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DORIAN/GAMBIT

THE ROLES OF MAN IN MOL

VOLUME II - ILLUSTRATIONS



MANNED ORBITING LABORATORY
PROGRAM OFFICE
WASHINGTON, D.C.

JUNE 1, 1969

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THE ROLES OF MAN IN MOL

(Volume II)

Manned Orbiting Laboratory
Program Office

June 1, 1969



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Preface

This volume contains figures which are cited and discussed
in Volume I of the report.

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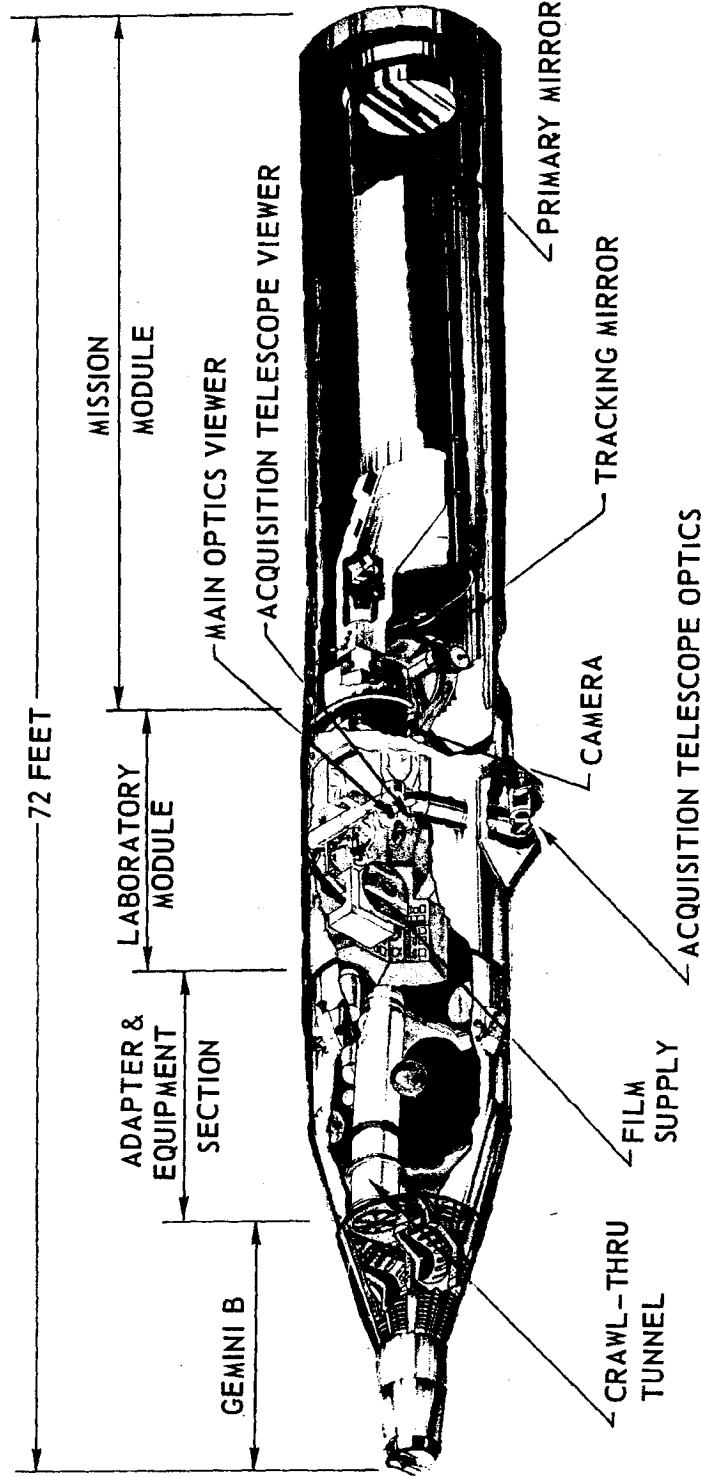
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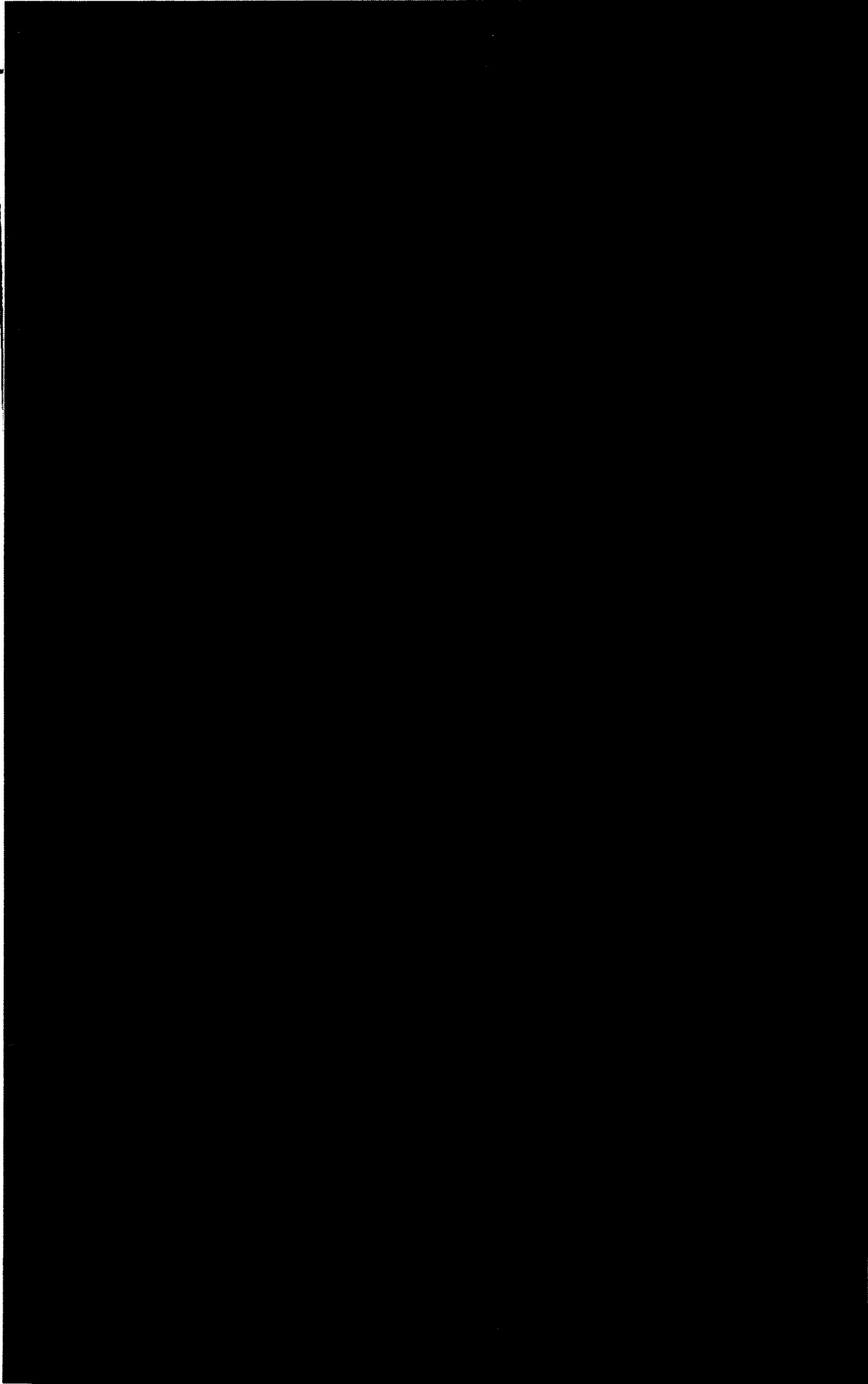
MOL BASELINE SYSTEM

FIGURE 1

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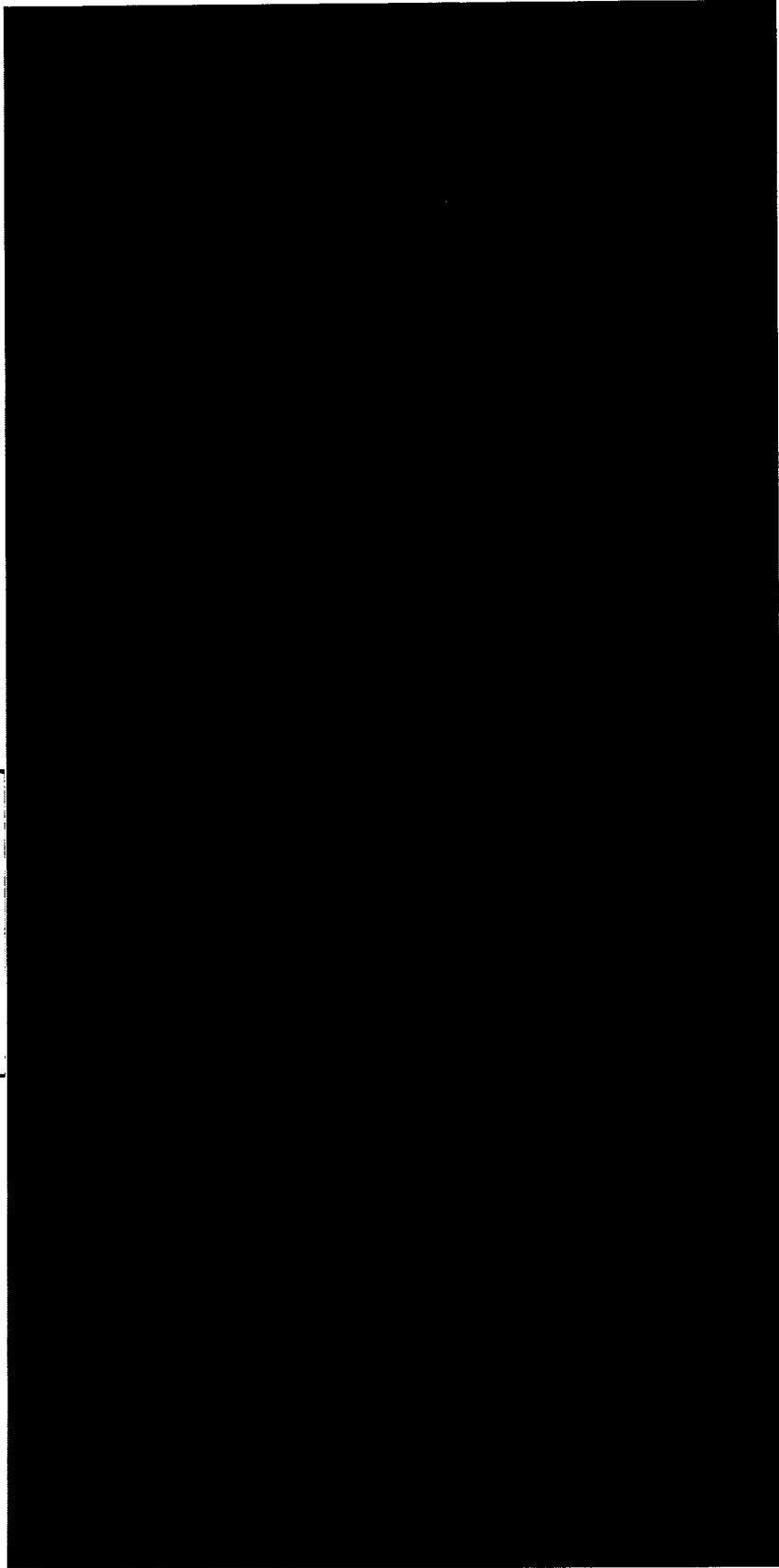
FIGURE 2
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DIRECTION
OF FLIGHT



