PROGRAM 698 BJ
SYSTEM REVIEW
18 Sept 62

ORIGINAL SPECIFICATIONS
TECHNICAL WORK Statement of 8 August 1960

REQUIREMENT:
0 ORBITAL PHOTO RECONNAISSANCE SYSTEM WITH HIGH
HEIGHT CAPABILITY HORIZONTAL SHOT/LINE
RELIABLE RE-CENTER AND ACCURATE RECOVERY IN 35

PERFORMANCE:
0 1.1 X10^3 km^2 PER DAY; 9 X10^3 km^2 TOTAL COVERAGE
0 10 FOOT RESOLUTION AT 2:1 CONTRAST
0 120 TO 300 K.M. ALTITUDE
0 SHORTEST POSSIBLE OPERATIONAL LIFE 6 DAYS DESIRABLE
0 PRINCIPAL POINT LOCATION TO ONE ANGULAR MILE
0 RECOVERY IN CONTINENTAL U.S., 6 KM. C.E.P.
ORIGINAL SCHEDULE:

- First launch December 61.
- Total of seven launches at forty day intervals.
- Option of two insurance flights.
- Extension of proposal submission due to revised proposal resolution.
- Schedule to 9 March 62.
SELECTED PAYLOAD CONFIGURATION

- Two 5049 focal length cameras (10% sized)
- Camera oriented near sensor (polar optics)
- 0.8 arc seconds
- OPGS type structure
- Single CCD
- Continuous camera operation
- Separate contacts and seals
- 0.1,000 feet at 63 inch dack test (30152)
SELECTED RE-ENTRY VEHICLE CONFIGURATION

BALLISTIC VEHICLE

AVA-2 FLOWER AERODYNAMICALLY SHARP (8° SPHERE CONE)
LESS THERMAL PROTECTION, LOWER WEIGHT THAN AMMUNITION VEHICLE
AERATION TYPE: G.E. CENTURY SERIES

NEW MAJOR SUBSYSTEMS

RECOVERY POWER, TELEMETRY AND PROGRAMMING
FILM CASSETTE
RECOVERY PACKAGE
DESTRUCTION SYSTEM: THERMAL TYPE

SEPARATION
EXPLOSIVE BOLTS
CONSIDERATIONS OF SIMPLIFIED COMMAND SYSTEM

DISCOVERER COMMAND SYSTEM UNREASABLE BECAUSE:

- \textbf{INABILITY TO CHANGE SORED PROGRAM}
- \textbf{LIMITED SORED PROGRAM CAPACITY}
- \textbf{OVER-TARGET COMMAND DEFICIENCY (ZMC)}
- \textbf{TIMOR INACCURACY FOR ULTIMATE LAND RECOVERY}
- \textbf{SECURITY DEFICIENCY}
SIGNIFICANT DEVIATIONS FROM SELECTED DESIGN RE-ENTRY VEHICLE

- Spin and deflection changed to spin stabilized and shaped charge
- Structure - sections increased from three to four
- Thermal - shield changed from single material to phenolic nylon
  nose & fairing made of GE PA-4 transparent plastic
- Lightened structure
- Recovery ( land & water )
- Debris system removed
### Mission Summary - Hardware Performance

<table>
<thead>
<tr>
<th>Section</th>
<th>A/B</th>
<th>C/D</th>
<th>E/F</th>
<th>G/H</th>
<th>I/J</th>
<th>K/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
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<tr>
<td>2</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
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<tr>
<td>3</td>
<td>OK</td>
<td>OK</td>
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<td>OK</td>
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<tr>
<td>4</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
<td>OK</td>
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</tbody>
</table>

**Note:** All data refers to nominal operation. Any deviation from normal should be noted.

### First Flight Experience

**Problem**
- A/C problems
- Navigation issues
- System failures

**Cause**
- Faulty sensors
- Inadequate training
- Weather conditions

**Fix**
- Replace faulty components
- Conduct additional training sessions
- Adjust flight paths

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**Problem**
- Communication breakdown
- Electrical malfunctions
- Control system issues

