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PHOTOGRAPHIC EVALUATION REPORT

MISSION 4002

6 - 8 SEPTEMBER 1963

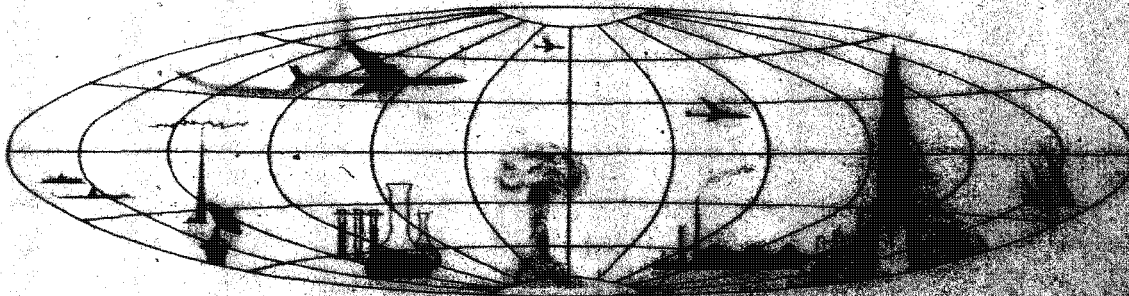
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This document contains information referring to
Project Gambit

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TECHNICAL PUBLICATION

PHOTOGRAPHIC EVALUATION REPORT
MISSION 4002
6 - 8 SEPTEMBER 1963

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PART I. PRIMARY CAMERA

Mission No: 4002
Camera No: G-3
Film Type: 401 (SO 132) 1500'Slit Width: 0.0083" (1/400 second)
Aperture: f 3.95
Filter: B & L Y-10 (equiv. to
Evaluated By: EC, IH

1. Camera Operation: A slight out-of-focus condition is noted in the format area immediately adjacent to the edge containing the time track. Close study of this out-of-focus area establishes the presence of double images, although these are not readily detectable except under magnification of culture in near-optimal exposures. A slight overall out-of-focus condition exists in passes D31E and D32E. This is attributed to failure of the camera to return to focus following the step-focus experiment initiated in pass D31E. Soft imagery resembling an out-of-focus condition is present in isolated instances on pass D08, frames 12, 13 and pass D24, frames 10, 11. The out-of-focus condition is associated with the from 300 to 400 seconds of continuous camera operation just prior to the frames indicated. Transverse banding, caused by the looper replenishment action, is present at the start and end of each frame and occurs intermittently within long frames at 24" intervals. Image distortion, induced by variations in film velocity, is particularly severe in the banded areas. Numerous, fine, continuous plus-density and minus-density streaks present throughout the film are possibly caused by a slit defect. Small, arced patterns appear consistently on the titled edge and inside the adjacent format areas. These are tentatively identified as camera roller cinch marks.

2. Image Motion Compensation: Severe IMC error, associated with looper exhaustion and replenishment, occurs in the looper action areas. The error is confined within acceptable toler-

ances as film oscillation and decay of the initial and terminal frames permits reversion to normal film drive velocities. Item 4 of remarks presents, graphically, examples of film speed analysis for selected frames on passes D15E and D24.

3. Exposure: The exposure is adequate although variations are apparent in stereo pairs and radical exposure differences occur within the long monoscopic strips.

4. Frequency Markers: The marks are well defined despite some background flare.

5. Fiducial Lines: The lines are well defined.

6. Yaw Slits: The exposure is adequate for determination of attitude variations but falls off noticeably on the time track side. In addition, the ends of the yaw slit images on the time track side are vignetted.

7. Light Leaks: None noted.

8. Static Electricity: None noted.

9. Pinholes: Pinholes are found at random throughout the film.

10. Abrasions and Scratches: A severe, camera-induced emulsion scratch is present 1.40" from and parallel to the titled edge of the film. Camera roller cinch marks, appearing as groups of small, shallow arcs, are found in the titled edge and the adjacent format areas throughout the film. Comparatively minor scratches and abrasions are present at random within the formats but not in significant numbers. Severe emulsion lifts degrade pass D08, frames 21-24.

