CORONA J-3

PERFORMANCE EVALUATION REPORT

MISSION 1113

FTV 1659, CR-13

Approved: [redacted]
Manager
Advanced Projects

Approved: [redacted]

FOREWARD

This report details the performance of the payload system during the operational phase of the Program [redacted] Flight Test Vehicle 1659.

Lockheed Missiles & Space Company has the contractual responsibility for evaluating payload performance.

This document is the final payload test and performance evaluation report for Mission 1113.

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INTRODUCTION

This report presents the final performance evaluation of Corona Mission 1113. The purpose of this report is to define the performance characteristics of the CR-13 payload system and to evaluate the technical characteristics of the mission, including analysis of any in-flight anomalies.

The payload system was assembled, tested and certified for flight at the Advanced Projects (A/P) facility of Lockheed Missiles and Space Company. A/P also provided services including pre-flight mission parameters and planning and preparation of the flight program.

MISSION SUMMARY

A. MISSION DESCRIPTION

Corona satellite Mission 1113 was planned to acquire search, cartographic and reconnaissance photography of selected terrain areas. Two mission segments were planned for a total of nineteen days orbital operation. Both segments nominally would return over 6000 operational frames, each covering approximately 1725 square miles.

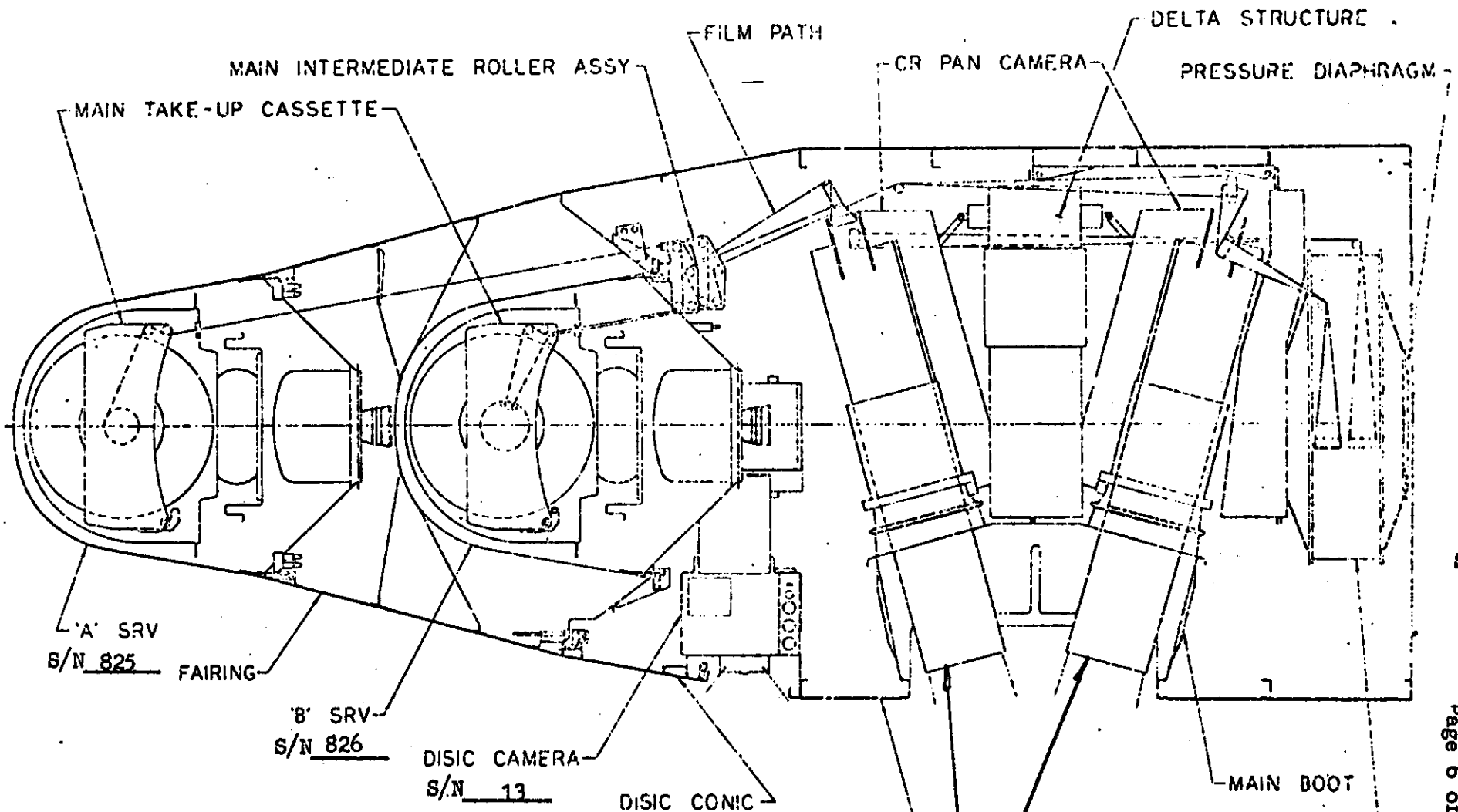
The CR-13 payload system was a standard J-3 dual reconnaissance camera system consisting of panoramic cameras 326 and 327, and DISIC camera No. 13. Other payload serial numbers are included in Figure No. 1.