**Cause**
- Electrical noise
- Software glitches
- Hardware malfunction

**Fix**
- Implement noise reduction techniques
- Update control software
- Replace faulty hardware

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**Problem**
- Emergency landing
- Fuel depletion
- Engine failure

**Cause**
- Low fuel levels
- Engine damage
- Electrical system failure

**Fix**
- Refuel aircraft
- Replace damaged engine
- Diagnose and correct electrical issues
### First Flight Experience

**PROBLEM**

- VHF coupling
- C收回 and FSC off
- Audio VHI off

**CAUSE**

- Lack of CSRH's feedback

**FIX**

- Investigation of performance, CSRH feedback
- Investigation of VHF coupling system

### First Flight Experience

**PROBLEM**

- DAA/Nav Data
- GPS AV
d

**CAUSE**

- GPS AV
d

**FIX**

- Investigation of GPS AV
d
<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Fix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate</td>
<td>Separation procedure</td>
<td>Adjust procedure parameters</td>
</tr>
<tr>
<td>Separation</td>
<td>Incorrectly set</td>
<td>Ensure correct setting</td>
</tr>
<tr>
<td>Procedure</td>
<td>Incorrectly used</td>
<td>Review usage instructions</td>
</tr>
<tr>
<td>Incorrectly</td>
<td>Separation procedure</td>
<td>Adjust procedure parameters</td>
</tr>
<tr>
<td>Set</td>
<td>Incorrectly used</td>
<td>Review usage instructions</td>
</tr>
<tr>
<td>Incorrectly</td>
<td>Vented wrong</td>
<td>Adjust venting settings</td>
</tr>
<tr>
<td>Used</td>
<td>Incorrectly used</td>
<td>Review usage instructions</td>
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<tr>
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<td>Review usage instructions</td>
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### SECOND FLIGHT EXPERIENCE
(February 8th)

<table>
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<tr>
<th>PROBLEM</th>
<th>CAUSE</th>
<th>FIX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sudden fuel flow at key 0</td>
<td>Fuel meter failure, valve imprecise, transport of fueling failure, failure switch.</td>
<td>Replace fuel meter, valve, and switch. Fix fueling system.</td>
</tr>
<tr>
<td>Outer flight failure 6-8 times inside of engine</td>
<td>Outer flight failure, engine failure, loss of pressure, engine failure.</td>
<td>Replace outer flight, engine, pressure, and system. Fix engine.</td>
</tr>
</tbody>
</table>

### THIRD FLIGHT EXPERIENCE
(March 20th)

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CAUSE</th>
<th>FIX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avulsion during descent</td>
<td>Sudden high value, circuit failure, circuit failure, high value, mode aground.</td>
<td>Replace circuit, failure, high value, and aground. Fix circuit.</td>
</tr>
<tr>
<td>ND allays during descent</td>
<td>Sudden high value, circuit failure, circuit failure, high value, mode aground.</td>
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*(Firing Vehicle: M33)*

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<tr>
<td><strong>APB</strong></td>
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FOURTH FLIGHT EXPERIENCE

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CAUSE</th>
<th>FIX</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAS USAGE</td>
<td>UNINTERRUPTED INTERMITTENT OCCURRENCE IN MERCURY FINS AND DURING PRELIM OPERATIONS</td>
<td>RANGE CONTROL MISC. INSTRUCTION - RECOMMENDATION AND CHANGE OF FLIGHT. CONTROL QUESTIONS INSERT INVESTIGATION</td>
</tr>
</tbody>
</table>
FLIGHT DATA - AERO-THERMO PROBLEMS

- HIGH ROLL RATE AT END OF BLACK-OUT
  - SYSTEM TIME 546
- Sudden increase then decrease in roll rate
  - SYSTEM TIME 536 - 576
- HIGH UNSP TEMPERATURE, STATION 154
  - SYSTEM TIME 546
- INDICATED TEMPERATURE INCONSISTENCY IN NEW SHIELD, STATION 65 & 154
- NO THERMAL & PRESSURE DATA AFTER TIME 542
MOTION ANALYSIS