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11. Tearing: None noted.
12. Watermarks: None noted.
13. Processing Streaks: None noted.
14. Blistering and Crimping: Minor crimps are present intermittently. No blisters are noted.
15. Foreign Matter: The material is free of foreign matter.
16. Contrast: 30% low, 65% medium, 5% high. Terrain densities were utilized to determine contrast percentages.
17. Apparent Resolution: Good. The resolution achieved in this mission ranks with the best obtained in satellite photography to date.
18. Apparent Graininess: Fine.
19. Photo Quality: The photographic quality is rated good despite the out-of-focus conditions noted in Item 1, Camera Operation. Degradation is confined to the format area immediately adjacent to the time track edge and to the two engineering passes which terminate the mission.
20. Suitability for PI: Good. The resolution and comparatively large scale of the photography serve to enhance the imagery to a degree seldom achieved by previous satellite reconnaissance missions.

Remarks

1. It is estimated that ground resolution in the order of 6'-8' is readily obtainable throughout the mission, with ground resolution of 4'-5' obtainable in the areas of best photography. A mensural error study was made on pass D15E, frame 4. A DC-3 was easily identified and selected for the measurements. The following is a comparison of small scale measurements, derived from an engineering drawing of a DC-3,

and measured values utilizing a one micron (Mann) comparator.

Measured Values (feet)	Actual Values (feet)
29	26.6
21	18.6
18	14.2
10	11.7
10	8.0
9	8.0
5	4.6
7	4.6
6	4.3
4	3.6
2	3.1

Measurements were also made on the smallest objects identified in the Mission. The objects, which are packing crates, have a measured value of 3.2' by 4.0'.

2. Although the exposure is rated adequate (refer to Item 3, Exposure), a slight trend toward underexposure is detectable. Contributing factors are low sun angle and terrain reflectivity.
3. Frame start and end points are indefinite due to the transients introduced by the film drive system. For example, the last frame in each pass terminates gradually. That is, the imagery "bleeds off" instead of terminating crisply at a definable end-point.
4. Examples of a film speed analysis of selected frames on passes D15E and D24 are shown following the terrain and limiting density charts.
5. Density readings were taken on each pass using a Macbeth QuantaLog Densitometer, Model EP 1000, with an ET 20 attachment and an 0.5 mm aperture. The values for terrain and limiting densities for D-Max and D-Min and Gross Fog readings are correlated below.

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Reading	Pass	Frame	Terrain		Limiting		Titled Edge	Untitled Edge
			D-Min	D-Max	D-Min	D-Max		
1	D04	001	0.26	0.72	0.25	1.86	0.24	0.24
2	D04	002	0.26	1.83	0.26	1.85	0.24	0.23
3	D04	002	0.27	2.10	0.27	2.10	0.24	0.24
4	D05	001	0.35	0.97	0.32	2.11	0.26	0.23
5	D05	002	0.36	1.38	0.33	1.92	0.25	0.24
6	D05	007	0.36	0.99	0.28	1.89	0.25	0.24
7	D06	002	0.37	0.67	0.36	2.07	0.24	0.24
8	D06	004	0.32	1.42	0.29	2.09	0.25	0.23
9	D06	005	0.48	1.62	0.34	1.88	0.24	0.22
10	A06E	001	NM	NM	0.23	NM	0.24	0.22
11	D07	002	0.34	0.81	0.32	2.01	0.24	0.23
12	D07	003	0.45	1.68	0.31	2.03	0.24	0.22
13	D07	003	0.35	1.45	0.34	2.08	0.24	0.23
14	D07	005	0.50	2.19	0.39	2.23	0.24	0.23
15	D07E	001	NM	NM	0.23	NM	0.27	0.22
16	D08	002	0.30	1.45	0.29	1.76	0.26	0.25
17	D08	002	0.29	0.52	0.28	2.03	0.26	0.24
18	D08	002	0.35	0.93	0.34	1.61	0.26	0.25
19	D08	009	0.52	1.53	0.36	2.08	0.24	0.23
20	D08	011	0.42	1.60	0.42	1.60	0.24	0.23
21	D10	005	0.44	0.73	0.42	1.92	0.26	0.24
22	A11	004	NM	NM	0.30	0.65	0.26	0.23
23	D11	002	0.28	1.12	0.28	1.40	0.23	0.23
24	D14E	001	0.26	1.64	0.26	1.64	0.24	0.24
25	D14E	003	0.55	1.67	0.38	2.08	0.24	0.22
26	D15E	017	0.41	1.63	0.36	2.06	0.24	0.22
27	D21	004	0.34	1.49	0.32	2.00	0.24	0.24
28	D22	001	0.31	0.52	0.30	1.95	0.25	0.24
29	D22	003	0.38	1.77	0.38	1.91	0.24	0.22
30	D23	002	0.44	1.25	0.36	2.07	0.24	0.23
31	D24	005	0.32	1.08	0.32	1.08	0.24	0.23
32	D24	009	0.54	1.35	0.44	2.04	0.24	0.23
33	D24	010	0.93	1.98	0.50	2.11	0.24	0.22
34	D25	001	0.29	1.84	0.27	1.84	0.24	0.23
35	D26	002	0.33	0.86	0.30	1.79	0.24	0.23
36	D26	011	0.41	1.06	0.41	2.04	0.23	0.23
37	A27	002	NM	NM	0.24	NM	0.27	0.24
38	D27	002	0.26	1.02	0.26	1.40	0.24	0.24
39	D27	003	0.40	1.04	0.27	1.44	0.25	0.24
40	D30E	001	0.60	1.52	0.36	2.32	0.27	0.25
41	D31E	001	0.33	1.74	0.24	1.74	0.22	0.20
42	D31E	005	0.42	1.46	0.34	2.14	0.21	0.20
43	D32E	001	0.30	0.71	0.30	1.67	0.20	0.20