The payload system was launched by FTV 1659 Agena vehicle (SS-01B) and a Thorad booster (SLV-24) S/N 537 at VAFB, pad SLC-3 west at 12:04:30.45 on February 17, 1971.

The selected orbital parameters were as follows:

Parameters	Planned
Period Min.	89.12
Perigee N.M.	90
Inclination (Deg.)	96.4
Perigee Latitude (Deg.N.)	237
Eccentricity	0.01088

PAYLOAD PROFILE AND SERIAL NUMBERS



SYSTEM NO. CR-13

TEST FLIGHT

PMU S/N 1015

SLOPE PROGRAMMER S/N 214

CLOCK S/N 620

SWITCH PROGRAMMER S/N 214

FIGURE #1

B. SUMMARY

An anomaly occurred during ascent and the system never achieved orbit. Information from Douglas indicates that the Thorad main engine stopped approximately 30 seconds after lift off. The solid fuel strap on rockets continued to burn. The vehicle subsequently destructed itself. Range Safety did not send Command Destruct. Agena T/M indicated normal pitch and roll rates from lift off through lift off plus 23 seconds. Subsequently a random tumble occurred. No "D" Timer start was observed. No Agena or payload malfunctions were indicated.

C. FLIGHT CONFIGURATION

1. Forward-looking Camera #327

Lens	24"f/3.5
Slit Widths	
S_1	0.125"
S_2	0.195"
S_3	0.260"
S_4	0.288"
F/S	0.135"
Filter Types	
Primary	Wratten 25 0.037" Glass
Secondary	Wratten 25 0.040" Glass
Film Types	
Primary	Eastman Type 3414 (16,300 Ft.)

Supply (Starboard) Horizon Camera:

Lens	45.3mm f/6.3
Aperture Setting	f/8.0
Exposure Time	1/100 second
Filter Type	Wratten 25

Take-up (Port) Horizon Camera:

Lens	45.4mm f/6.3
Aperture Setting	f/6.3
Exposure Time	1/100 second
Filter Type	Wratten 25

2. Aft-looking Camera #326

Lens	24"f/3.5
Slit Widths	
S_1	0.095"
S_2	0.123"
S_3	0.178"
S_4	0.248"
F/S	0.088"
Filter Types	
Primary	Wratten 21 Gelatin
Secondary	Wratten 21 0.007" Glass
Film Types	
Primary	Eastman Type 3414 (16,300 Ft.)

Supply (Port) Horizon Camera:

Lens	45.4mm f/6.3
Aperture Setting	f/6.3
Exposure Time	1/100 second
Filter Type	Wratten 25

Take-up (Starboard) Horizon Camera:

Lens	45.4mm f/6.3
Aperture Setting	f/8.0
Exposure Time	1/100 second
Filter Type	Wratten 25

3. DISIC Camera

Stellar Cameras:

Lens	3 in. f/2.8
Exposure Time	1.5 seconds
Filter Type	None
Film Type	Eastman Type 3401 (2000 Ft.)

Index Camera:

Lens	3 in. f/4.5
Exposure Time	1/500 second
Filter Type	Wratten 12
Film Type	Eastman Type 3400 (2000 Ft.)