CONDITIONS:
ALTITUDE 80 N.M.
OBLIQUITY 20°
FORWARD LOOK 15°

DIRECTION
OF FLIGHT



WITH X-FORMAT IMC

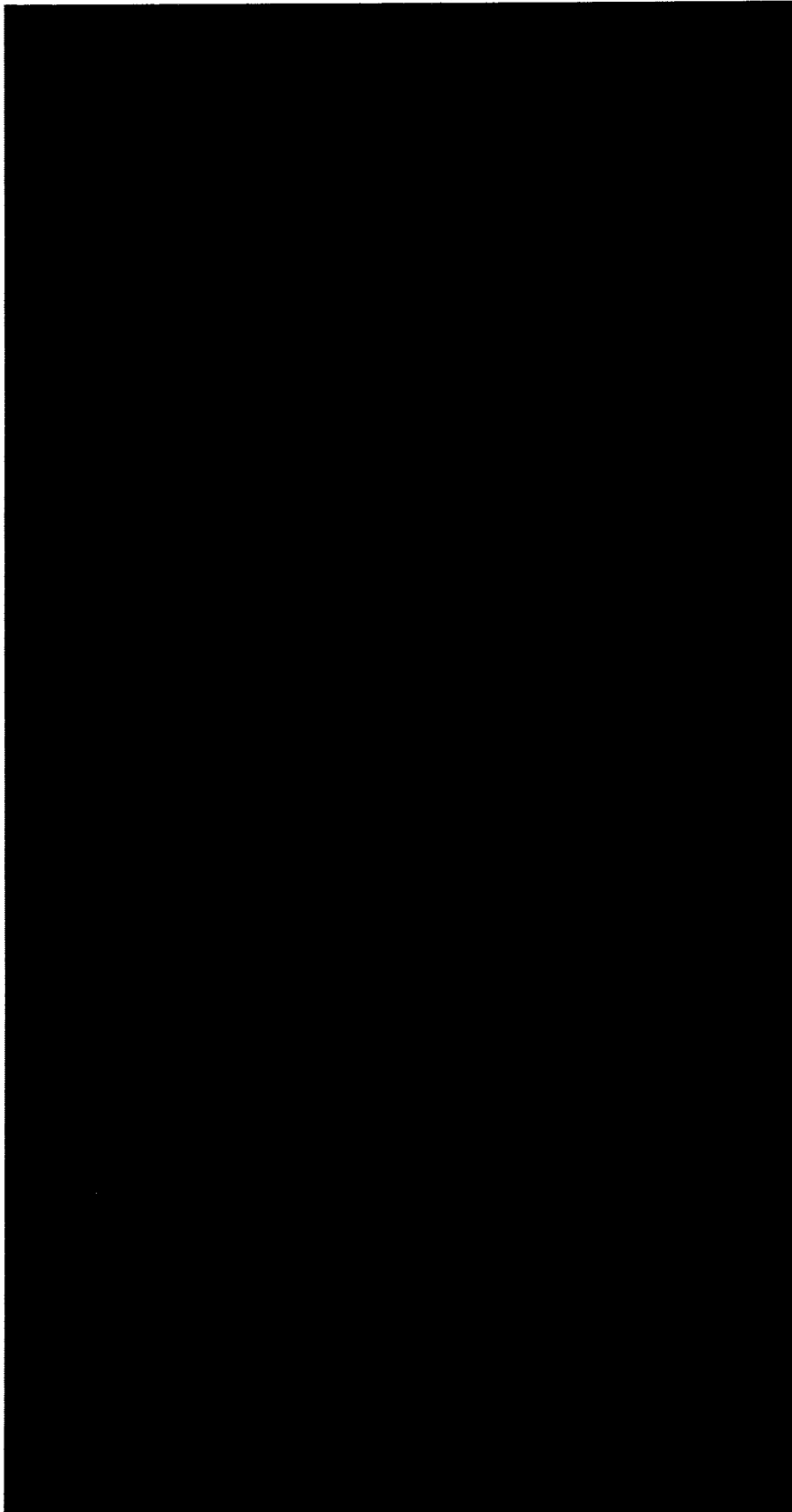
WITHOUT X-FORMAT IMC

COMPARISON OF RESOLUTION ACHIEVED AT VARIOUS POINTS ON MOL
9-INCH CIRCULAR-FORMAT PHOTOGRAPH, WITH AND WITHOUT X-FORMAT
IMC, FOR GIVEN CONDITIONS OF PHOTOGRAPHY.

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GEOMETRIC
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RESOLUTION



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MOL SYSTEM MEAN STATIC RESOLUTION ON AXIS
AS FUNCTION OF FOCUS ERROR

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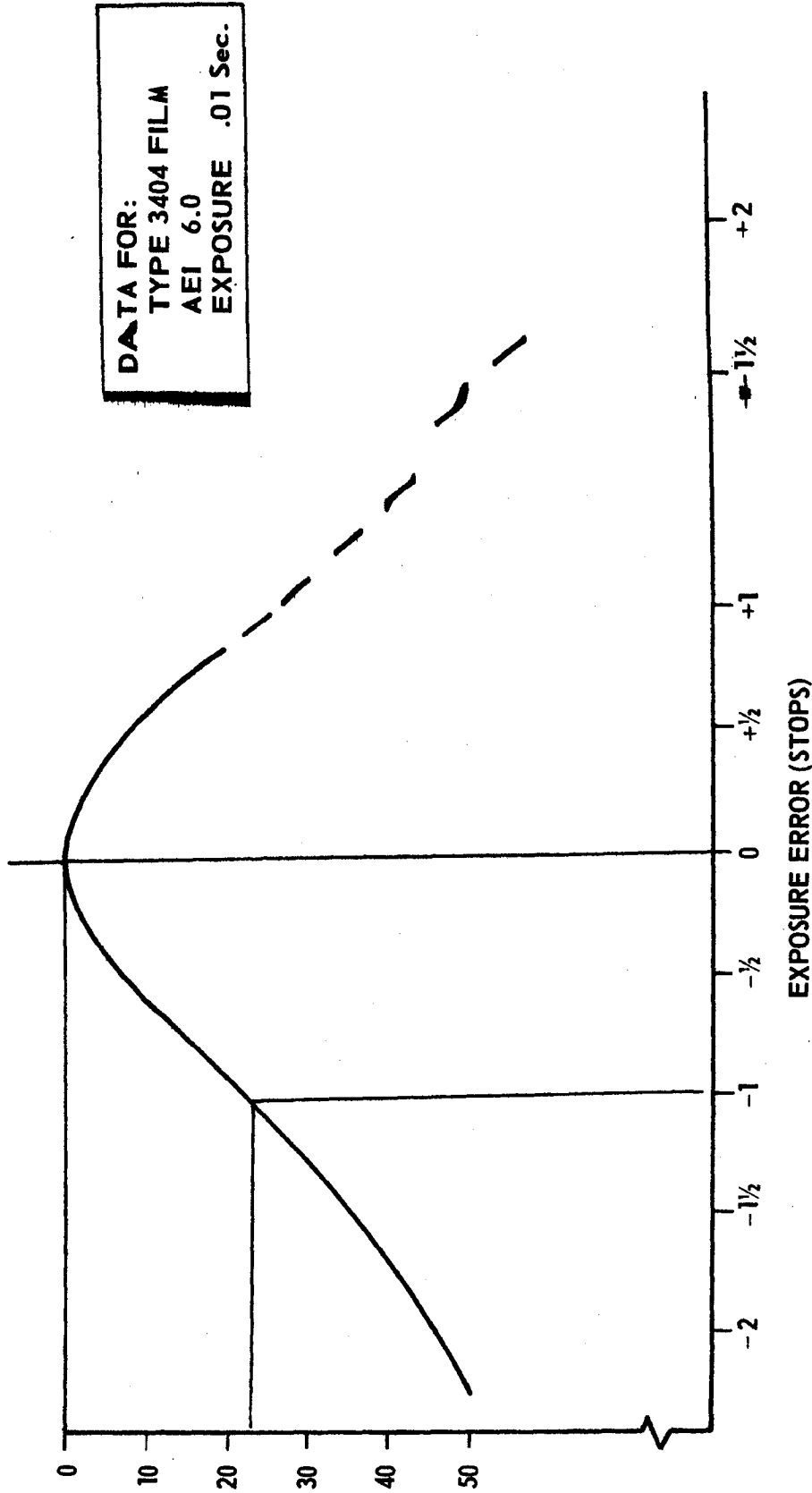
FIGURE 4

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MOL SYSTEM PHOTOGRAPHY RESOLUTION LOSSES
AS FUNCTION OF EXPOSURE - SETTING ERROR

