN LOSS IN MOTOR DRIVE

SUPPORTING

A. NO T/M INDICATION ON TWO CONTINUOUS T/M CHAN. (LENS ROTATION AND CENTER FORMAT).

B. OPERATIVE INFO...
C. T/M RESPONSE FOLLOWING INPUT.

D. SHUTDOWN HAD MINOR EFFECT ON GUIDANCE.

E. CURRENT LOAD WAS NORMAL. CAMERA FAILED TO SHUT DOWN, NO ACTION OF S-107 SHUT DOWN SWITCH.

NON-SUPPORTING

TORN FILM WAS NOT NECESSITATED BY FAILURE.

COMMENTS

THE SPLICE THAT PASSED ON REV. 180, FRAME 23, POSSIBLY LOADED THE SYSTEM SUCH THAT A PIN OR PINS WERE PARTIALLY FRACTURED THAT FINALLY SEVERED AT THE TIME

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3.	TORN FILM FROM SUPPLY CASSETTE		NONE W/O FURTHER ANALYSIS	A. GOOD PHOTOGRAPHY TO POINT OF TEAR. B. T/M INDICATED SUPPLY SPOOL WAS NOT ROTATING WITH GOOD RESULT IN SPOOL ROTATING CONTINUOUSLY.
4.	WRAP/MESS IN TAKE-UP		NONE	NO. 2 CAMERA OPERATED THROUGHOUT MISSION.

COMMENTS: THE WRAP/MESS WAS AN EFFECT
AND NOT CAUSE OF THE CAMERA'S
NO. 1 FAILURE.

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MISCELLANEOUS:

CAUSE: A. SINGLE DRIVE BELT BREAKAGE

SUPPORTING: NONE

NON-SUPPORTING: LOSS OF LENS ROTATION & C.F. T/M REQUIRES

COMMENTS: NO BELT FAILURES HAVE BEEN EXPERIENCED ON ANY M/J1/J3 SYSTEM.

CAUSE: B. FRAME-METERING WRAP

SUPPORTING: NONE

NON-SUPPORTING: A. MISSING T/M WOULD BE AVAILABLE.

B. CAMERA COULD BE SHUT DOWN.

C. VEHICLE PERTURBATION SHOULD BE NOTED AT JAMB-UP.

CAUSE: C. INPUT METERING MISTRACK

SUPPORTING: NONE

NON-SUPPORTING: A. NO EVIDENCE OF MISTRACK ON FILM.

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INPUT METERING MISTRACK CONTINUED:

B. LOAD ON INSTRUMENT OF MAGNITUDE TO SHEAR PIN IN THE MOTOR SHOULD CAUSE VEHICLE PERTURBATION.

CAUSE: D. TACH FAILURE

SUPPORTING: TIME WORD ANALYSIS

NON-SUPPORTING: FRAME 70 PHOTOGRAPHY INDICATES NORMAL SPEED.

COMMENTS: FURTHER TIME WORD ANALYSIS WILL BE PERFORMED.

5. THE CAMERA CONTRACTOR [REDACTED] HAS CONDUCTED THE FOLLOWING POST-FLIGHT ANALYSIS:

A. THE ENGINEERING MODEL 1 CAMERA (IN CONFIGURATION) WAS HAND CYCLED, THE FILM WAS DELIBERATELY CUT AT THE START OF THE FRAMING CYCLE AND A LOOP STARTED TO DEVELOP AT THE INPUT METERING DRIVE. THIS LOOP WAS HAND GUIDED INTO THE INPUT DRIVE WITH THE RESULT THAT THE UNIT BOUND UP AND STOPPED WITHIN ONE HALF TO THREE QUARTERS OF A FRAME.

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B. A "B" TAKE UP WITH BUCKET, ET AL, WAS PARTIALLY FILLED WITH 3,000 FEET OF UNEXPOSED FILM (3404) THAT HAD A TAIL END BREAK SIMILAR TO THE FLIGHT FILMS RETRIEVED END. THIS ASSEMBLY WAS PLACED IN A CHAMBER AT 1 X 10 TO THE MINUS 3 POWER MM OF HG, AND ALLOWED TO CYCLE AT THE MAXIMUM RATE FOR SIX HOURS. THE FILM WAS THEN RETRIEVED AND PROCESSED. THE FILM WAS DEFECTABLE FOR 30 FEET WITH THE LAST TWELVE INCHES EXTENSIVELY DAMAGED AND MARKED. THE LAST TWELVE INCHES WERE TORN LOOSE AND BADLY SHREDDED. THIS WAS NOT SIMILAR TO FLIGHT RESULTS.