- VARIATION OF AERODYNAMIC COEFFICIENTS - C_d, C_l,
- VARIATION OF MASSES
- AERODYNAMIC SURFACE TO SIMULATE ROLL
- RV-2 DATA

POSSIBLE AERO/ THERMO DESIGN PROBLEMS

- AFT BLINDHELD HEAT PROTECTION
- THERMAL PROTECTION OF COMPONENTS IN BALLAST AREA
- ELECTRICAL CABLE NEAR EXIT OF HEAT SOURCE
- RE-ENTRY VEHICLE DEFORMATION EFFECTS
**ATLAS GUIDANCE MECHANIZATION PROBLEM**

- **Mariner I Failure Investigated**  
  (Guidance equations mechanized to respond improperly to poor data)

- **Different Programming Discrepancy Discovered**  
  For Program 63B DJ  
  (Resulting in similar problem)

- **Interim Fix Implemented for Flight No. 5**  
  (Reduces probability of failure to negligible proportion)

- **Final Fix Will Be Implemented for Flight No. 6**
SPECIAL EFFORT GENERATED BY FLIGHT EXPERIENCE SYSTEM

- Complete review of system design and procedures by contact/try and air force/aerospace
  - Test and equipment
  - NASA
  - FAA

SPECIAL EFFORT GENERATED BY FLIGHT EXPERIENCE AREA

- Gas regulator pressure tests
- Gas valve vibration tests
- Solid engine rocket vibration tests
- Analog studies of attitude control
SPECIAL EFFORT GENERATED BY FLIGHT EXPERIENCE
RECOVERY VEHICLE

- RELIABILITY ISSUES "E" AND "B" SERIAL REPRODUCIBLE POWER SUPPLY
  - FACTORY TESTS, EXTENDED BATTERY CYCLE
  - FAILURE ANALYSIS

- RELIABILITY ISSUES: DEPLOYMENT DESIGN AND POWER SUPPLY
  - FACTORY TESTS
  - FAILURE ANALYSIS

- SHAKEDOWN OVER TEST OF SEPARATION PROGRAMMER

SPECIAL EFFORT GENERATED BY FLIGHT EXPERIENCE
RECOVERY VEHICLE

- RESEARCH PROGRAM ON AERODYNAMIC AND THERMODYNAMIC PROBLEMS

- RECOVERY SYSTEM: AERODYNAMIC INTEGRATION, PACKAGING AND DEPLOYMENT TESTS (FLIGHT HARDWARE)

- LABORATORY TESTS OF NEW THERMAL COATING RTV 80 PLUS NITROCELLULOSE (PD-50D)
  - GROM TESTS
  - INTEGRATION

- IN-SITU TESTS OF PARIS SUBJECT TO MAE HEATING

- CALIBRATOR CALIBRATION TEST, FLUX RATE AND INTEGRATION
SPECIAL EFFORT GENERATED BY FLIGHT EXPERIENCE

- DETERMINATION OF ATTITUDE EFFECT ON RECORD TRANSFER
- INERTIAL TESTS, BENDING, VIBRATION
- REFLECTOR MEASUREMENTS AND ANALYSIS

- SPECIAL RECORD RUNS WITH ERROR RECORDED
  - HORIZONTAL
  - VERTICAL

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FLIGHT 5 READINESS

- ATLAS
  HIGH CONFIDENCE THAT SUCCESSFUL BOOST WILL BE OBTAINED

- ASW
  HIGH CONFIDENCE THAT SUCCESSFUL INJECTION/ON-ORBIT/REDOCK PERFORMANCE WILL BE OBTAINED

- PAYLOAD
  HIGH CONFIDENCE THAT AT LEAST ONE CANDIDATE WILL OPERATE THROUGH MISSION
**PERFORMANCE COMPARISON WITH OTHER PROGRAMS**

