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Keep



FULCRUM

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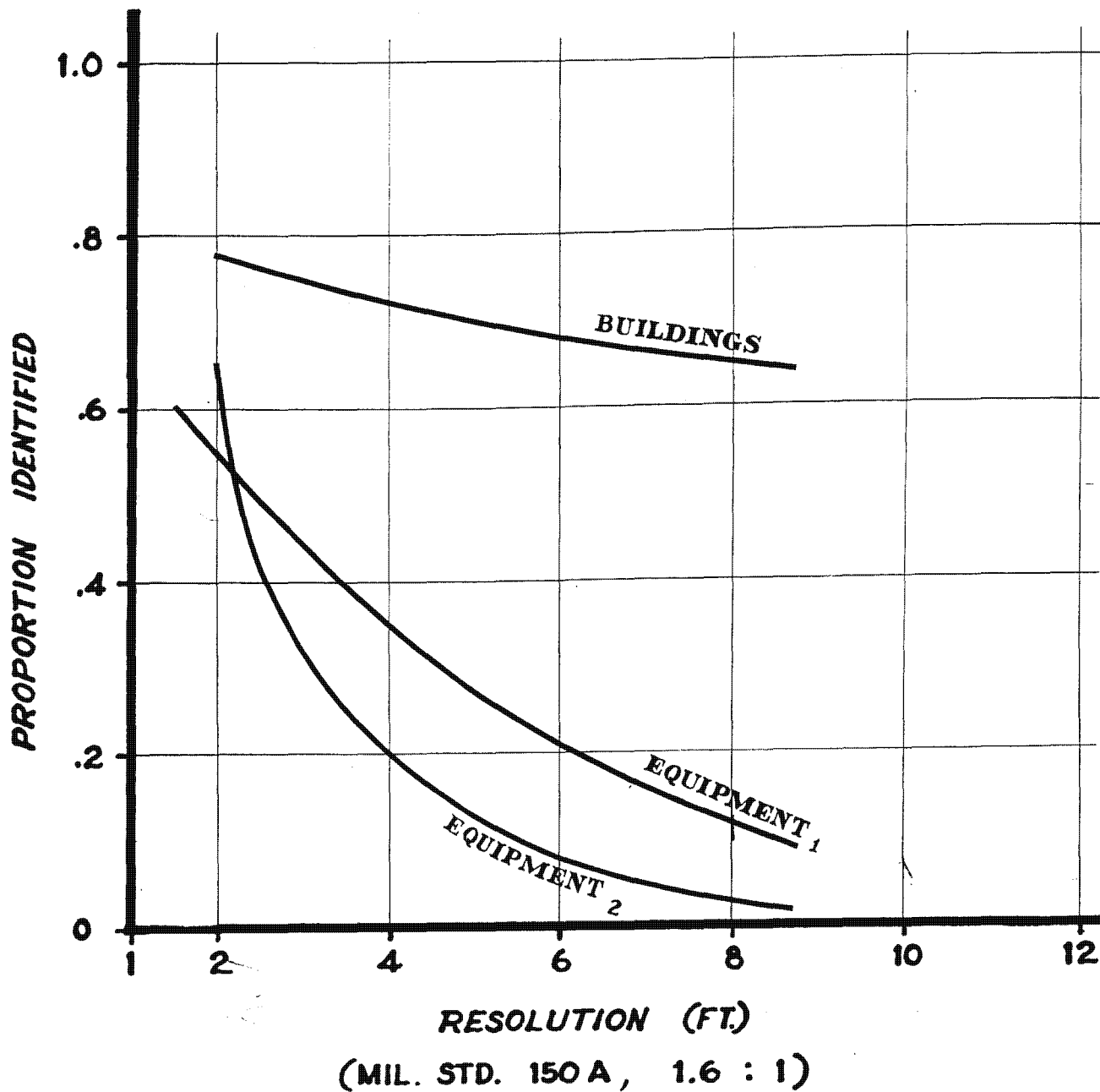
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CIA PROGRAM TO DEFINE NEXT GENERATION SATELLITE RECON SYSTEM

GROUP		1963	1964
PURCELL PANEL	FORECAST OF RECON SATELLITE TECHNOLOGY	■	
DDS&T	CRITIQUE OF AIR FORCE RESPONSE TO DCI ON CORONA IMPROVEMENT	■	
DRELL COMMITTEE	FUNDAMENTALS OF CORONA QUALITY		■
NPIC/DDS&T	INFORMATION VS. PHOTO RESOLUTION		■■■■■
DDS & T	CRITICAL EXAMINATION OF COVERAGE, RESOLUTION, FREQUENCY, AND TARGETING NEEDS		■■■■■
DDS&T/ITEK	<ul style="list-style-type: none"> • SENSOR EVALUATION • HYBRID CAMERA DESIGN 		■■■■■
DDS & T/STL	SPINNING VEHICLE HYBRID SYSTEM		■■■■■
DDS&T/STL	<ul style="list-style-type: none"> • LAUNCH VEHICLE • ORBITAL CONSTRAINTS • WEATHER OPERATIONS 		■■■■■
DDS & T	PROGRAM DEFINITION		■■■■■