NOTE: NM denotes not measurable.

Terrain
D-Max Range 0.52-2.19
D-Min Range 0.26-0.93
Average D-Max 1.32
Average D-Min 0.39

Limiting
D-Max Range 0.65-2.32
D-Min Range 0.23-0.50
Average D-Max 1.86
Average D-Min 0.32

Gross Fog Range 0.20-0.37
Average Gross Fog 0.23

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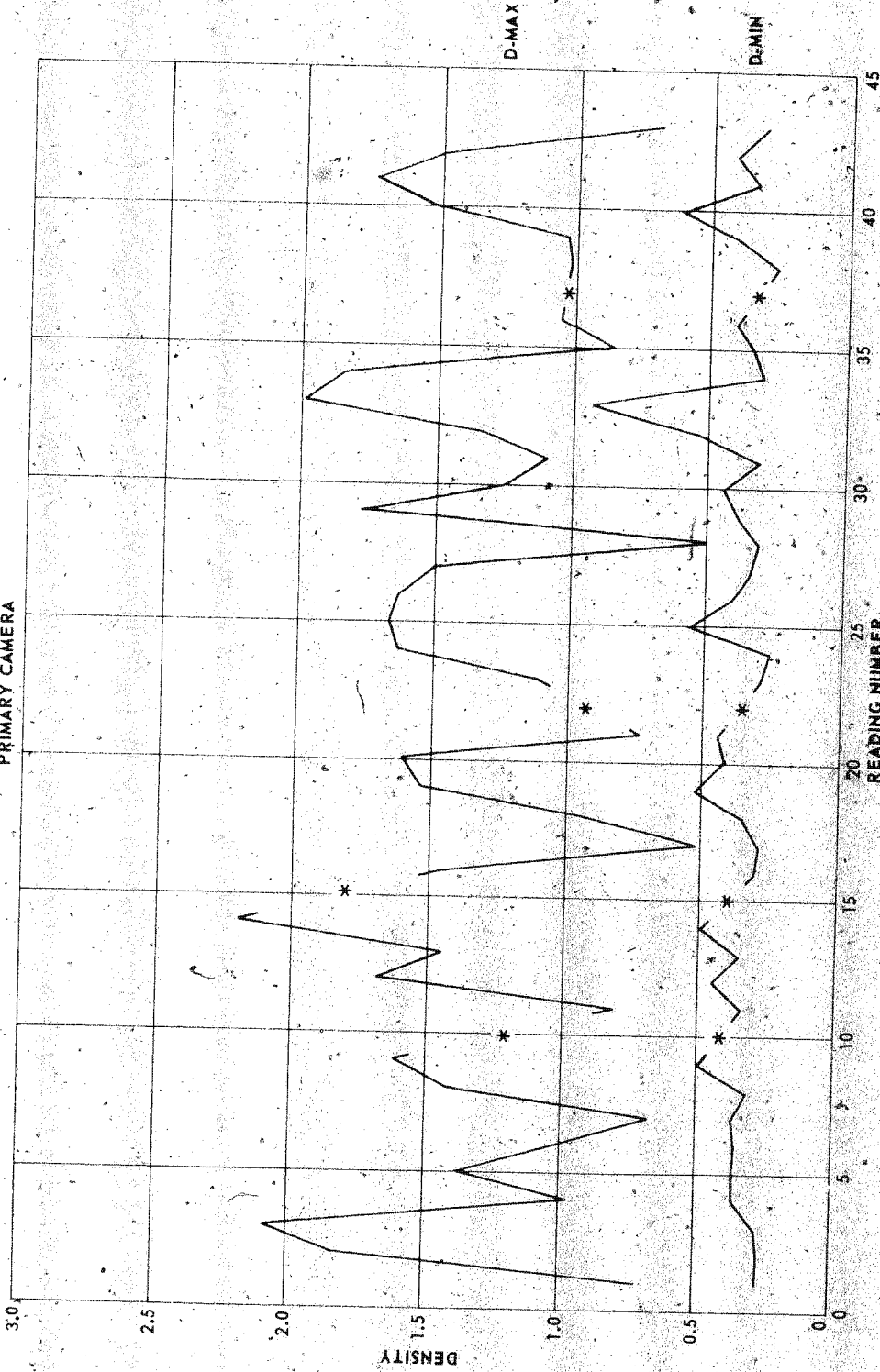
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MISSION 4002
TERRAIN DENSITIES
PRIMARY CAMERA