<table>
<thead>
<tr>
<th>SUBSYSTEM</th>
<th>PROGRAM 6268BJ</th>
<th>OTHER PROGRAMS</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATLAS</td>
<td>100%</td>
<td>90%</td>
<td>LAST 20 ALIS SHOTS</td>
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<tr>
<td>AGAMA</td>
<td>80%</td>
<td>60%</td>
<td>DISCOVERER SHOT'S TYPICAL EXECUTION</td>
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<tr>
<td>PV</td>
<td>75%</td>
<td>NO DATA AVAILABLE</td>
<td></td>
</tr>
<tr>
<td>PL</td>
<td>61%</td>
<td>NO DATA AVAILABLE</td>
<td></td>
</tr>
<tr>
<td>RV</td>
<td>INADEQUATE DATA</td>
<td>80%</td>
<td>DISCOVERER RE-ENTRY AND RECOVERY</td>
</tr>
<tr>
<td>C&amp;C</td>
<td>&lt; 23%</td>
<td>&lt; 3%</td>
<td></td>
</tr>
</tbody>
</table>

**BEST ESTIMATE OF OVER-ALL PERFORMANCE**
IN RESPONSE TO
TWX*SAFSS-DIR-123
DATED 21 AUG
FEASIBILITY OF ALTERNATE SYSTEMS (CONT'D)

AUGMENTED TOW/MEGA ROCKET (THREE SEGMENTS)

PRELOAD CAPABILITY (WEIGHT AHEAD AREA)
120 DA PULL-IN GB --- --- --- 1100 LB

WEIGHT OF CURRENT FWP AND RV
AHEAD AREA --- --- --- 350 LB

WEIGHT OF BIG D WITH CURRENT FWP --- --- 310 LB
MODIFIED 698 BJ PAYLOAD ON AUGMENTED THOR/AGENA

- THE PAYLOAD FORWARDED OF THE AGENA INTERFACE MUST WEIGH LESS THAN 700 POUNDS
- A POSSIBLE PAYLOAD IS
  - EXISTING B.E. INJECTION
  - EXISTING E.A. STRUCTURE LESS SECTION A AVAILABE
  - NO LOADING OF RECORD A
  - USE OF EXISTING DISCRIPTOR BY TO RECORD IN PLACE OF RECORD A
- REQUIRES COMPLETE PAYLOAD APPROACHING, DESIGN OF NEW INTERFACE, DESIGN OF NEW TUBE OF CASETTE, & MODIFICATION TO DISCOVERER PAY TO RECEIVE RECORD
- SIGNED DATA NOT OBTAINED, CONVERGE REDUCED TO ONE HALF MISSION REQUIREMENT

MODIFIED 698 BJ PAYLOAD ON AUGMENTED THOR/AGENA

WEIGHT STATEMENT

- EX TOTAL LAUNCH WEIGHT (M.B. ONLY) 1254
  - LPD OUTPUT 9
  - LPD/STRT 374
  - LPD AIRCRAFT 9
  - LPD AIRCRAFT A/4 18
- PAYLOAD INJECTION INT (INCLUDING HY OR RECORD) 659
- CASETTE CABLE & ASSOCIATED STRUCTURE IN HY 61
- G.E. INJECTION 905
  - D' 4
  - DIAMETER 27
  - TUBE 7
  - TUBE 2.28
- INTERSTAGE (AND TO HY) 60
- DISCOVERER PAYLOAD (STRUCT & RECOVERY SYSTEM, NO PAYLOAD) 285
- TOTAL SYSTEM WEIGHT 1580
  - ALLOWABLE WEIGHT 1700
  - RESERVE 70
FINAL PAYLOAD CONFIGURATION

- Two 35 mm focal length cameras 100% stereo
- Cameras oriented near horizontal
- IS 600 speed
- Cylindrical structure
- Two windows with thermal shades
- Independent camera operation
- 1000 feet of 80 mm wide film (NOTE)
- Single cutter and roll

POWERED FLIGHT
Simplified schematic showing new resistance in wire harness.

In process or under consideration:
- Resolution of circuits after final alignment
- Resequence main engine components & re-simulate:
  - Find E100, electronically simulate engine prior to launch
  - Review engine simulator for circuit appearance
  - Develop procedures to check resonant circuit close

In process:
- Test potentiometer for clipping level
- Review specifications & procedures to obtain clean, dry attitude control, etc.
- Reuse attitude control system conditioning, handling, & testing & new resonant limits of command & load
- Review specific to include complete end-to-end test