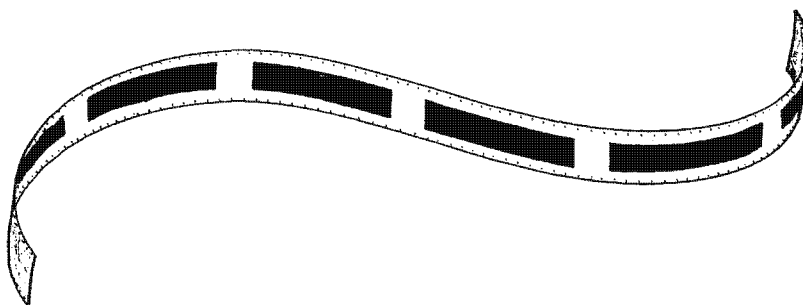
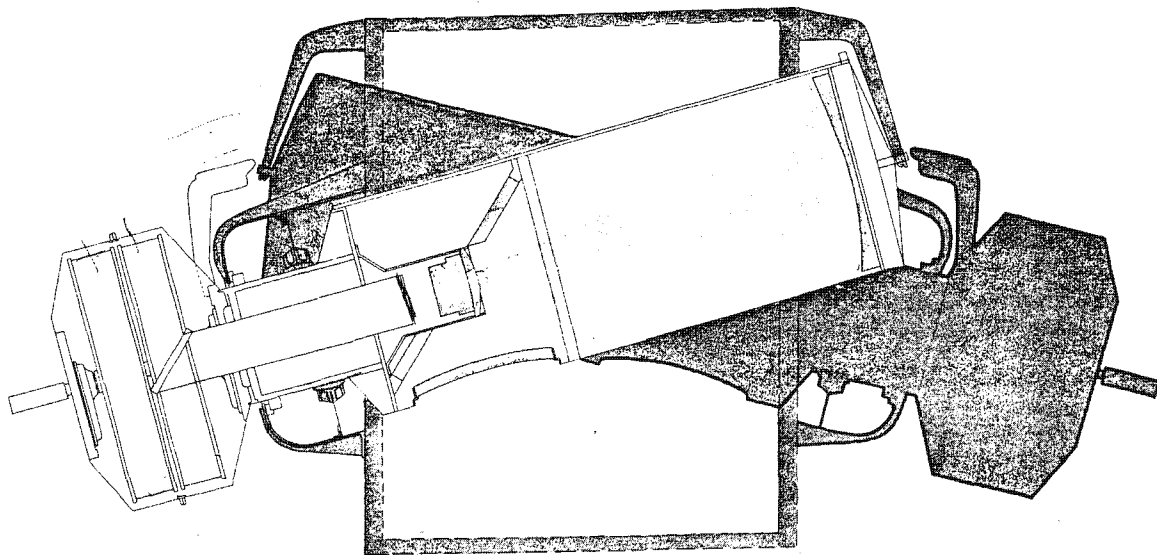
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TARGET IDENTIFICATION EXPERIMENT



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FULCRUM CAMERA SYSTEM



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FULCRUM SYSTEM SUMMARY

OPTICS - *MAKSUTOV DESIGN*

- FOCAL LENGTH - **60 in.**
- F NO. - **3**

FILM - *KODAK TYPE 4404*

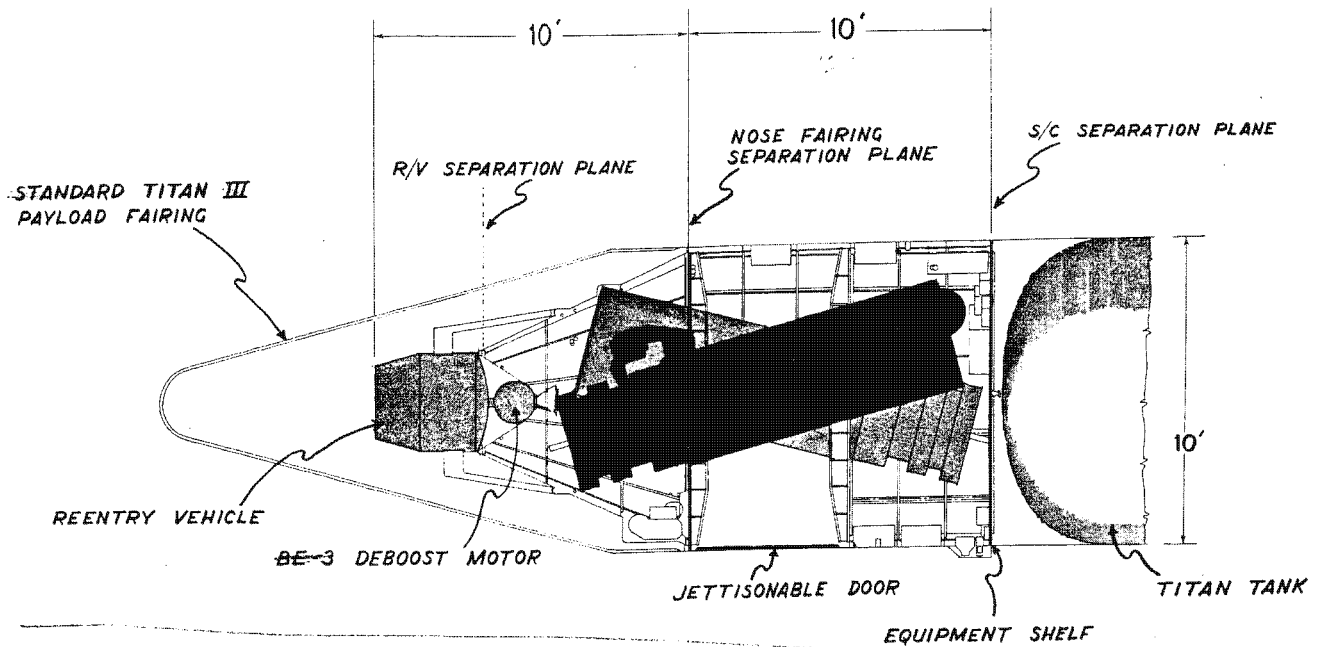
- WIDTH - **7 in.**
- FOOTAGE/CAMERA - **34,000 FT.**
- WEIGHT/CAMERA - **440 LBS.**

PERFORMANCE - *100 NM. ORBIT*

- COVERAGE/FRAME - **10 NM. X 360 NM.**
- TOTAL STEREO COVERAGE -
 $11.6 \times 10^6 \text{ NM}^2$
- NADIR DYNAMIC RESOLUTION -
2.7 TO 3.6 FT.