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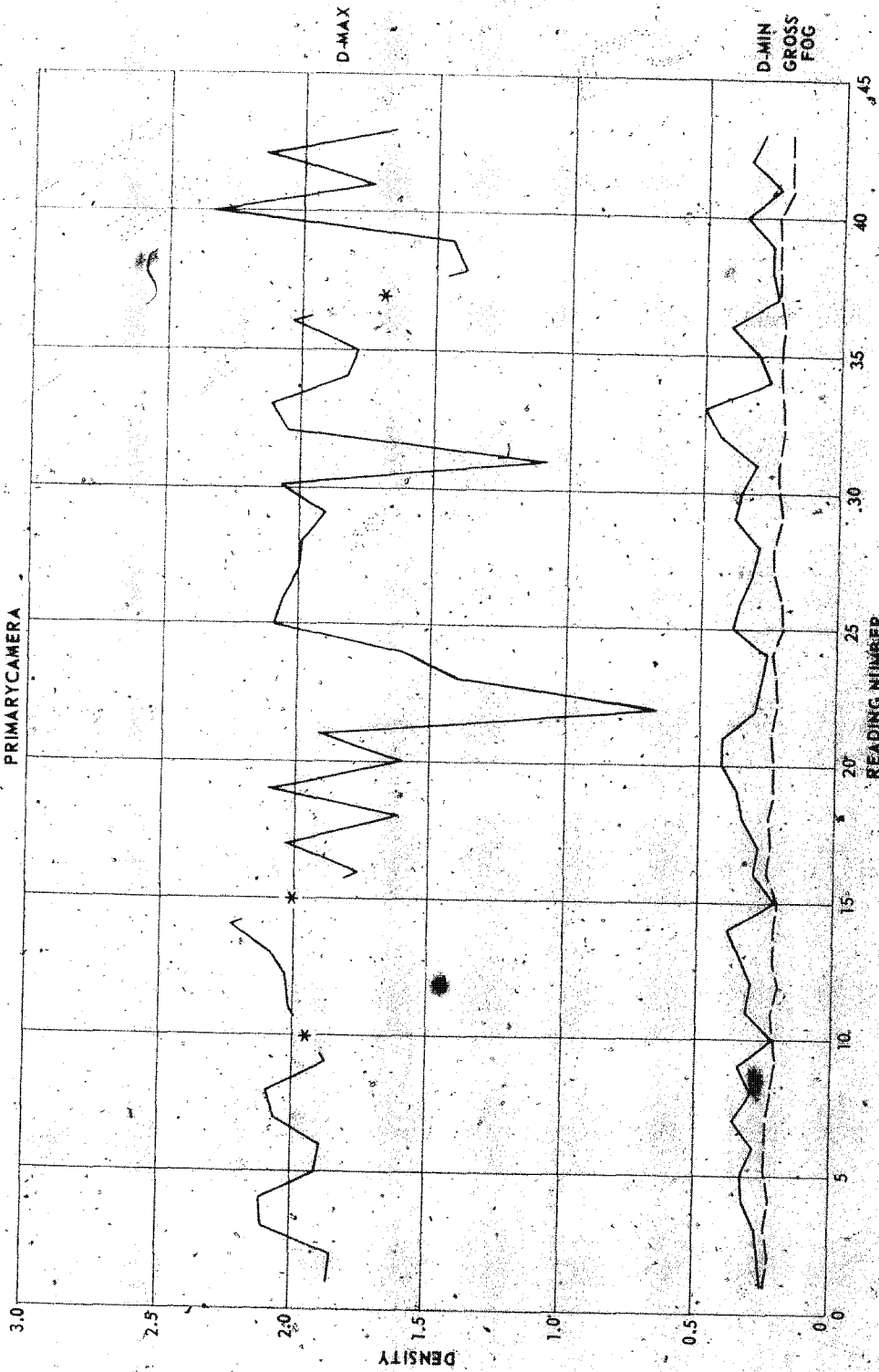
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MISSION 4002
LIMITING DENSITIES
PRIMARY CAMERA