FIGURE 5
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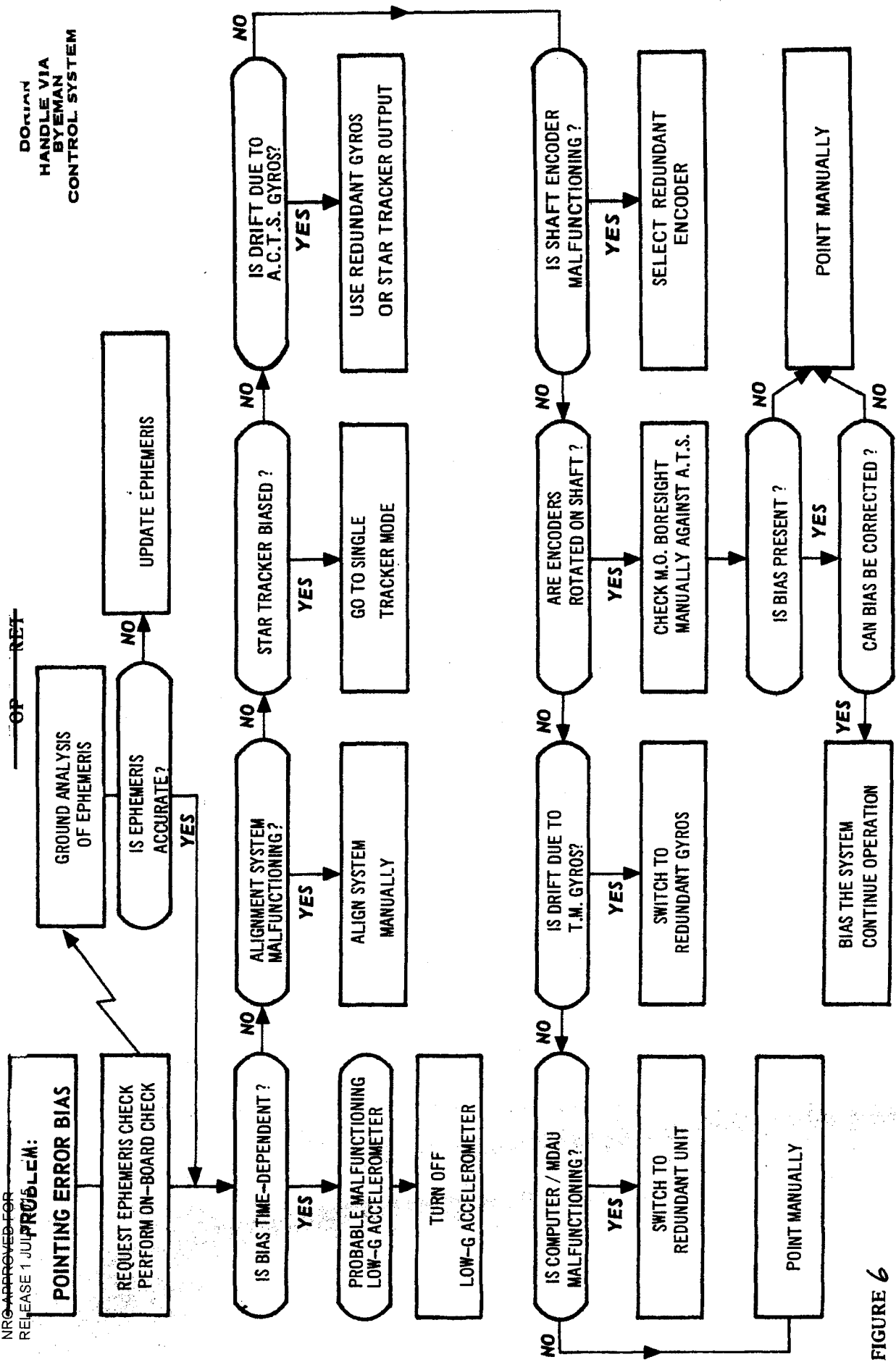


FIGURE 6

ILLUSTRATION OF MOL SYSTEM DIAGNOSTIC TECHNIQUE
PROBLEM: TARGETS NOT CENTERED IN PHOTOGRAPHS

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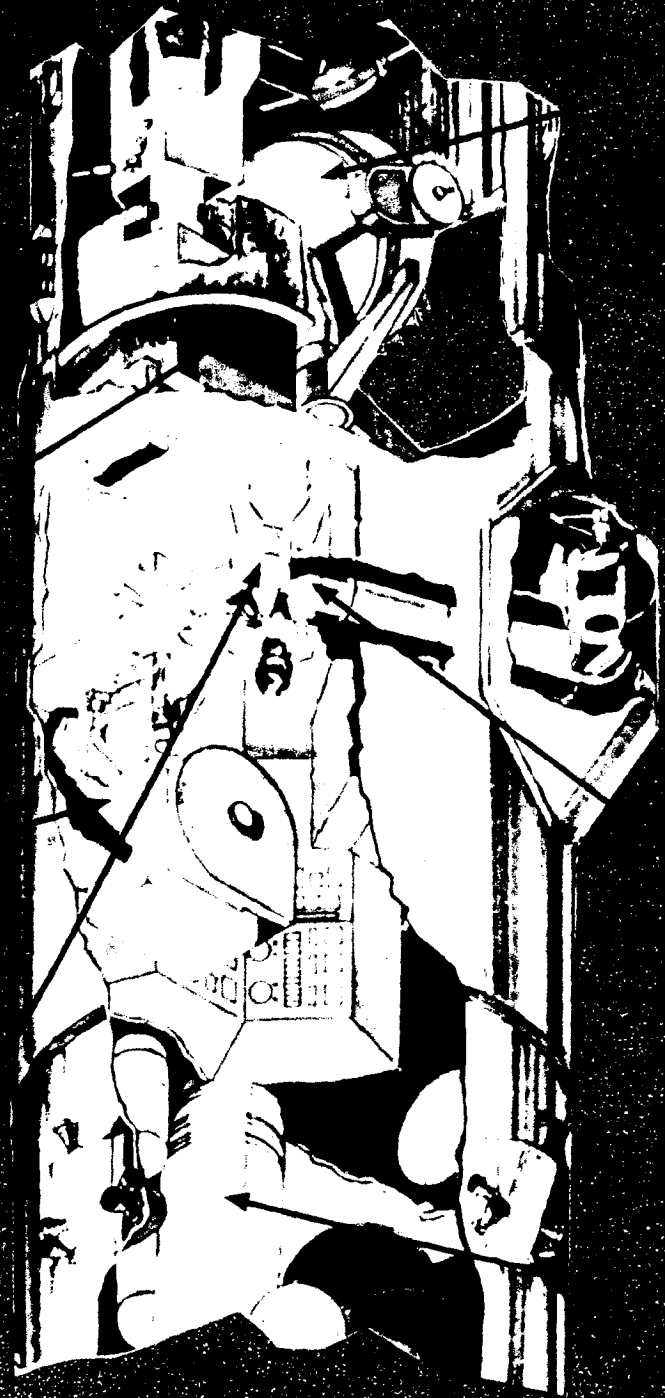
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ACQUISITION
TELESCOPE No. 2

MAIN OPTICS

CAMERA



TO GEMINI B

CRAWL-THRU
TUNNEL

ACQUISITION
TELESCOPE No. 1

A.T.S. TRACKING
MIRROR

MAIN OPTICS
TRACKING MIRROR

LOCATION OF ACQUISITION TELESCOPE SYSTEMS
IN MOL LABORATORY COMPARTMENT

Figure 7

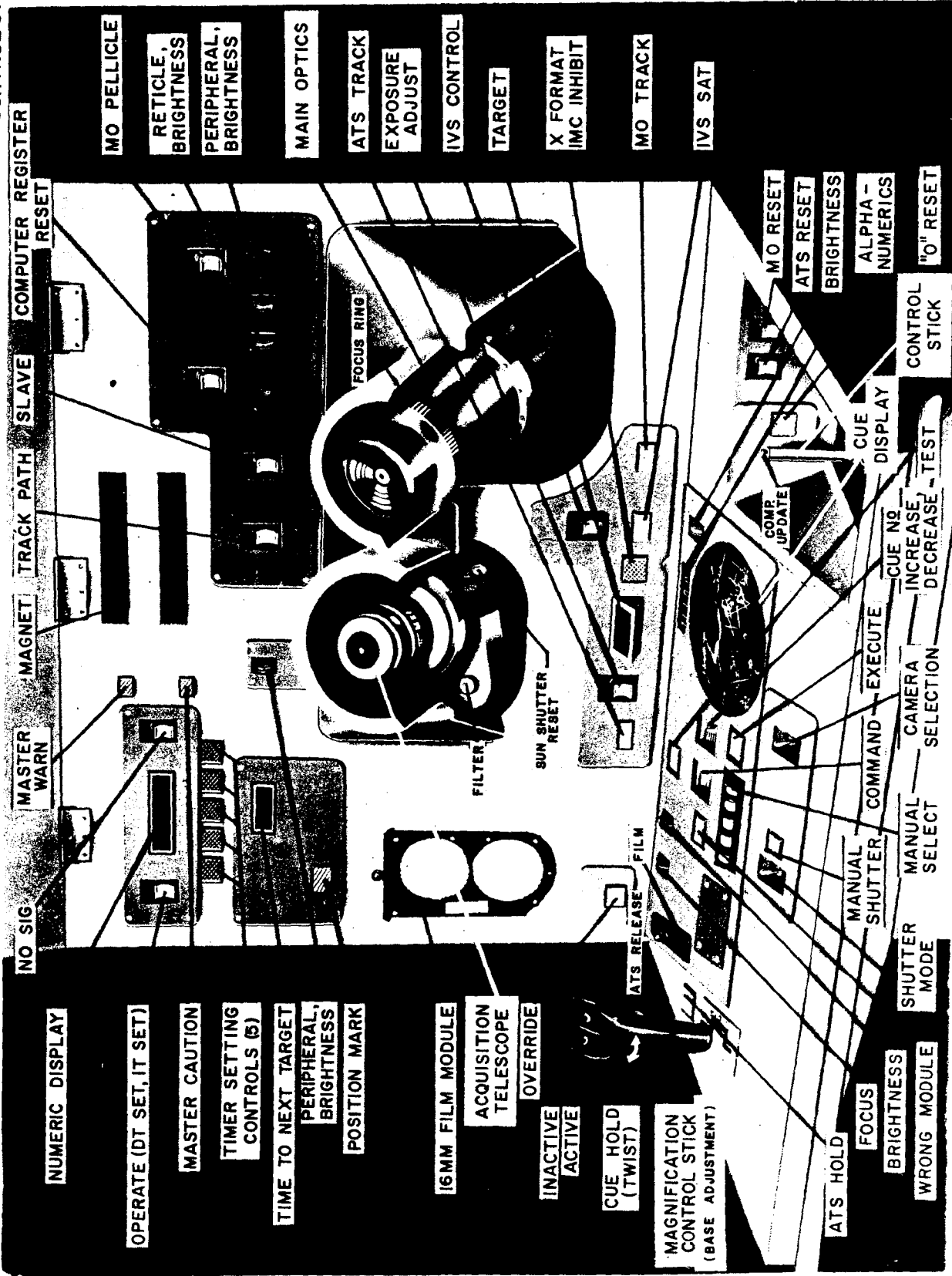
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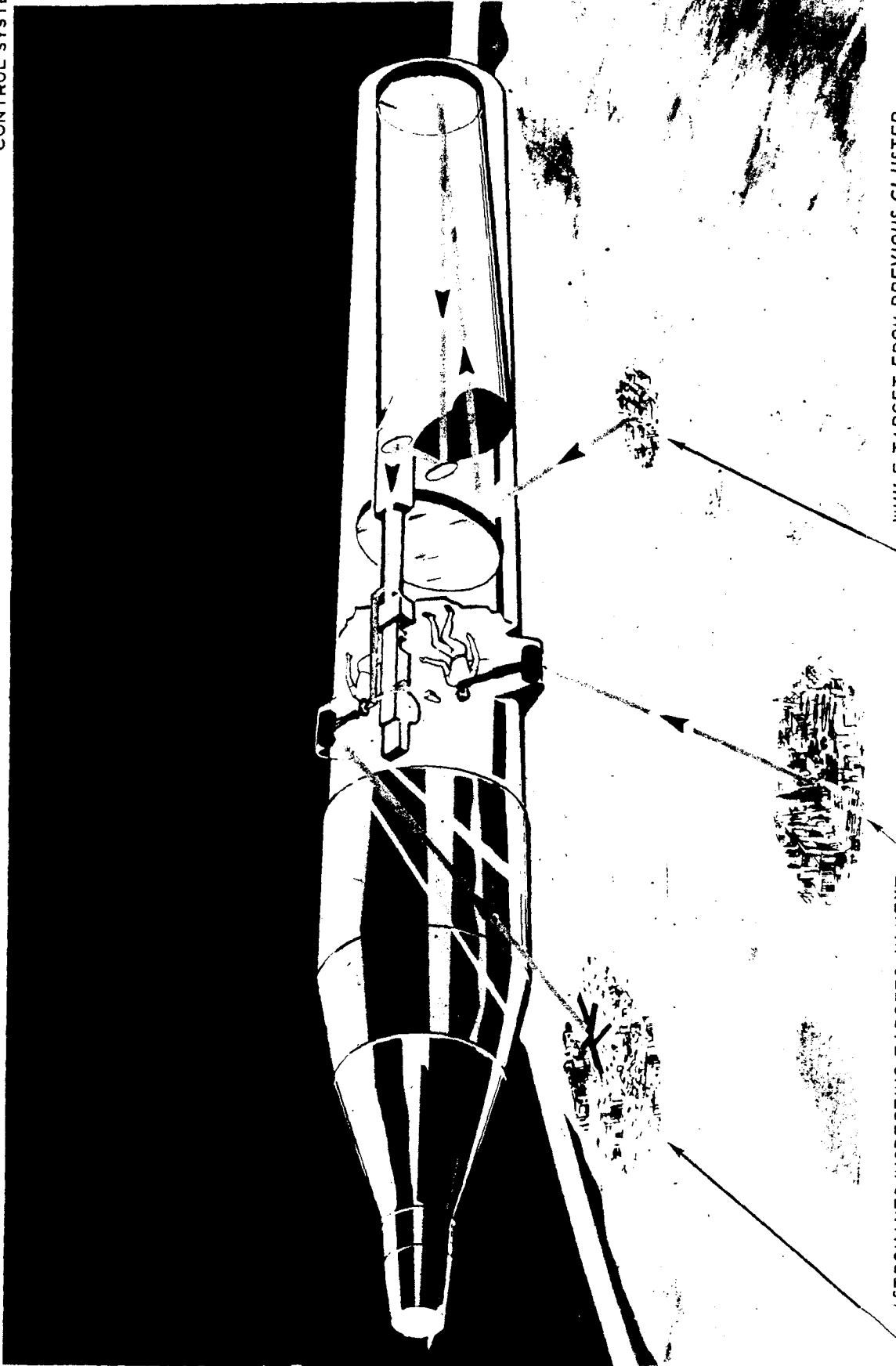
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FIGURE 3
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— WHILE TARGET FROM PREVIOUS CLUSTER
IS BEING PHOTOGRAPHED