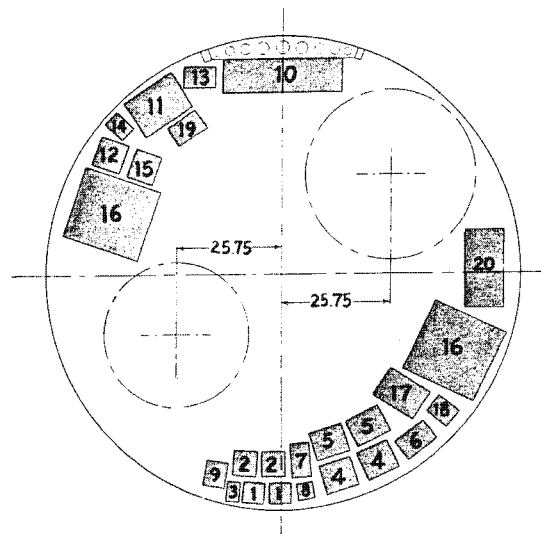
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FIG. 2
 (CLE)



EQUIPMENT LIST

1. TRANSMITTER
2. DTU
3. SIGNAL CONDITIONER
4. RECEIVER
5. COMMAND DECODER
6. CDU
7. S-BAND TRANSPONDER
8. COAX JUNCTION
9. DSU
10. YAW REACTION WHEEL
11. SENSOR ELECTRONICS
12. ATTITUDE CONTROL ASSY.
13. YAW GYRO & ELECTRONICS
14. HORIZ. SCANNER ELECTRONICS
15. INVERTER
16. BATTERY
17. PCU
18. CONVERTER
19. PROGRAMMER
20. CAMERA ELECTRONICS

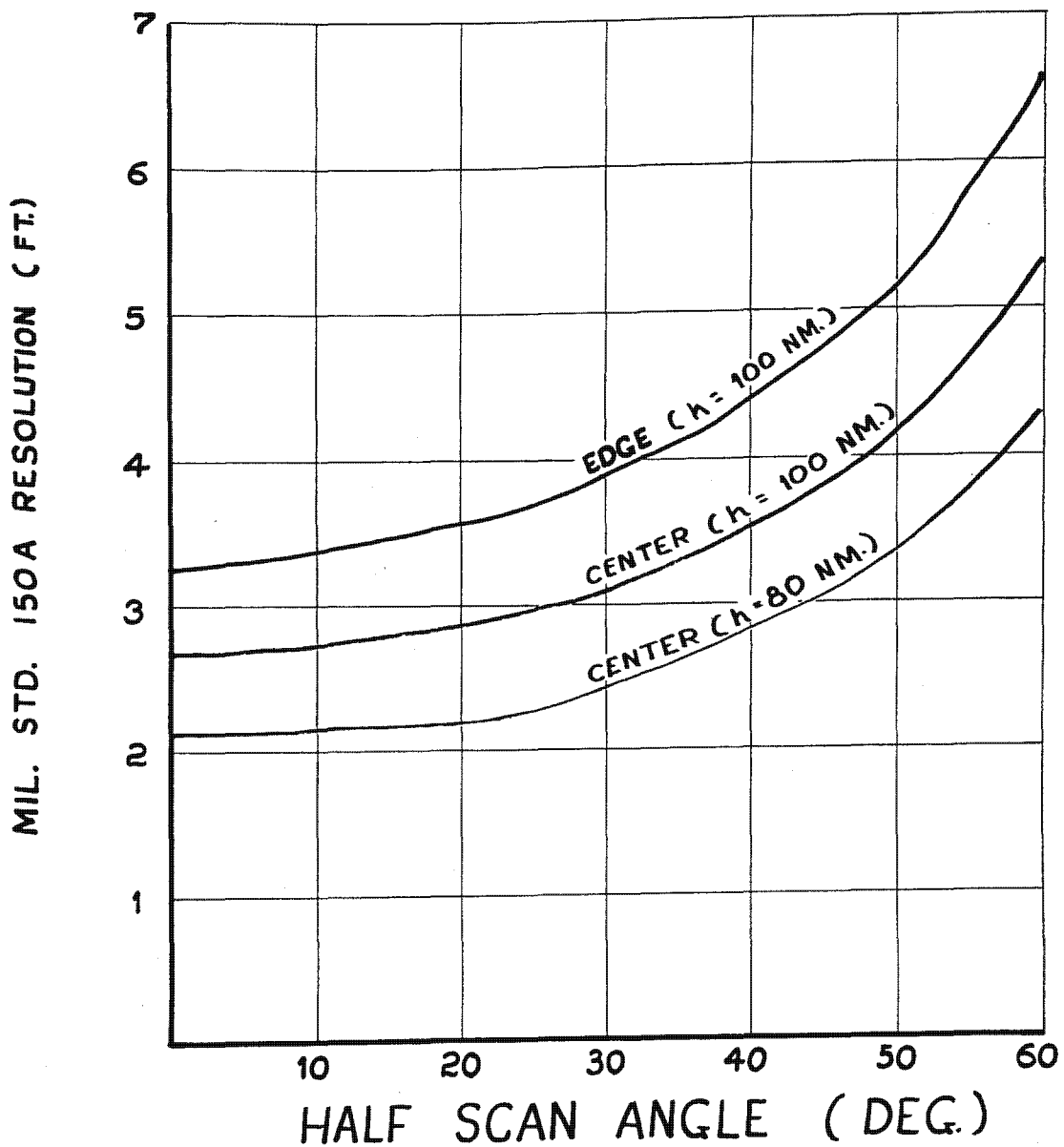


VIEW OF EQUIPMENT SHELF

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STATIC FULCRUM RESOLUTION PERFORMANCE