PRE-FLIGHT SYSTEMS TEST

The CR payload systems are subjected to a sequential series of tests required to demonstrate a satisfactory confidence level in the flight worthiness of the systems. These tests include static verifications, dynamic performance and system calibrations, operation in simulated thermal-altitude environment, light leak evaluation and dynamic photographic performance measurements.

Significant baseline levels and anomalies experienced on CR-13 during pre-flight testing are as follows:

A. Environmental Testing

Payload system CR-13 was tested twice in the environmental HIVOS chamber. The first test was performed from April 8 through April 15, 1970 with the system in the Aschenbrenner Grid Test (AGT) configuration. The purpose for this was to determine film plane flatness as well as to evaluate the system Corona marking characteristics. The processed material from both instruments was evaluated. The film from the No. 1 instrument, #326, was free of corona marking, but the film from instrument #327 bore unsatisfactory 2π corona marking. The AGT analysis showed that film plane flatness was satisfactory.

Evaluation was performed on the DISIC camera system. Analysis of the stellar film showed unacceptable corona marking caused by the grid plate and metering roller. Marking on the terrain film was satisfactory.

The system was returned to the HIVOS chamber, configured for 'B' mode operation only for five days from May 15 through May 20, 1970. The pan cameras were loaded with SO-349 film. The DISIC Terrain and Stellar cameras were loaded with 3400 and 3401 type films respectively. The metering rollers on instrument #327 were anti-stated as a preventive measure against corona marking.

The processed material from instrument #326 was free of corona marks during this second HIVOS test but excessive corona marking caused by the input metering roller was present on the film from instrument #327. A waiver was provided for this anomaly.

Both stellar and terrain films from the DISIC camera were marked. Dense and extensive corona marking was present throughout the stellar film, caused by a mis-aligned binary data block unit. After subsequent re-alignment and evaluation this problem was considered to be solved. The terrain film bore flow type corona marks along one or both sides of the film, affecting approximately 10% of the test material. This marking affected a very small part of the format area and a waiver was provided for this anomaly.

Performance of both camera systems and the various subsystems was deemed acceptable throughout the second HIVOS test.