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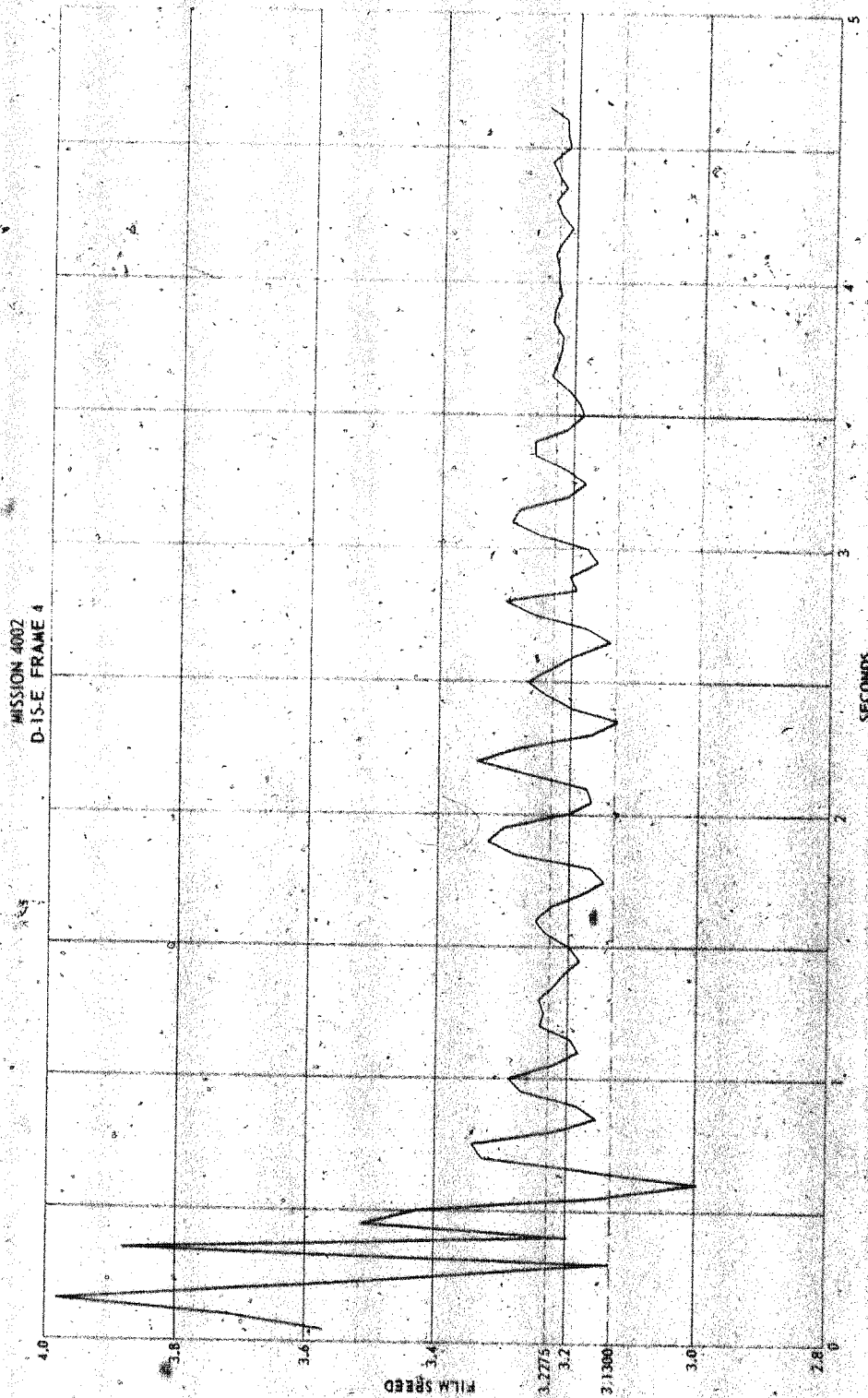
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