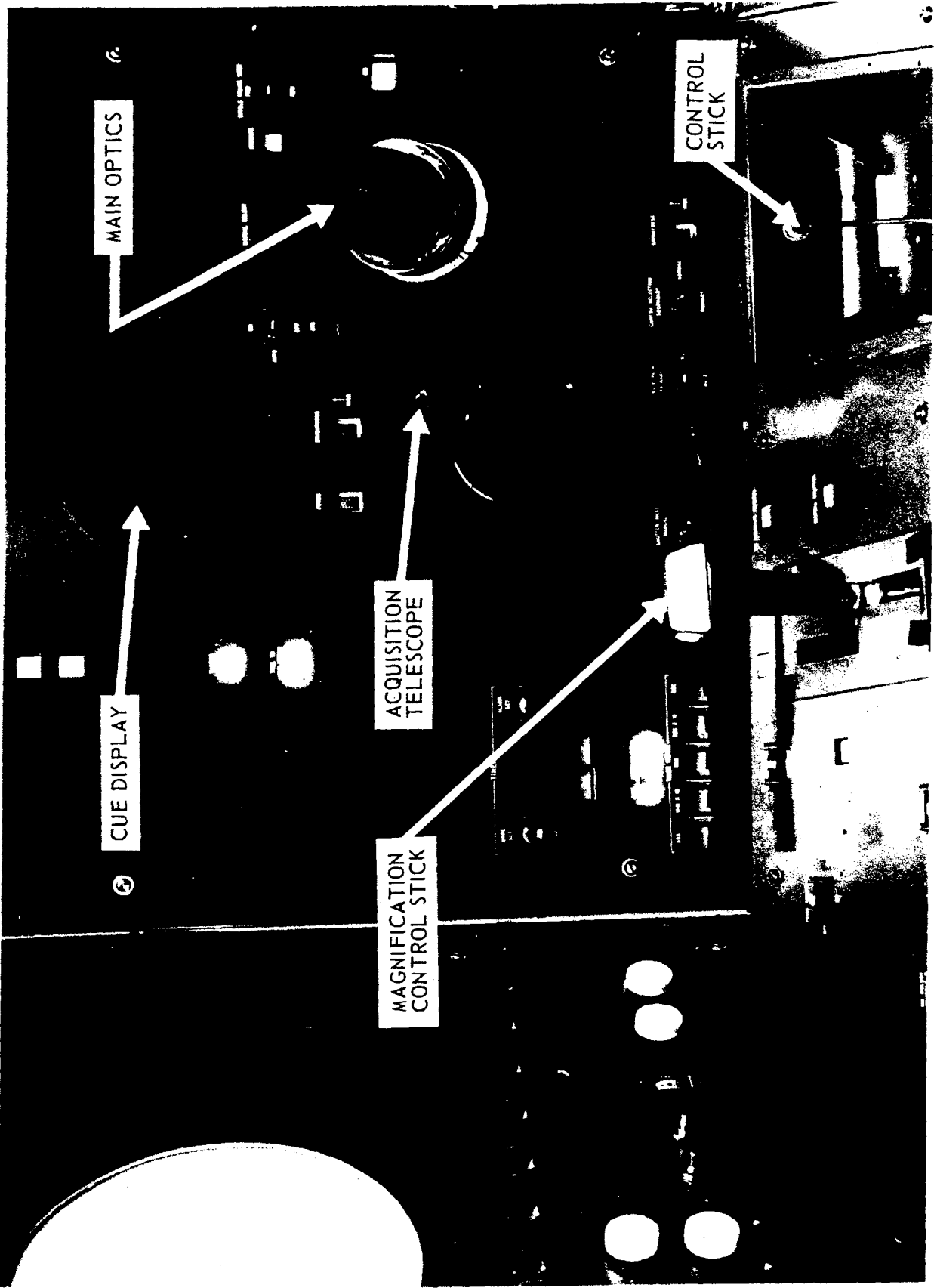
— ASTRONAUTS INSPECTING TARGETS IN NEXT
CLUSTER, FOR CLOUD COVER AND "ACTIVITY"

FIGURE 7

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ACQUISITION TELESCOPE SYSTEM OPERATING CONCEPT

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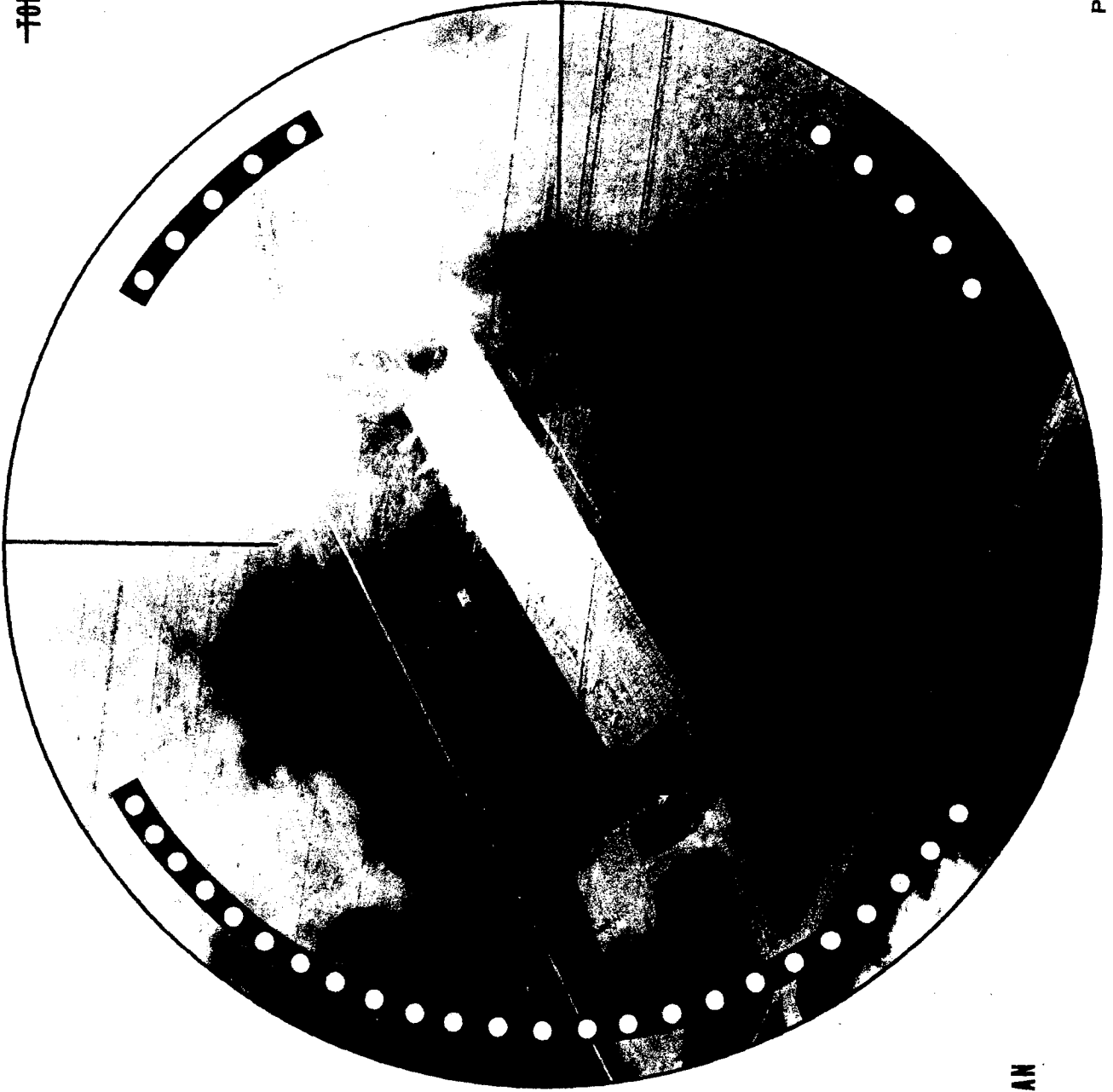
MOL MISSION CONSOLE (EARLY CONFIGURATION)