155 L/MM. AT FORMAT CENTER
125 L/MM. AT FORMAT EDGE
(EXPOSURE TIME 1/500 SEC.)



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TV 3

3 σ MOTION ERROR

- TERRAIN HEIGHT VARIATION
- V/H KNOWLEDGE & CAMERA DRIVE
- RESIDUAL VEHICLE RATES
- VEHICLE ATTITUDE (ROLL & PITCH)
- VEHICLE ATTITUDE (YAW)
- LENS DISTORTION
- SUPPORT BEARING NOISE
- OPTICAL-MECHANICAL AXIS MISALIGNMENT
- 15° Forward Obliquity Error (roll & yaw only)*
- FILM DRIVE VELOCITY ERROR

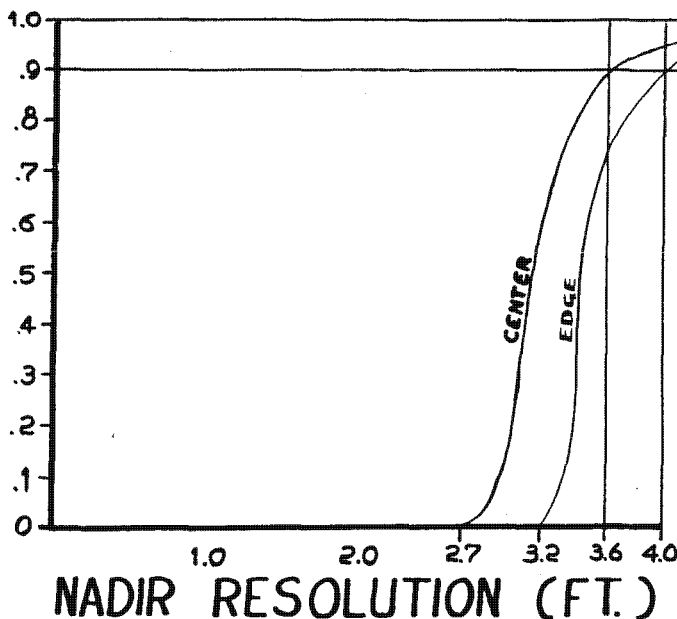
ALONG TRACK	CROSS TRACK
0.20 ^{MR./} _{SEC.}	0.00 ^{MR./} _{SEC.}
0.40	0.00
0.30	0.37
0.20	0.00
0.00	0.50
0.01	0.60
0.15	0.15
0.50	0.50
0.00	1.50
0.8 1.40	1.80
2.4 MICRONS	5.40 MICRONS

RSS

IMAGE SMEAR AT 1/500 SEC. EXPOSURE

4.36

COVERAGE FRACTION



QUALITY DISTRIBUTION AT NADIR

(H = 100 NM.)

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FULCRUM WEIGHT SUMMARY

TITAN II POLAR ORBIT PAYLOAD (12 DAY LIFETIME) _____ 5400 LB.

CAMERAS _____ 2148 LB.

OPTICS	187
ROTATING STRUCTURE	570
FILM TRANSPORT	56
IMAGE MOTION COMPENSATION	25
ELECTRONICS	86
NON-ROTATING STRUCTURE	150

WEIGHT/CAMERA 1074

SPACECRAFT _____ 1588 LB.

STRUCTURE	554
THERMAL CONTROL	70
ATTITUDE CONTROL HARDWARE	108
HYDROGEN PEROXIDE (8 DAY MISSION)	82
TRACKING, TELEMETRY, COMMAND	67
BATTERIES (8 DAY MISSION)	600
POWER SUPPLY HARDWARE	90

RE-ENTRY SYSTEM _____ 540 LB.

FILM _____ 880 LB.