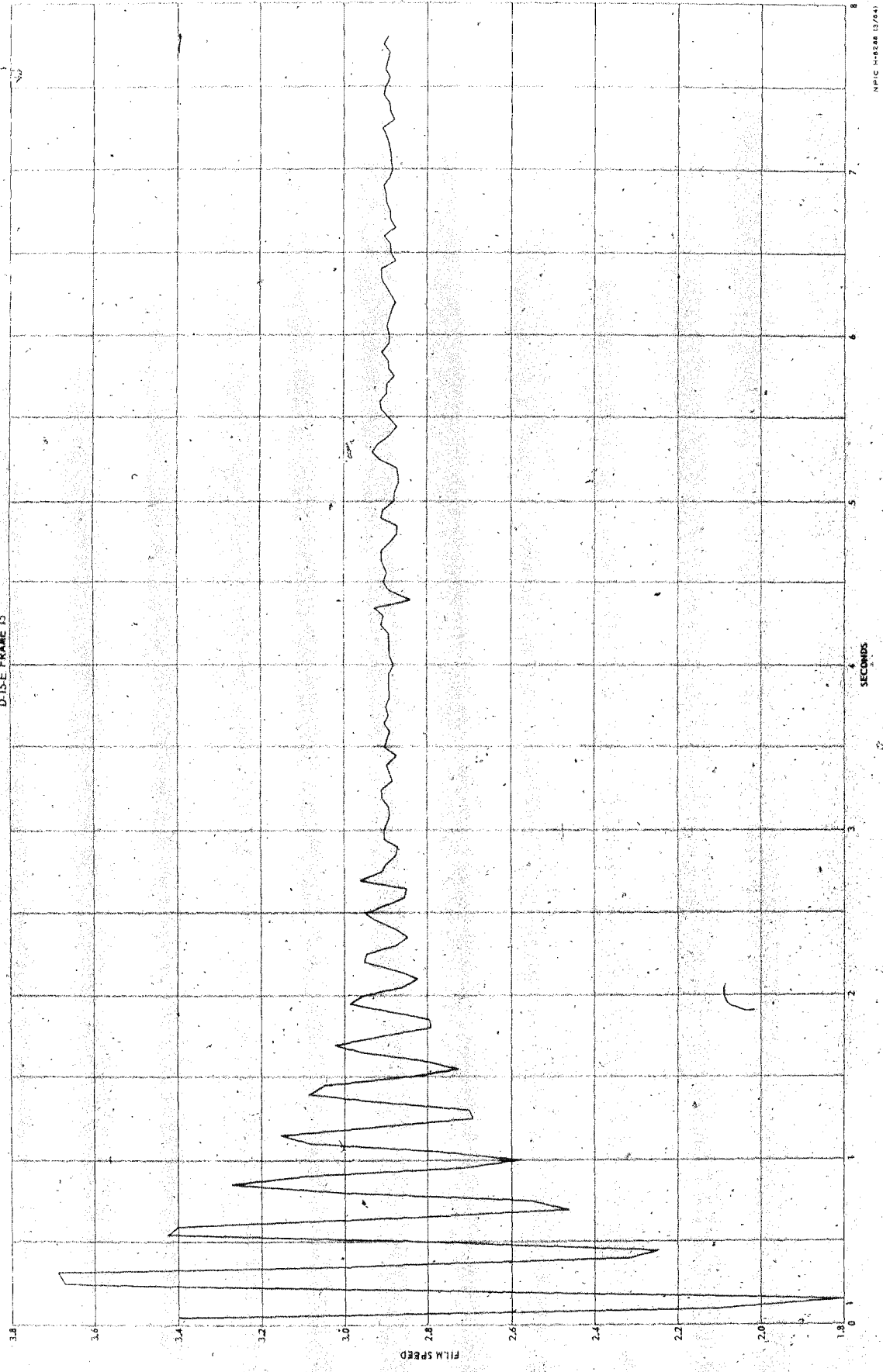
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MISSION 4002
D-15-E FRAME 15