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FIGURE 1
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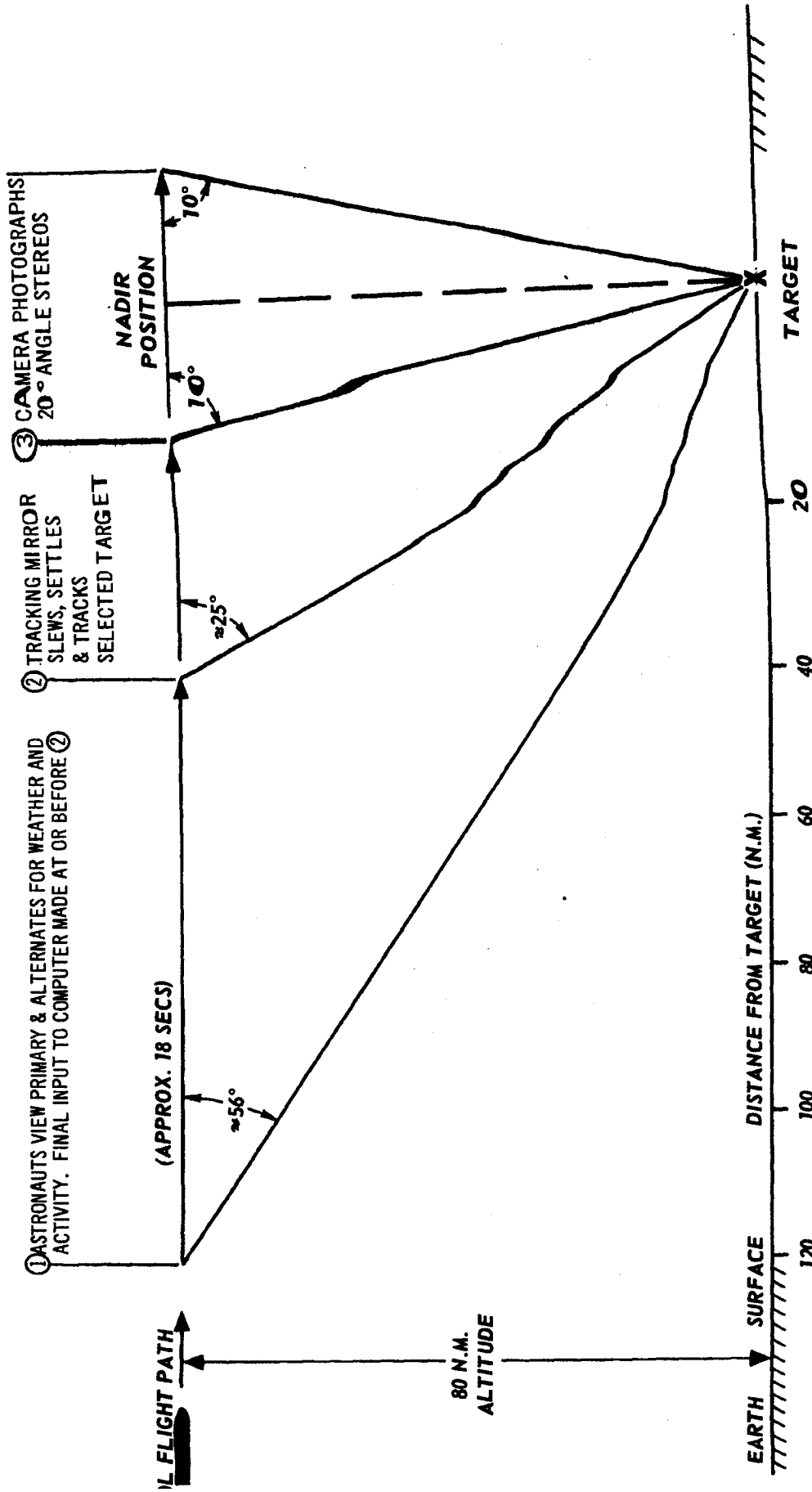
FIGURE //

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ILLUSTRATION OF "ACTIVITY" AT AIRFIELD

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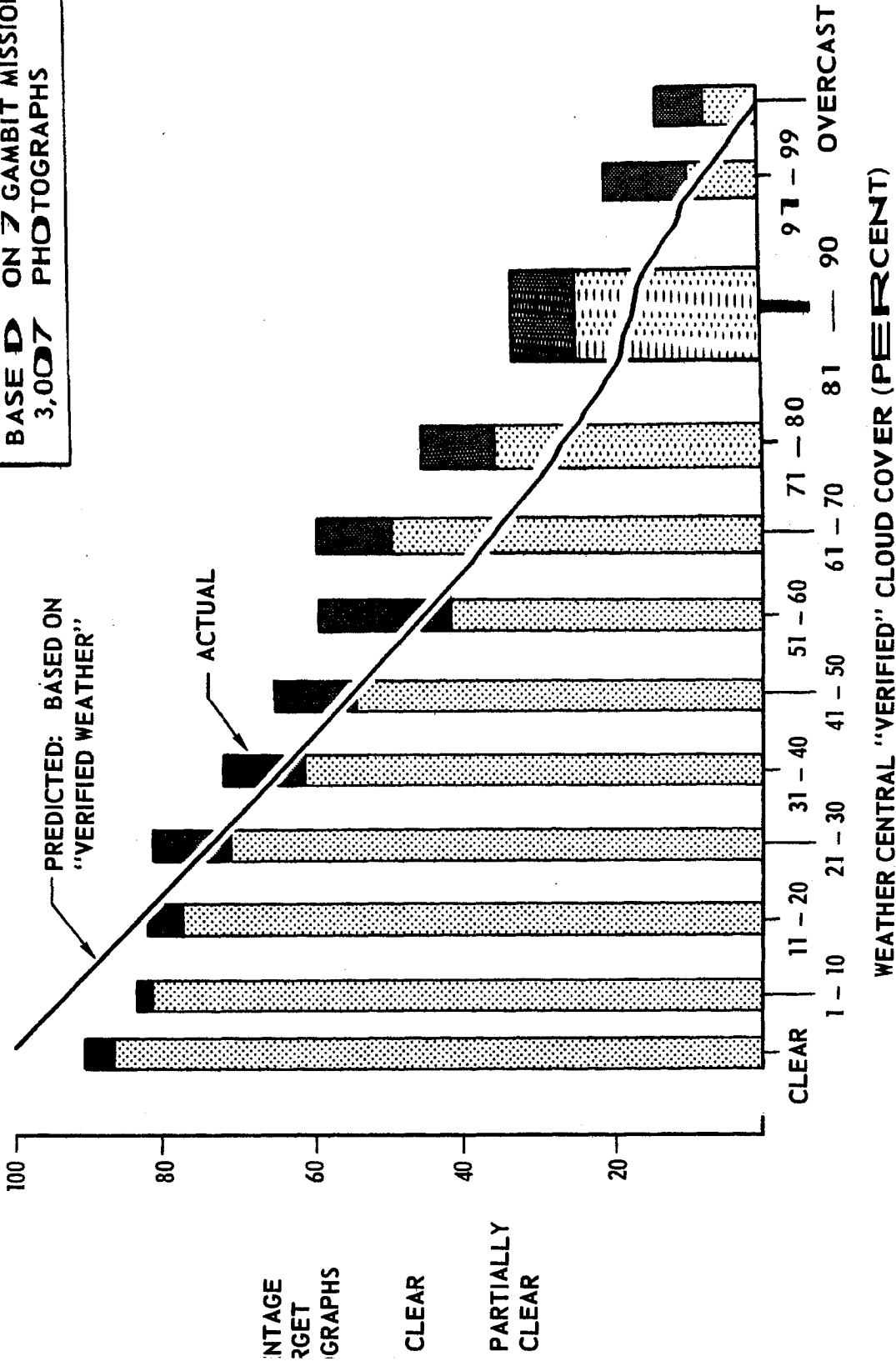
TIME - SPATIAL CONSTRAINTS FOR ASTRONAUTS WHILE
PERFORMING IN ACTIVE TARGET INDICATOR MODE
(TYPICAL EXAMPLE)

FIGURE 12

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BASE D ON 7 GAMBIT MISSIONS
3,007 PHOTOGRAPHS



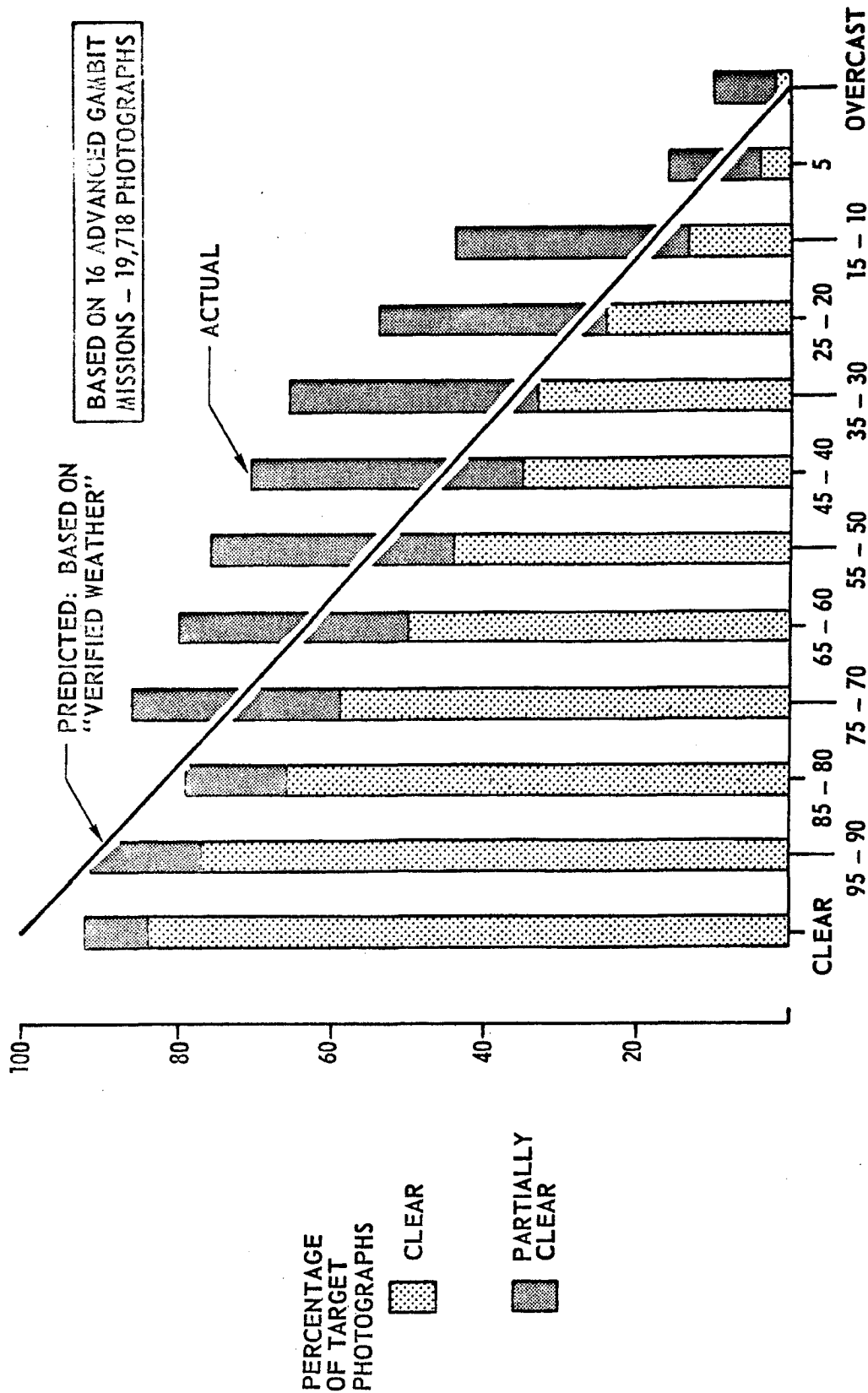
ACTUAL SUCCESSFUL GAMBIT PHOTOGRAPHY VERSUS
THAT PREDICTED BASED ON "VERIFIED" WEATHER