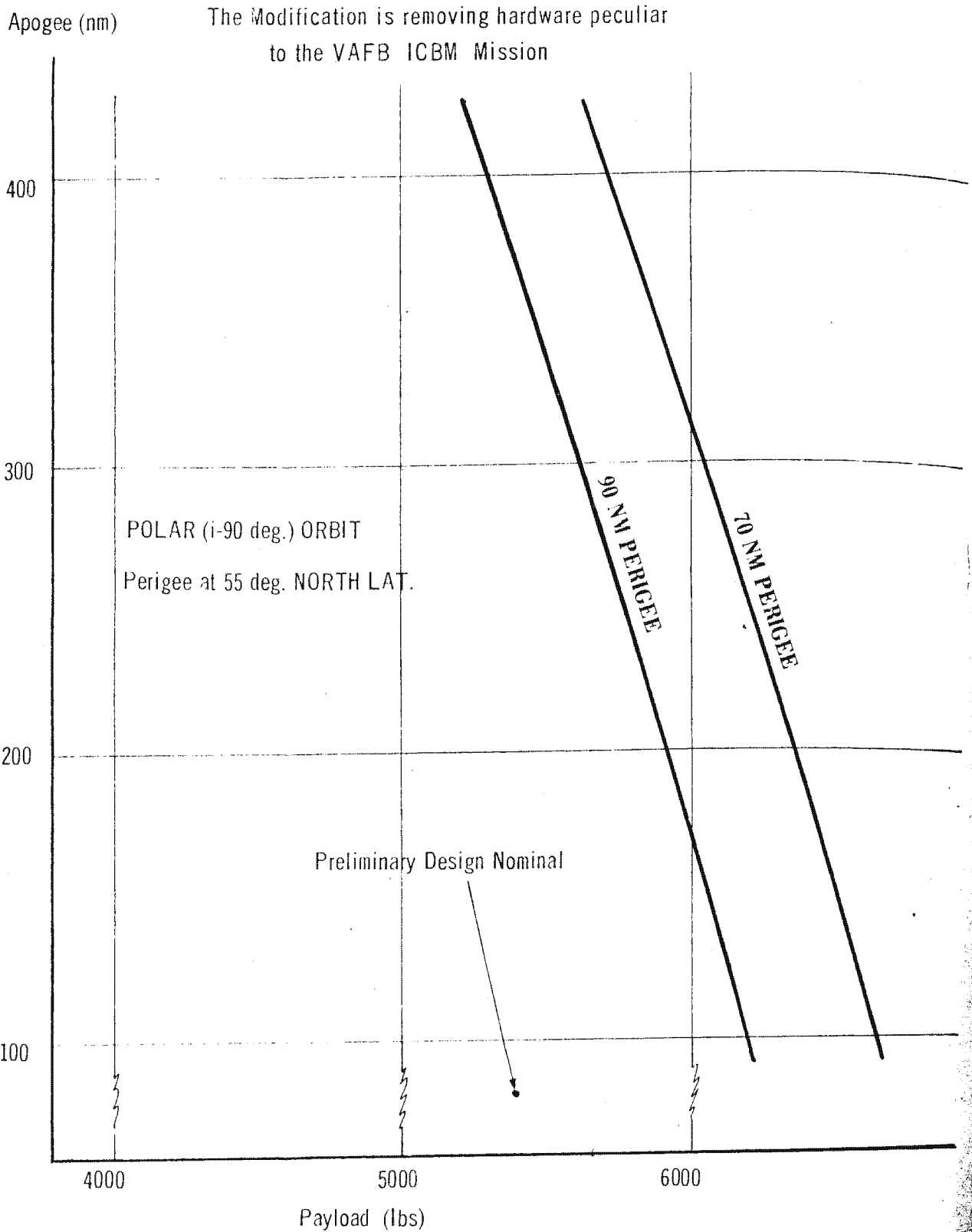
STELLAR INDEX SYSTEM _____ 45 LB.

TOTAL ON ORBIT WEIGHT - 5201 LB.

MARGIN 199 LB.

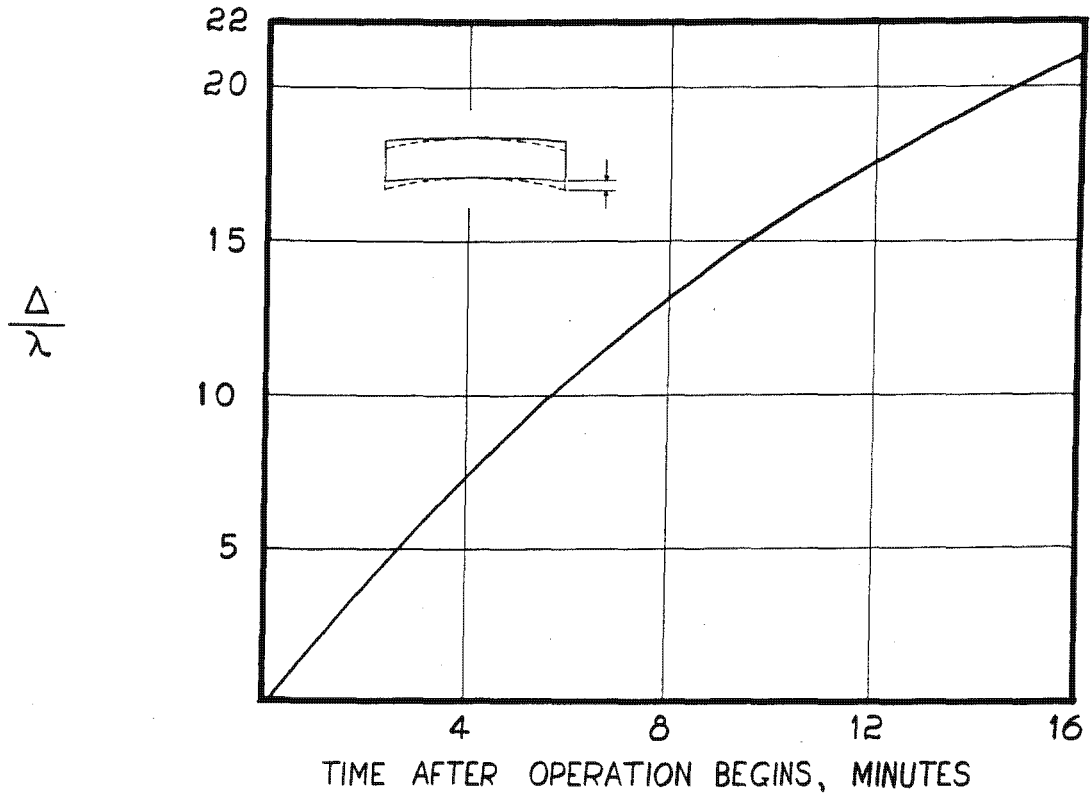
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MODIFIED OPERATIONAL TITAN II