C. A SUPPLY SPOOL WITHOUT PUCK ARM ~~MEMBERS~~ WITH 3,000 FEET OF FILM WAS ROTATED AT 100 RPM IN A HORIZONTAL PLANE WITH THE TOP FLANGE REMOVED. THE FILM'S TAIL END PULLED IN TOWARDS THE CORE AS THE SPOOL ACCELERATED, WHEN THE SPOOL ATTAINED ITS MAXIMUM RATE, THE TAIL END AND THE FIRST LAYER STARTED TO UNWRAP DUE TO CENTRIFICAL FORCE. SEVERAL OUTER LAYERS BECAME UNWRAPPED AFTER FIFTEEN MINUTES OF CONSTANT ROTATION, THIS MAY BE SIMILAR TO THE LOOSE WRAPS OBSERVED IN THE RECOVERED BUCKET. THE TEST WAS THEN

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 RUN IN A CHAMBER AT 1 MM HG. AND A MUCH MORE RAPID UNSPOOLING OCCURRED AFTER ACCELERATION. THE TAIL END FLAILED AND WHIPPED THE OBJECTS IT CONTACTED AROUND THE PERIPHERY, THEREBY DAMAGING THE END OF THE FILM.

D. THE ENGINEERING MODEL 1 UNIT WAS POWERED, THE FILM CUT AND THE CREATED LOG...
 99/101 CLUTCH GEARS WERE JAMMED AND THE CLUTCH SLIPPED WHILE THE UNIT CONTINUED TO CYCLE.

E. USING ONLY A MAIN MOTOR DRIVE AND GEAR ASSEMBLY, A WRAP OF 3404 FILM WAS MADE ON THE OUTPUT SHAFT WITH THE OTHER FILM END SECURELY FASTENED. WITH FULL POWER THE FILM HELD, STALLED THE MOTOR AND FAILED TO SHEAR A PIN.

F. USING A CLAMP ON THE OUTPUT SHAFT AND DRIVING THIS AGAINST A STOP, THE PIN ON THE MAIN DRIVE SHAFT WAS SHEARED. THIS FAILURE WHICH WAS DUE TO IMPACT LOADING CANNOT BE EXPERIENCED WITHIN THE CAMERA SYSTEM DUE TO THE TYPE OF CONSTRUCTION.

G. MANY QUALITATIVE TESTS WERE RUN WITH AND WITHOUT

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CUTS. THOSE WITHOUT CUTS WERE VIRTUALLY IMPOSSIBLE TO BREAK WHEREAS THOSE WITH NICKS OR CUTS TORE READILY.

6. CONCLUSION FROM THESE ANALYSES ARE:

A. THE FILM WILL NOT BREAK BY FORCES WITHIN THE CAMERA UNLESS THE EDGE HAS BEEN PREVIOUSLY CUT OR NICKED.

B. THE FAILURE WAS CAUSED BY A TAPER PIN WHICH WAS LOOSE IN THE MAIN DRIVE ASSEMBLY AND WAS REMOVED BY HAVING THE FILM JAM UP AND CAUSING A PIN TO SHEAR.

C. THE UNSPOOLING TEST DUPLICATED TO SOME MEASURE THE WRAP CHARACTERISTIC OBSERVED ON THE NBR. 1 TAKE UP.

D. A LOSS OF A PIN IN THE MAIN DRIVE ASSEMBLY WAS THE ONLY KNOWN WAY TO EXPLAIN THIS CAMERA FAILURE AND BE COMMENSURATE WITH THE T/M DATA. HOWEVER, THERE IS NO KNOWN PHYSICAL WAY THAT A LOOSE TAPER PIN CAN STAY IN PLACE FOR EVEN A SHORT OPERATION OF THE SYSTEM.

7. IN SUMMARY, THERE IS NO KNOWN REASON FOR THE FILM TO HAVE BROKEN. DURING THE STOPPING OF THE CAMERA, THE VEHICLE ATTITUDE, AS RECORDED ON T/M, SHOWED NO ABNORMAL DISTURBANCE, SUGGESTING NO ABRUPT STOPPAGE AT THE TIME OF FAILURE.