FIGURE 13

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GAMBIT™
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WEATHER CENTRAL "VERIFIED" PROBABILITY THAT TARGET WAS PHOTOGRAPHED CLEAR

ACTUAL SUCCESSFUL ADVANCED GAMBIT PHOTOGRAPHY VERSUS THAT PREDICTED BASED ON "VERIFIED" WEATHER

FIGURE A
GAMBIT
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WEATHER MODEL	No. OF CLEAR PHOTOGRAPHS OBTAINED IN SIMULATED 30-DAY MISSION		% INCREASE DUE TO CLOUD AVOIDANCE ROLE PLAYED BY MAN
	AUTOMATIC OPERATION (PRIMARYES)	MANNED OPERATION (PRIMARYES & ALTERNATES)	
ANALYZED SINO-SOVIET WEATHER FOR PERIOD MARCH 7 - APRIL 5, 1960	2,019	2,533	25%
132,000 FRAMES OF SATELLITE PHOTOGRAPHY (WEATHER DISTRIBUTION SHOWN IN FIGURE 16)	2,209	2,584	17%
1,159 FRAMES OF GAMBIT PHOTOGRAPHY (SEE FIGURE 17)	2,023	2,365	17%
3,007 SEPARATE GAMBIT CAMERA OPERATIONS AGAINST PRIMARY TARGETS (FIG. 18)	2,153	2,592	20%
"VERIFIED" SINO-SOVIET WEATHER FOR PERIOD JULY-AUGUST 1966	1,150*	1,367*	22%

* RESULTS SHOWN ARE FOR SIMULATED 15-DAY MISSION

INCREASE IN NUMBER OF CLEAR TARGET PHOTOGRAPHS OBTAINED
DUE TO MAN'S CLOUD - AVOIDANCE ROLE IN MOL
BASED ON SIMULATED AUTOMATIC VS. MANNED FLIGHT AGAINST TYPICAL
SINO-SOVIET CLOUD COVERAGE

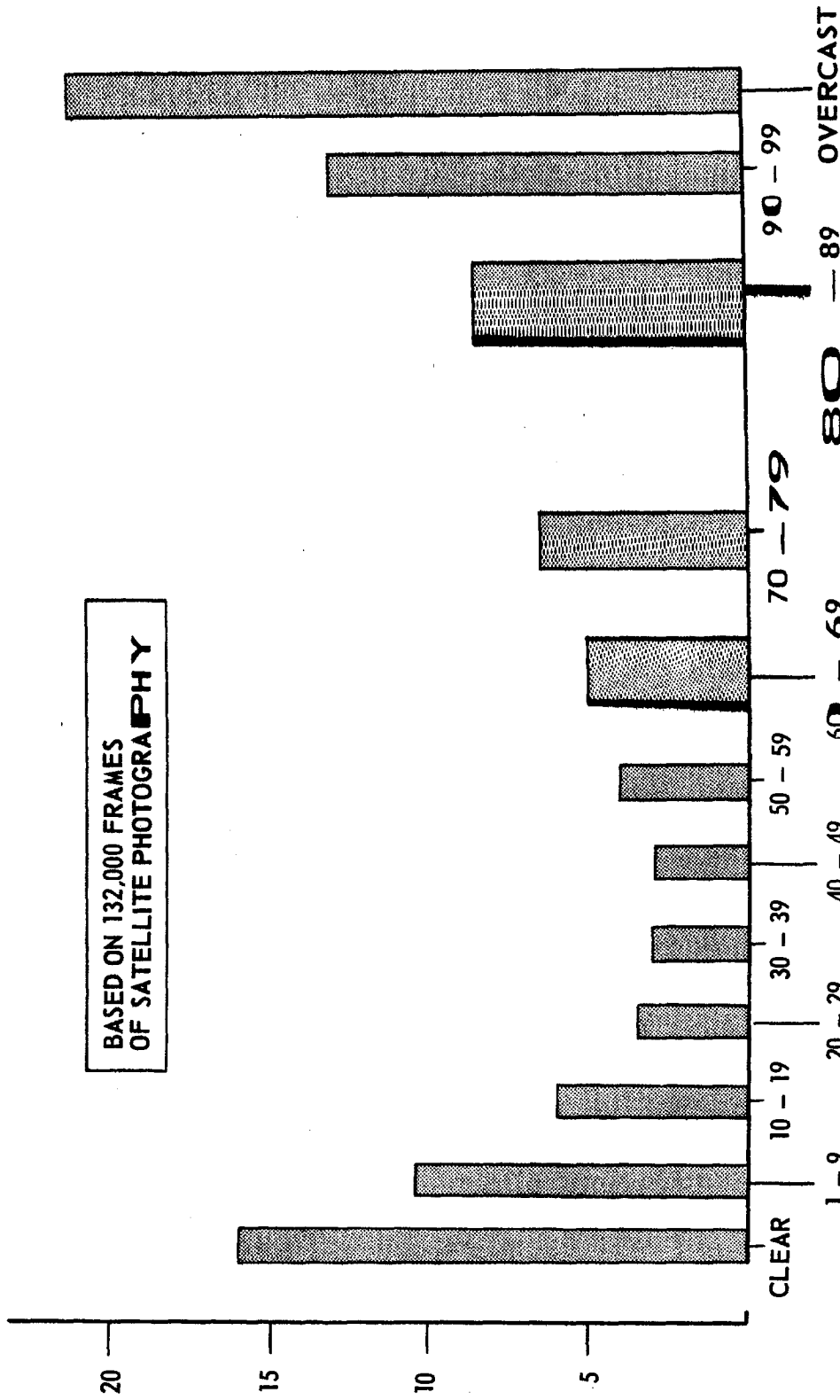
FIGURE /5

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PERCENTAGE OF SKY CLOUD COVERED

SKY COVERAGE CONDITIONS (U.S. SATELLITE EXPERIENCE)