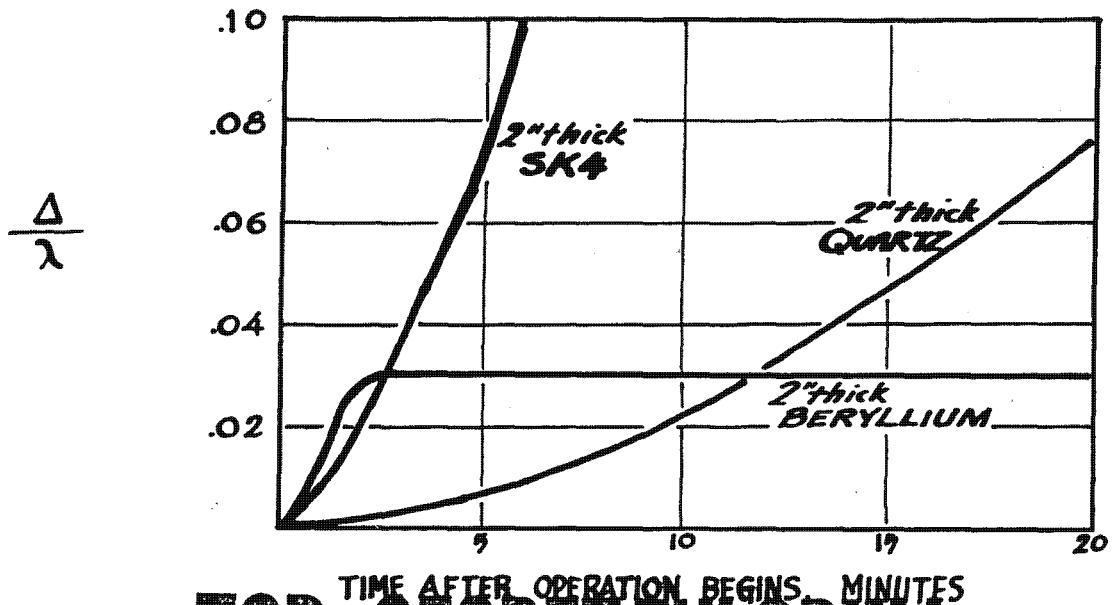


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THERMAL SENSITIVITY CORRECTOR PLATE BOWING



FOLDING MIRROR BOWING



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TEMPERATURE EFFECTS ON FOCUS

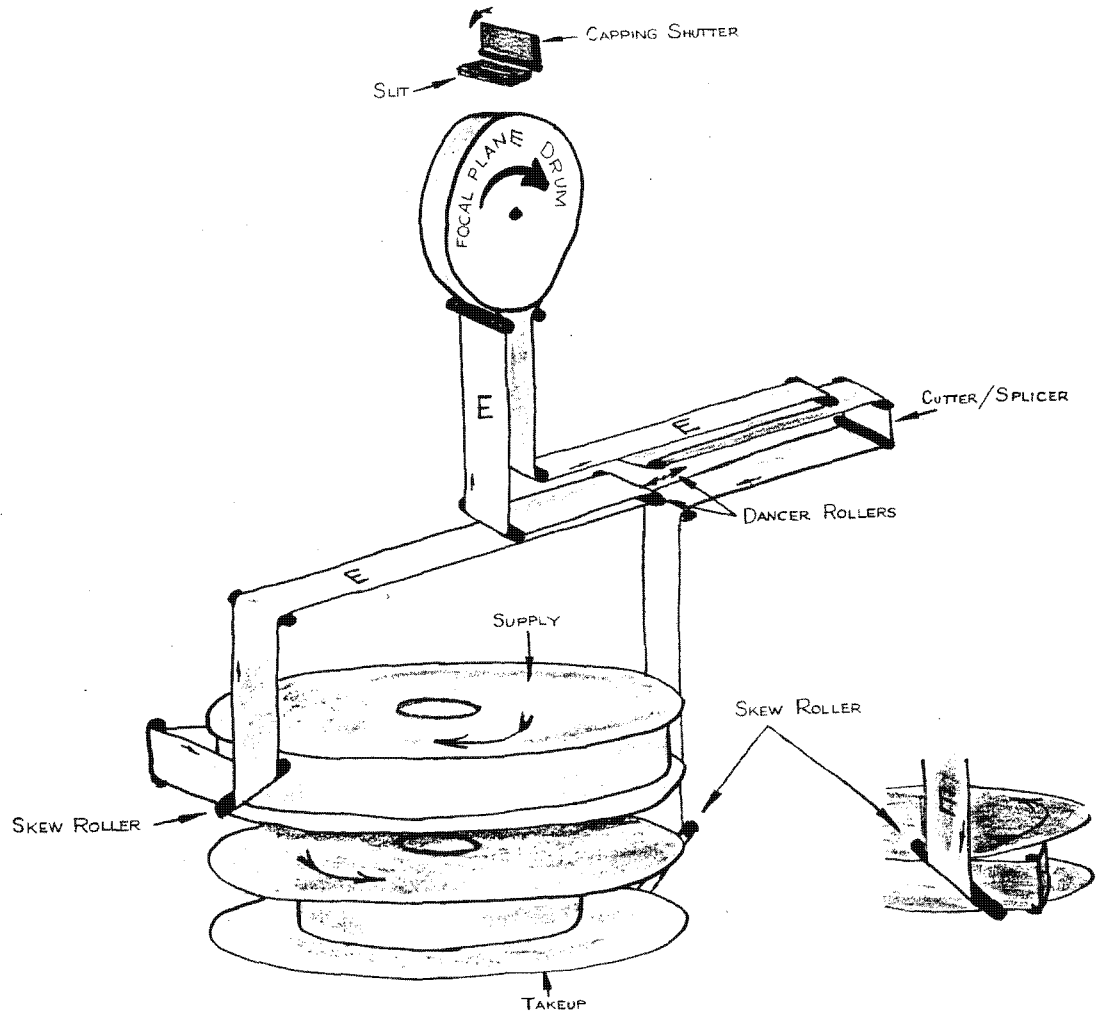
	FOCAL SHIFT	ABERRATION CHANGES
+ 10° C FIELD FLATTENER	-5.0 μ	NONE
+ 10° C CORRECTOR ELEMENTS	+5.8 μ	NONE
+ 10° C FUSED SILICA PRIMARY COMPENSATED BY INVAR STRUCTURE	0 μ	NONE
10 λ BOWING OF CORRECTOR PLATE	12 μ	1 μ SPHERICAL
0.03 λ BOWING OF 45° MIRROR	2 μ	0.7 μ ASTIGMATISM