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THE IMAGERY OF FRAME 70 (SIX INCHES OF FORMAT ON THE T/U END) WAS IN GOOD FOCUS, THE TORN END (THE LAST ONE INCH) OF RETURNED FILM WAS NOT PROCESSED, BUT REMOVED FOR ANALYSIS OF THE BREAK.

PROPOSED FAILURE MODE: ASSUMING THAT THE FILM WAS PARTLY CUT, THE FINAL BREAK (TEAR) WOULD OCCUR DUE TO INCREASED FILM TENSION (DUE TO THE FILM BREAKING) WHICH WOULD CAUSE THE FILM TO BECOME ENTANGLED IN THE INPUT METERING ROLLER ASSEMBLY, WITH THE ENTANGLEMENT BINDING UP THE DRIVE AND CAUSING A PIN IN THE METERING DRIVE ASSEMBLY TO SHEAR.

THE RETRIEVED FILM END SUGGESTS A DIAGONAL CUT THAT WAS APPROXIMATELY ONE THIRD ACROSS THE FILM WEB. THE REMAINDER OF THE BREAK SUGGESTS THAT A SHEAR TEAR FINISHED THE BREAK.

SHOULD THE FINAL BREAK HAVE OCCURRED AFTER THE START OF EXPOSURE ON FRAME 70 OR AT THE START OF METERING OF FRAME 71, SLACK WILL DEVELOP CAUSING A LOOP AT THE INPUT METERING DRIVE WHICH BECOMES ENTANGLED WITH OTHER FILM OR THE INPUT DRIVE.

THE FINAL BREAK, OCCURRING UNDER NORMAL TENSION AS SUPPLIED BY THE TAKE UP CASSETTE, WOULD BE REAMED OUT AND

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FRAMED OUT AND LIKELY WRAPPED ERRATICALLY DUE TO THE LOSS OF TENSION AND THE BIAS INTRODUCED BY THE FINAL TEAR. AT THIS TIME, THE SHUTTLE WAS PULLED TO THE 99 PERCENT POSITION.

THE SUPPLY FILM END WHICH PREVIOUSLY HAD TENSION FROM THE TAKE UP CASSETTE, STOPPED AND COULD SPRING BACK IN THE DIRECTION OF INPUT REFEEDING. BECOMES ENTANGLED UPON ITSELF, GEARS OR ROLLERS OF THE INPUT DRIVE, BINDING THE DRIVE AND SHEARING A PIN.

WITH THE TAKE UP NO LONGER BEING HELD BACK, IT ACCELERATES TO ITS MAXIMUM RATE FOR THE BALANCE OF THE MISSION. THE TAIL END FLOATING FREE IS BELIEVED TO HAVE WRAPPED ERRATICALLY ON THE TAKE UP. WITH THE TAKE UP ROTATING AT MAXIMUM SPEED, IT FORCES THE FILM OUTWARD BY CENTRIFICAL FORCE, WHILE PERMITTING THE FILM TO SLIP FROM UNDER THE PUCK ARM CREATING A LOOSE OUTER WRAP. THE OUTER WRAP WAS MARRIED BY PASSING OVER THE PUCK ARM. OTHER DAMAGE MAY HAVE OCCURRED DURING THE RECOVERY IMPACT.

8. THE FILM CONTRACTOR [REDACTED] HAS BEEN REQUESTED TO:

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2		10	
3		11	
4		12	
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6		14	
7		15	
8		16	
	DEFERRED	PRIORITY	INITIALS
	ROUTINE	OPERATIONAL IMMEDIATE	INITIALS

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TO INFO CITE

- A. REVIEW THE OVERALL QUALITY CONTROL PROCEDURES RELATED TO CORONA 70 MM PRODUCTION SPOOLING.
- B. REVIEW THE CURRENT PRODUCTION TECHNIQUES FOR THE MARKING AND REMOVAL OF UNACCEPTABLE MATERIAL AND SUBSEQUENT SPLICING OF THE MATERIAL.

9. [REDACTED] IS RE-INSPECTING THE REMAINING J-1 SERIES INSTRUMENT, PARTICULARLY THE MAIN DRIVE ASSEMBLY AND PINS, WITH EPOXY BEING APPLIED TO THE PINS.

END OF MESSAGE

[REDACTED]

D/OSP

COORDINATING OFFICERS

[REDACTED]

S/C/OSP

RELEASING OFFICER

~~SECRET~~

GROUP 1 Excluded from automatic downgrading and declassification

AUTHENTICATING OFFICER

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