B. Resolution Test

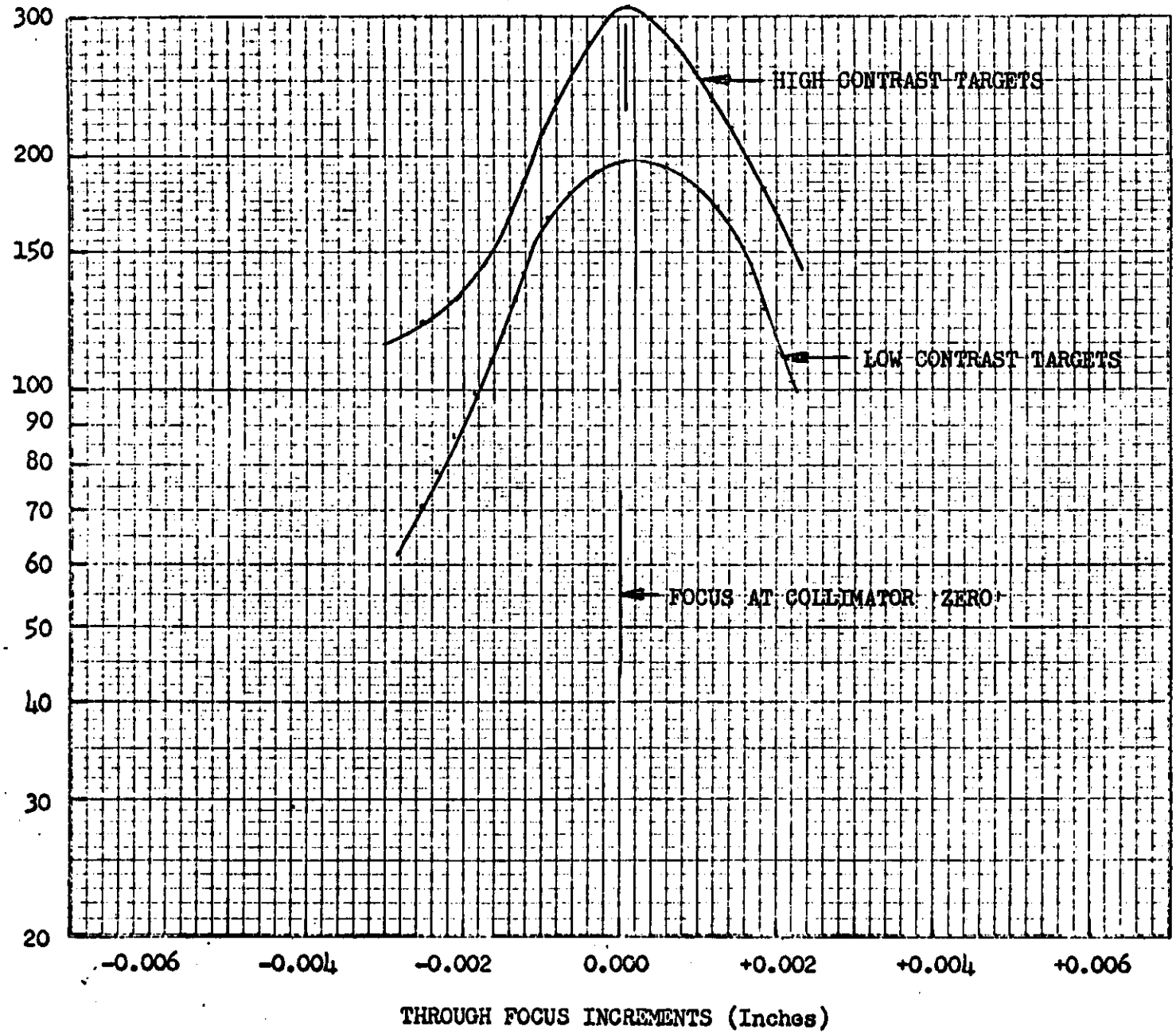
Through focus resolution tests were performed for the panoramic cameras on June 4, 1970. Analysis of the test target data indicated that the focal point was properly adjusted in relationship to collimator zero for both instruments. The low contrast resolution value for instrument #327 was 175 lines per mille-meter (L/MM) which agreed favorably with ITEK calibration data.

However, analysis of instrument #326 Test Target data placed the through-focus resolution value at 135 l/mm which was considerably less than the ITEK calibration value of 163. As a result of this the lens in instrument #326 was changed from I-214 to a new lens cell I-225. New through-focus resolution tests on the CR-13 system were made 7 November 1970. Instrument No. 326 produced a peak low contrast resolution of approximately 152 lines/mm at -0.0004" from collimator 'zero' and instrument #327 produced a peak low contrast resolution of approximately 200 lines/mm at collimator 'zero'. These values and focusing positions were acceptable. Representative graphs of this resolution data are included on pages 13 and 14.

C. Light Leak Test

The photomultiplier light search test conducted after flight loading indicated that the system was free of any light leaks. Evaluation of the flight test specimens that were later retrieved and processed also indicated that the system was light-tight.

PRE-FLIGHT DYNAMIC RESOLUTION



Camera No: 327

Payload No: CR-13

Resolution (l/mm)