RAY LEIGH TOLERANCE $f/3$ SYSTEM $\lambda = 0.6 \mu$

$$\Delta f = \pm 2 (F\#)^2 \lambda = 11 \mu$$

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TRANSPORT SYSTEM

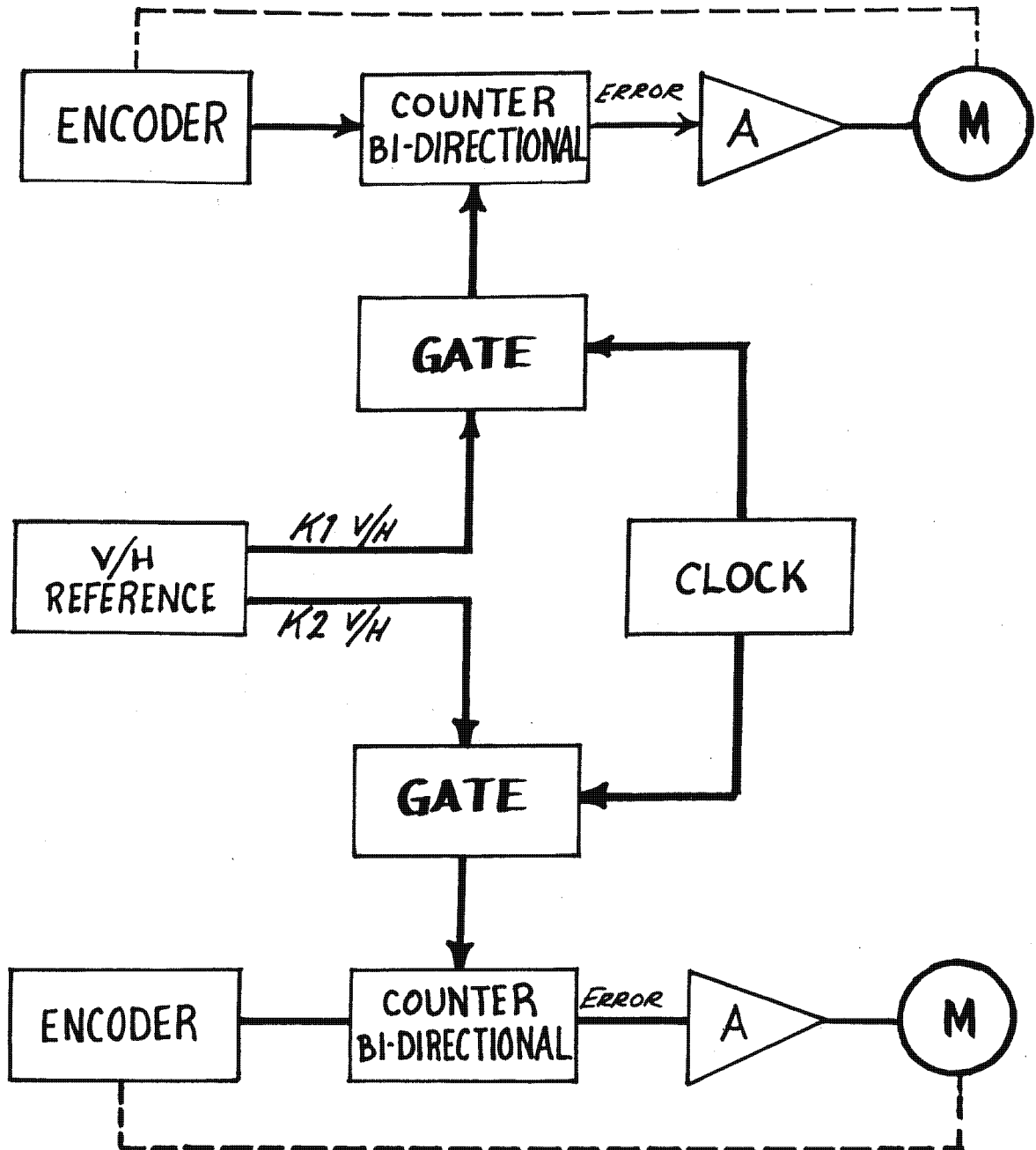


ROLLERS
2 SKEW
13 PLAIN
(6 Rollers on Emulsion)