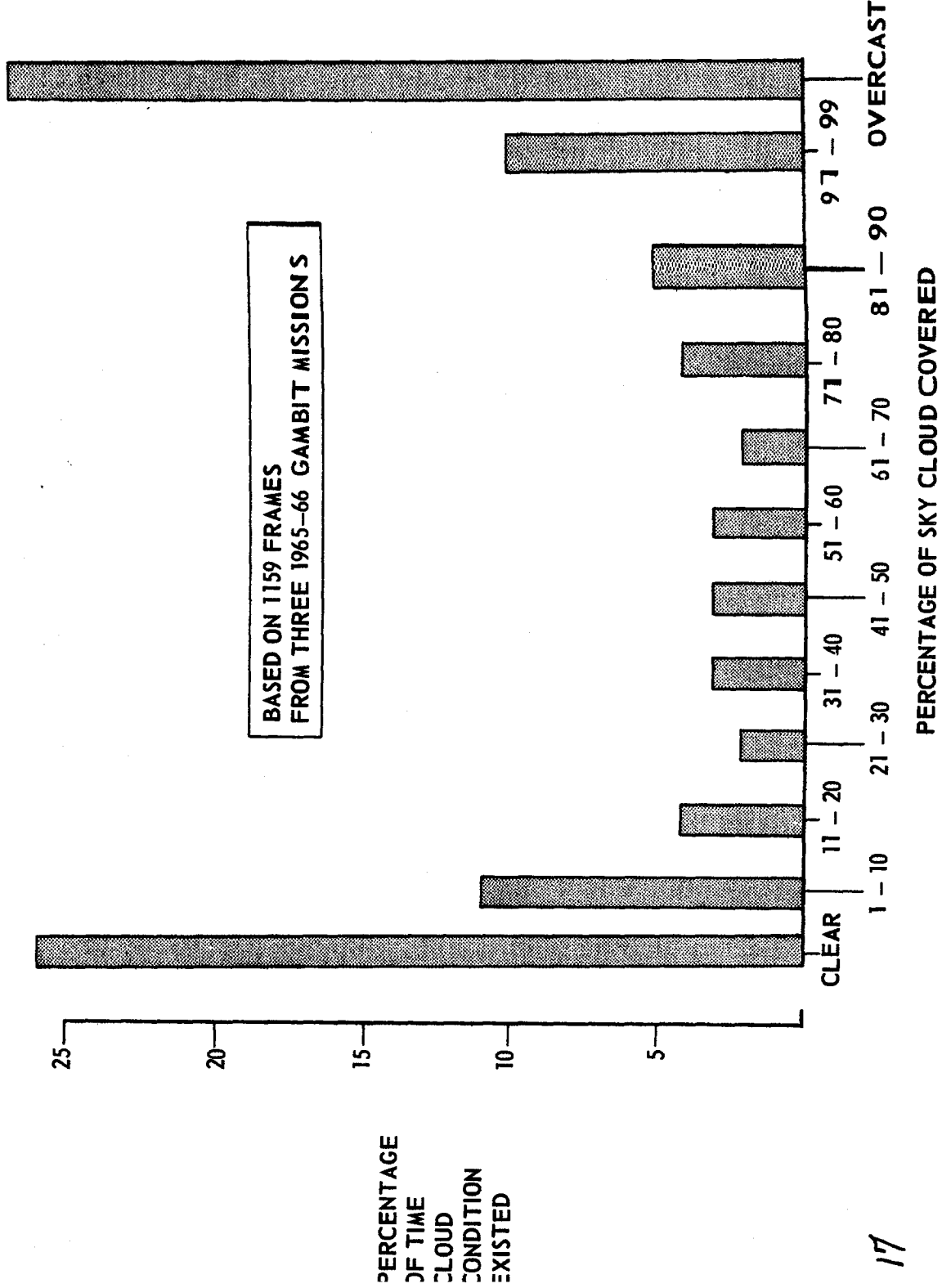
FIGURE 16

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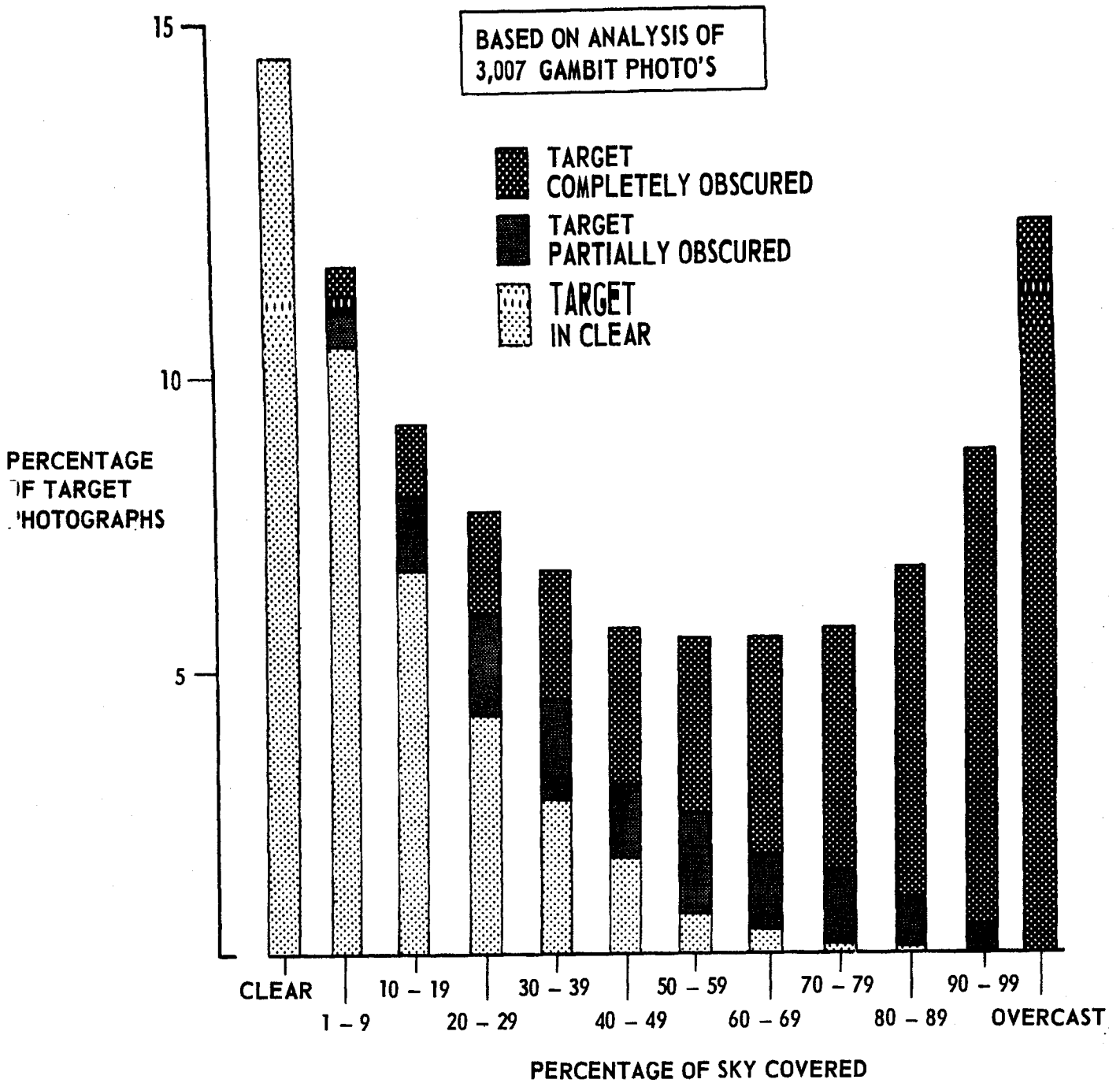
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SKY COVERAGE CONDITIONS (GAMBIT EXPERIENCE)

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SUCCESS OF PHOTOGRAPHY ACHIEVED OVER SINO - SOVIET LAND MASS
AS FUNCTION OF CLOUD COVER EXISTING AT TIME OF PHOTOGRAPHY

FIGURE 18

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TARGET CATEGORY	PERCENTAGE OF SITES AT WHICH "ACTIVITY" MAY OCCUR	PROBABILITY THAT ANY ONE SITE WILL BE "ACTIVE" DURING PAYLOAD PASS
MISSILE DEVELOPMENT & TEST	99	.07
GROUND FORCES	35	.11
AIRFIELDS	75	.18
RADAR/COMMUNICATIONS DEPLOYMENT	35	.04
INDUSTRY	5	.02
MISSILE PRODUCTION & LOGISTICS	65	.01
NUCLEAR WEAPONS	85	.05
BW / CW	85	.05
NUCLEAR MATERIALS	5	.03
AIRCRAFT PRODUCTION	75	.24
NAVAL ACTIVITY	65	.09
RADAR/COMMUNICATIONS (MAJ & R&D)	100	.25
AVERAGE:	70%	.06

FIGURE 19

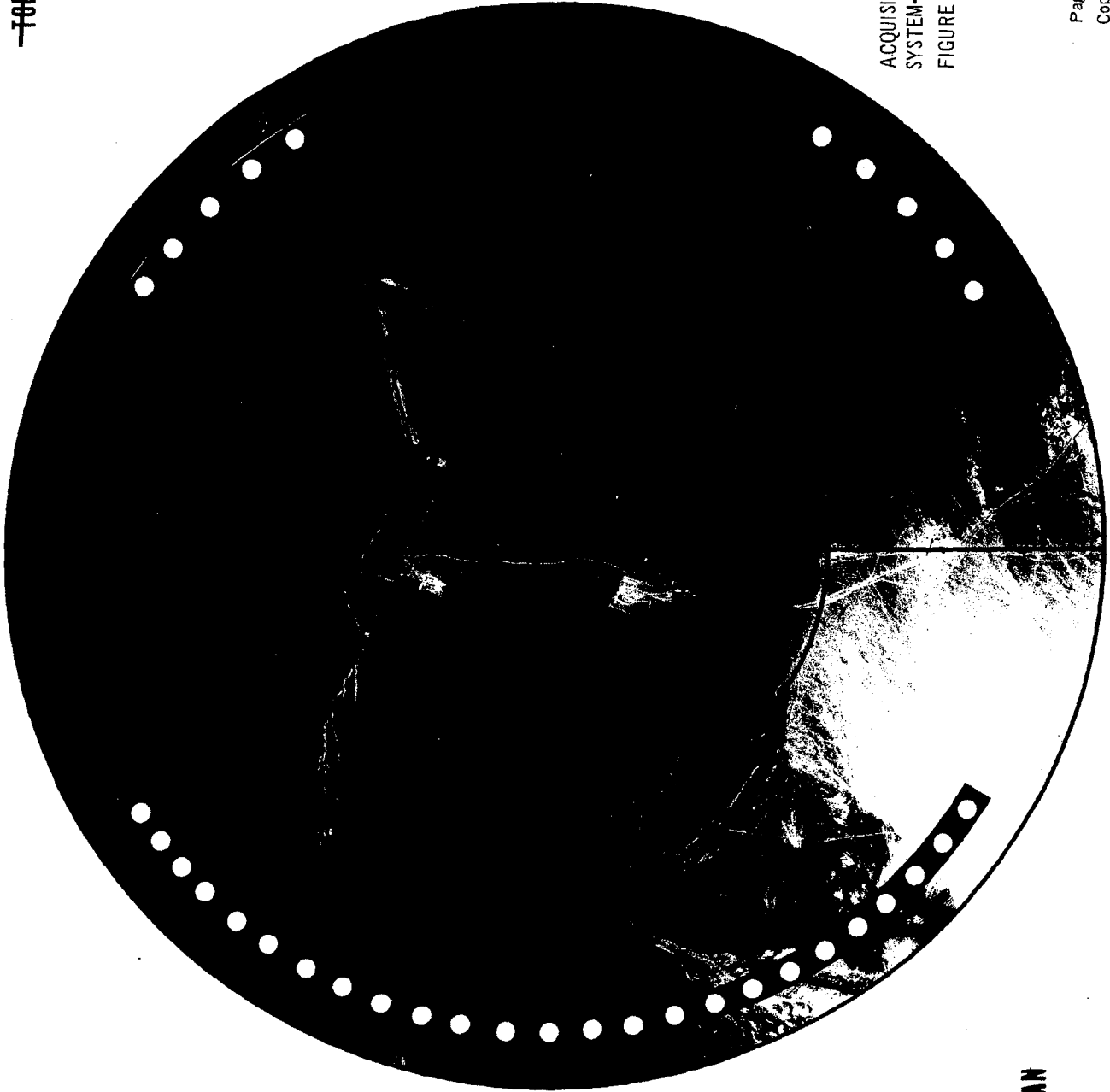
PROBABILITY OF OCCURRENCE OF "ACTIVITY"
AT SINO-SOVIET TARGETS DURING MOL OVERFLIGHTS