High Contrast: 310

Low Contrast: 200

Film Type: 3414

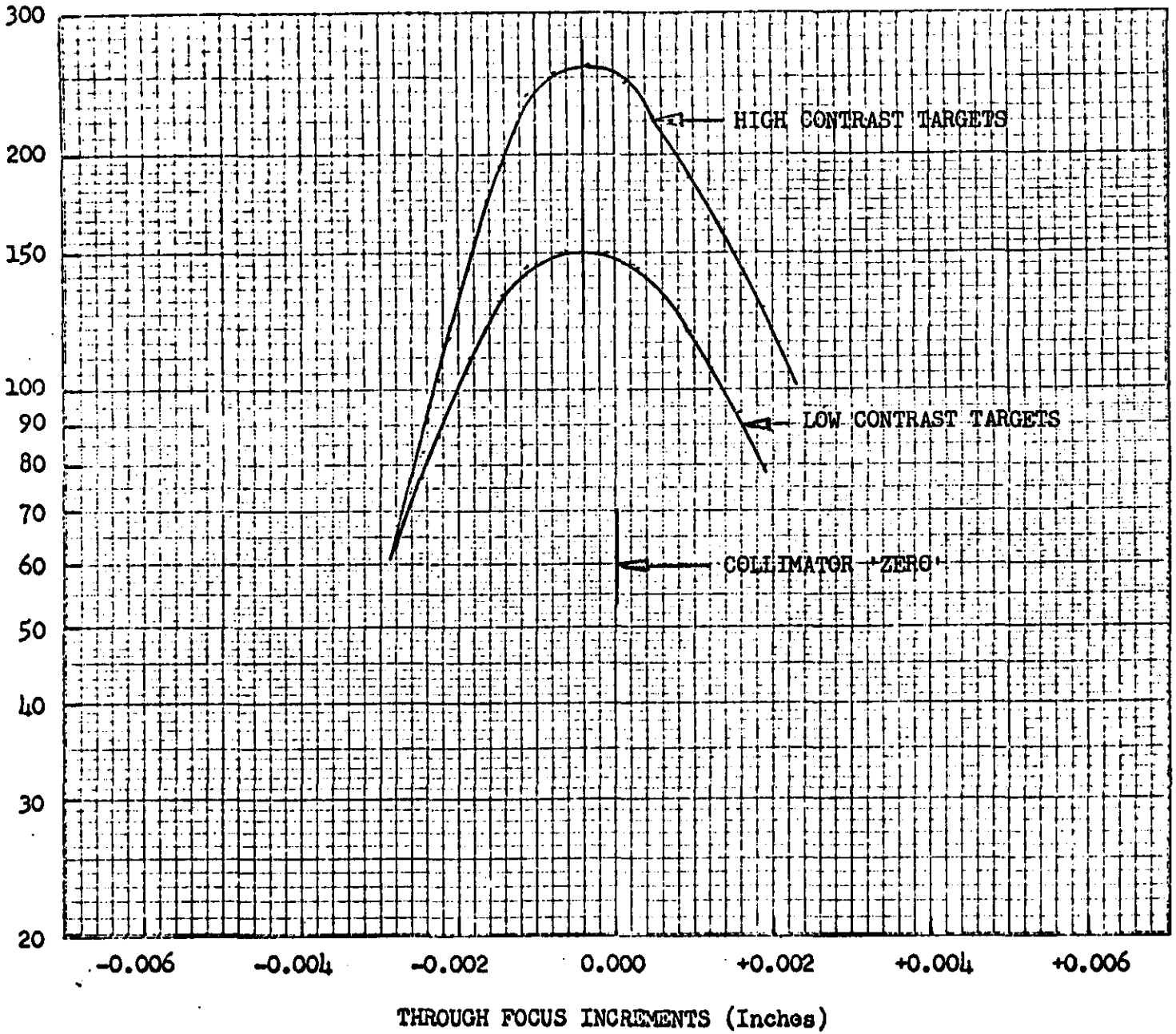
Test Date: 11-7-70

Lab No. 3830

[redacted]

11-9-70

PRE-FLIGHT DYNAMIC RESOLUTION



Camera No: 326

Payload No: CR-13

Resolution (1/mm)

High Contrast: 264

Low Contrast: 152

Film Type: 3414

Test Date: 11-7-70

Lab No. 3830

[redacted]

11-9-70

D. Flight Loading and Certification

Problems were encountered during flight loading of both the Pan instruments and DISIC systems. Excessive base fog was found on the processed flight film samples from primary payload can No. 48 from the pan instruments. Consequently the secondary payload from can No. 28 was loaded into the pan instrument system. Processed film samples were evaluated and found to be satisfactory. The first two cans of five (5) inch film for the DISIC terrain camera were rejected because of random edge anomalies in the processed material. While the marking was not excessive and limited randomly along the edge of the film, it cast doubt upon the integrity of the material and consequently it was rejected. Evaluation of the film from can No. 3 showed that the flight samples were acceptable for flight.

All functions were normal and the system performed satisfactorily during the final system readiness test that was conducted on 6 February 1971 and the CR-13 flight payload system was certified for flight.

The launch operation was unsuccessful and the CR-13 payload system fell back to earth after a 30 second flight.