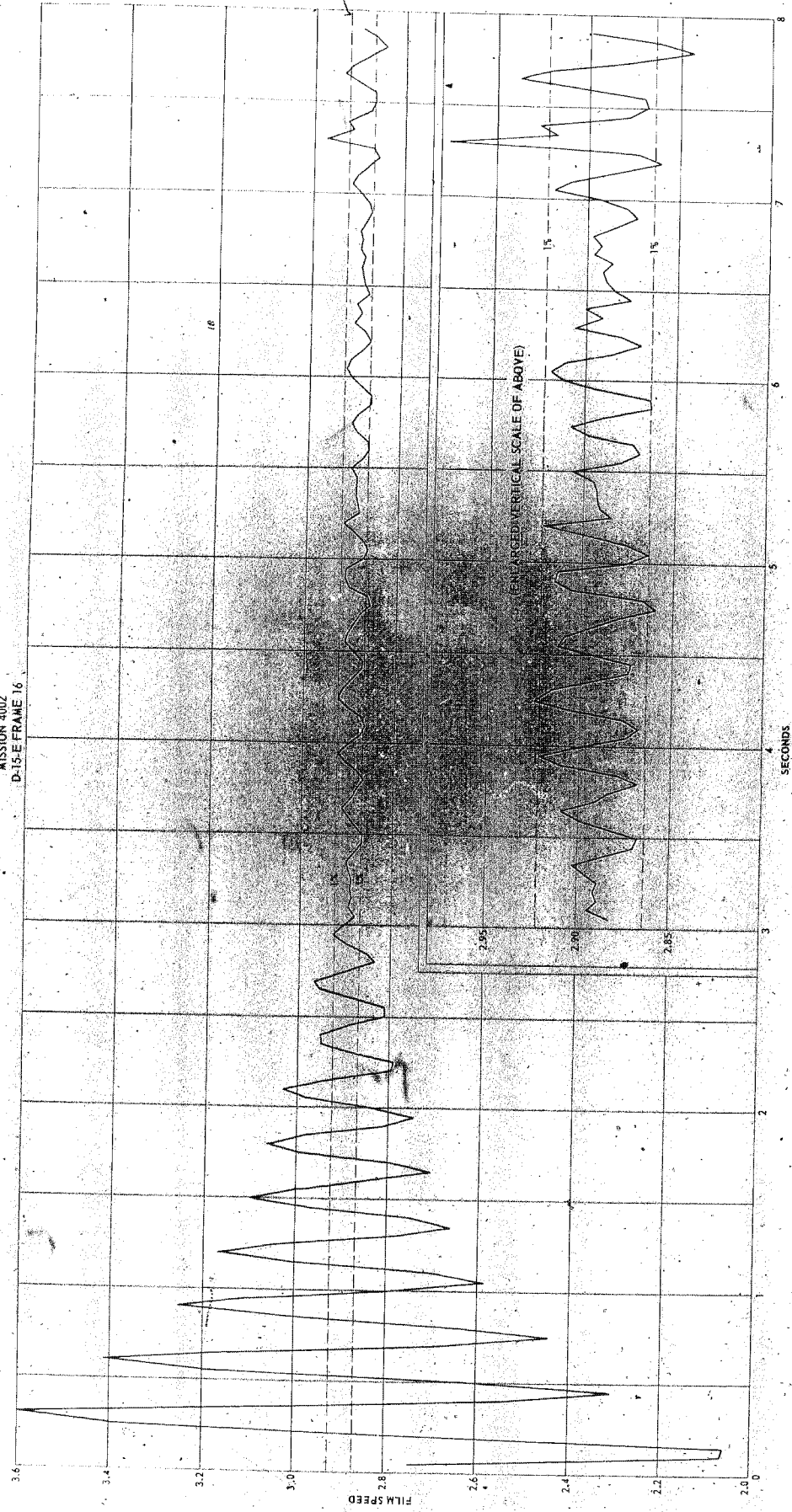
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D-15-E FRAME 16