KR 100-
MA 44

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FILM CONTROL SCHEMATIC



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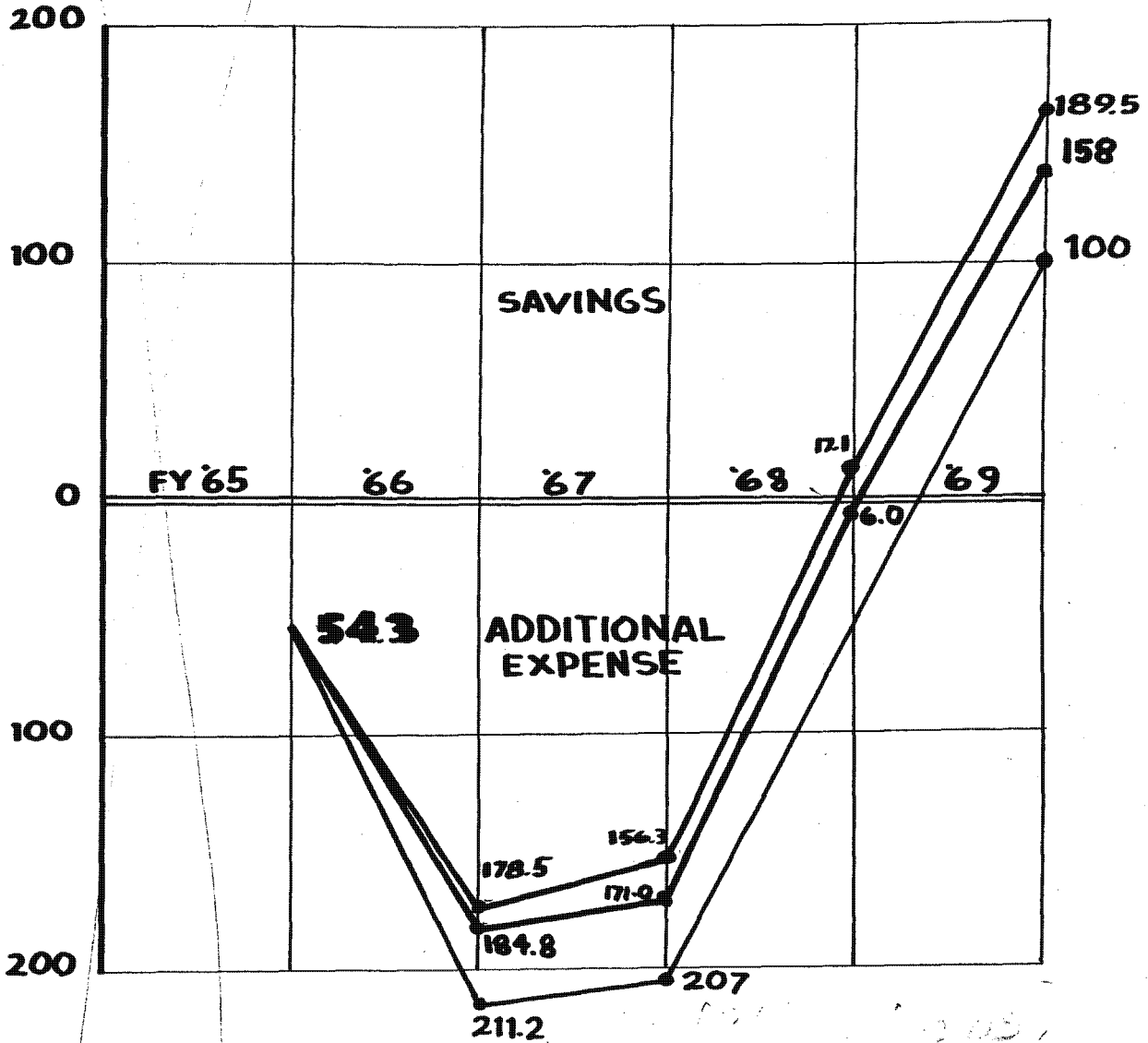
ANNUAL PROGRAM COSTS

	FY 65	FY 66	FY 67	FY 68	FY 69
CORONA	146 ⁽¹⁴⁾	146 ⁽¹⁴⁾	146 ⁽¹⁴⁾	146 ⁽¹⁴⁾	146 ⁽¹⁴⁾
GAMBIT	200 ⁽¹⁰⁾	194 ⁽¹⁰⁾	160 ⁽¹⁰⁾	156 ⁽¹⁰⁾	155 ⁽¹⁰⁾
FULCRUM	54.3	156.9	148.8 ⁽¹⁰⁾	149 ⁽¹²⁾	149 ⁽¹²⁾
	54.3	130.5	139.2	137	137
	54.3	124.2	130.8	128.6	128.6

12

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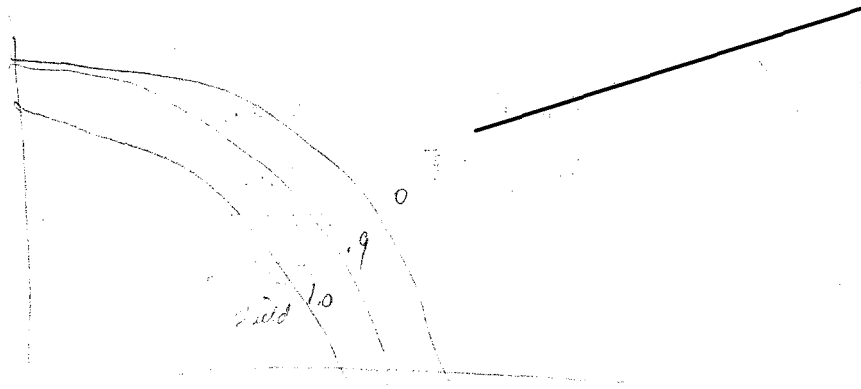
G+C = 1595
 G+C+F = 1495
 1437
 1405.5



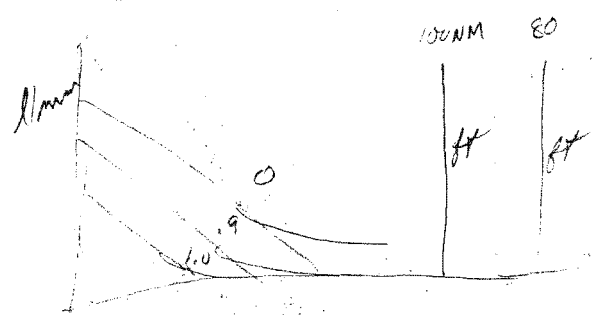
~~14-C~~ 16-C
~~10-G~~ 14-C
 15-G 12-C
 15-G 15-G
 12-F (6-C)
 6-G 12-F
 12-F 12-F
 12-F

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M



l/mm
no motion



ΔX

residual motion in μ
2:1 contrast