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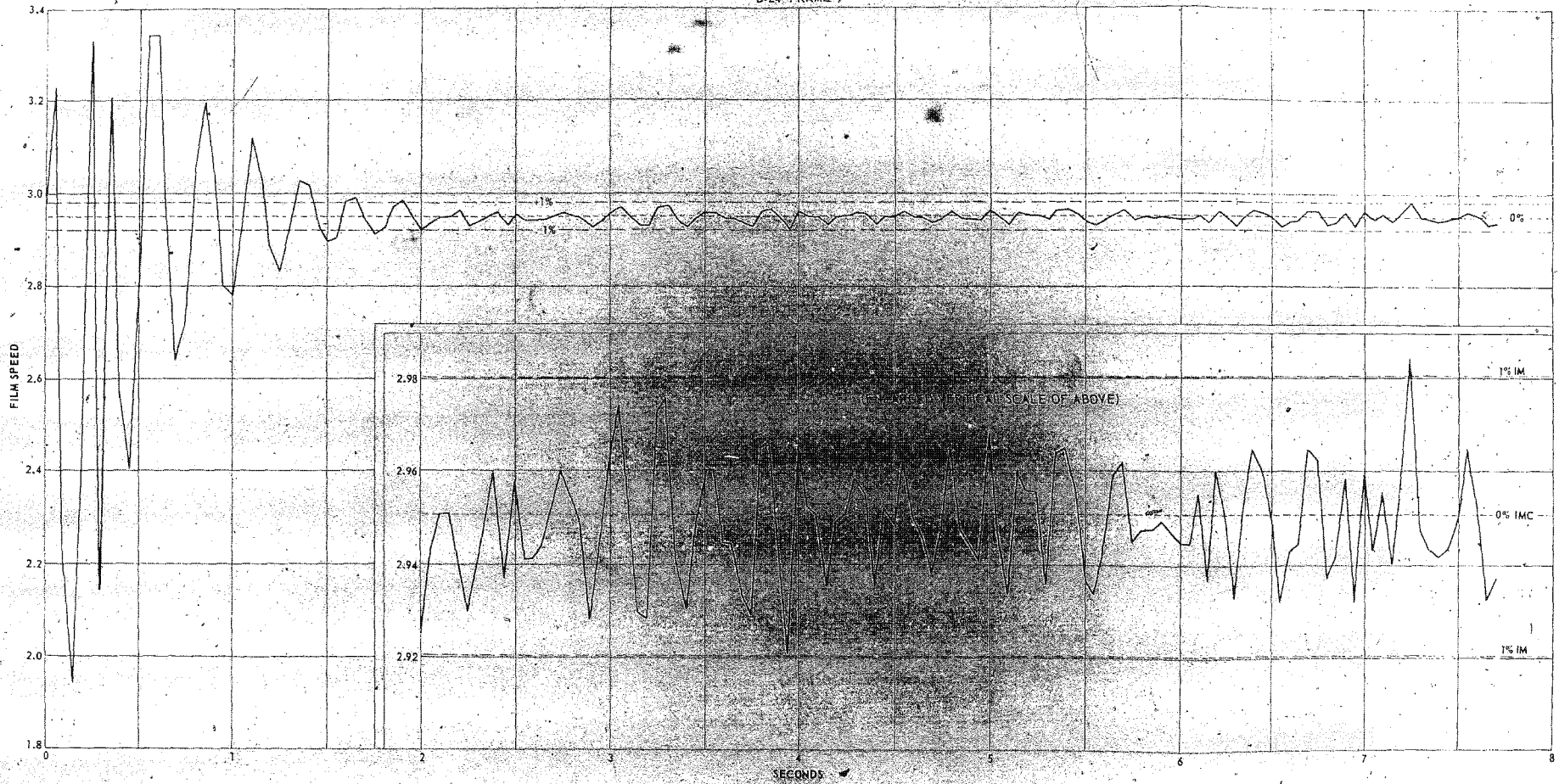
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D-24 FRAME 4



NPIC 11-8200 (3/64)

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