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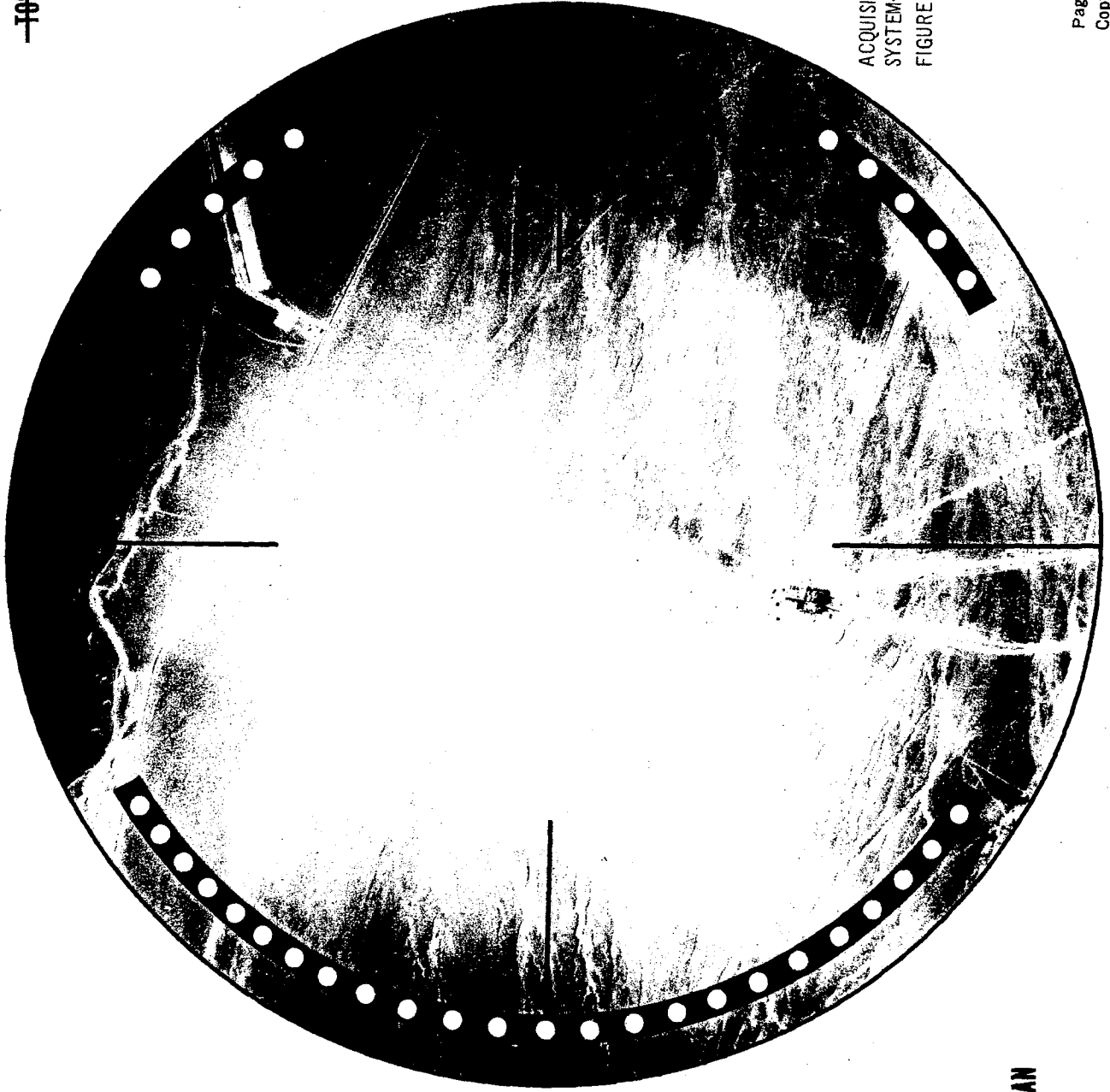
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ACQUISITION TELESCOPE
SYSTEM-VIEW AT 15X
FIGURE 1000

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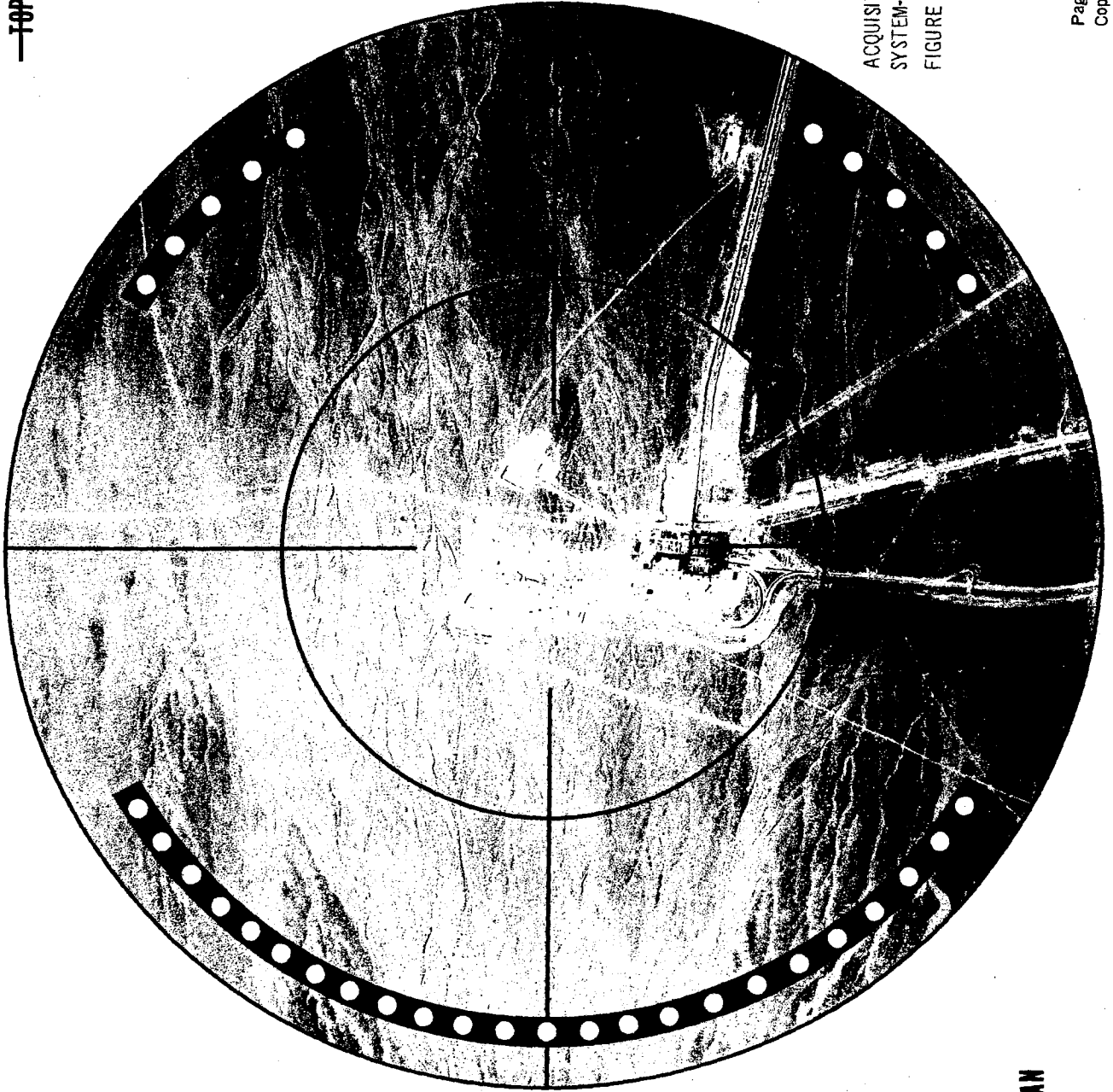
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ACQUISITION TELESCOPE
SYSTEM-VIEW AT 32X
FIGURE 1

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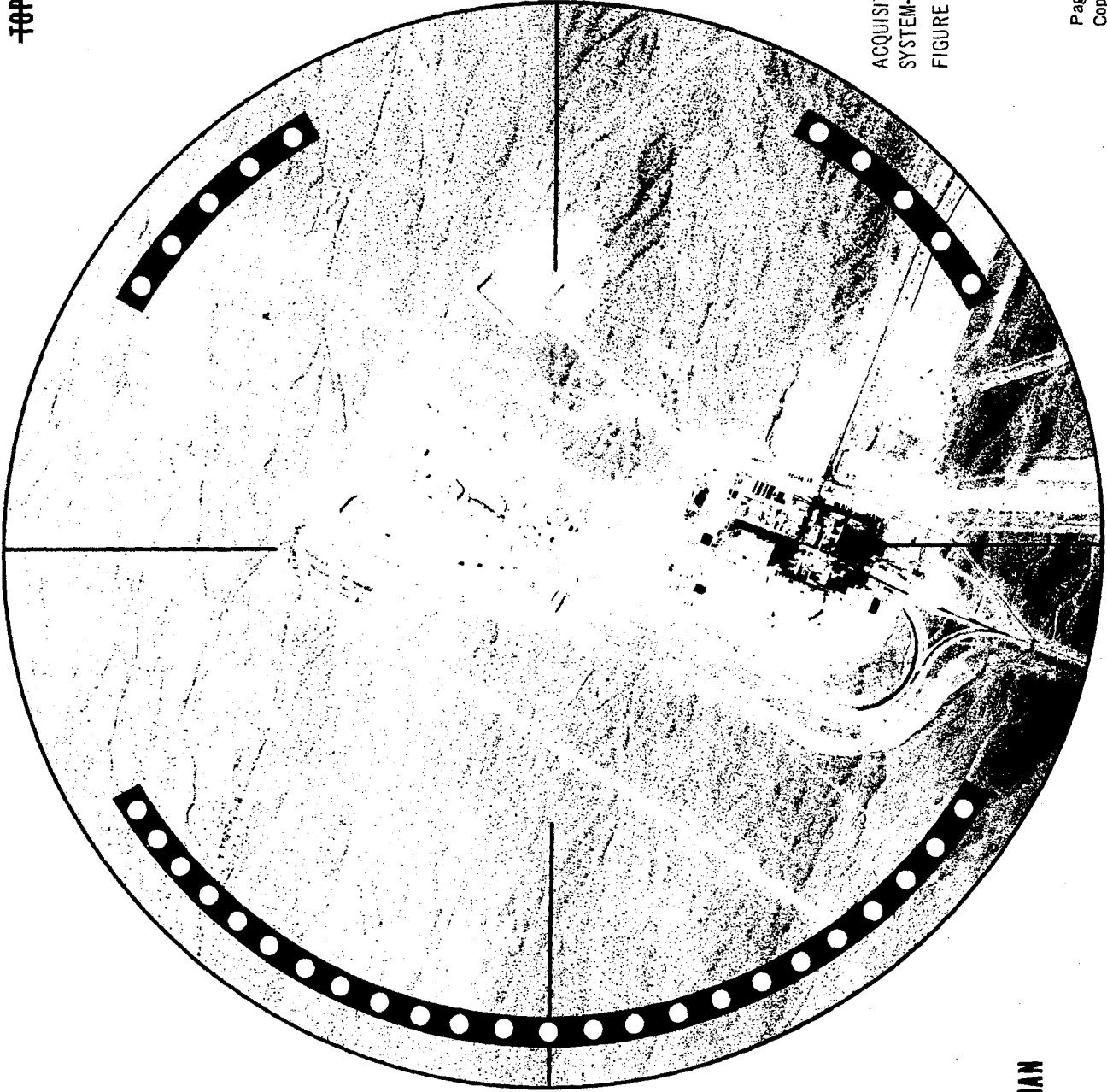
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ACQUISITION TELESCOPE
SYSTEM-VIEW AT 64X
FIGURE 100

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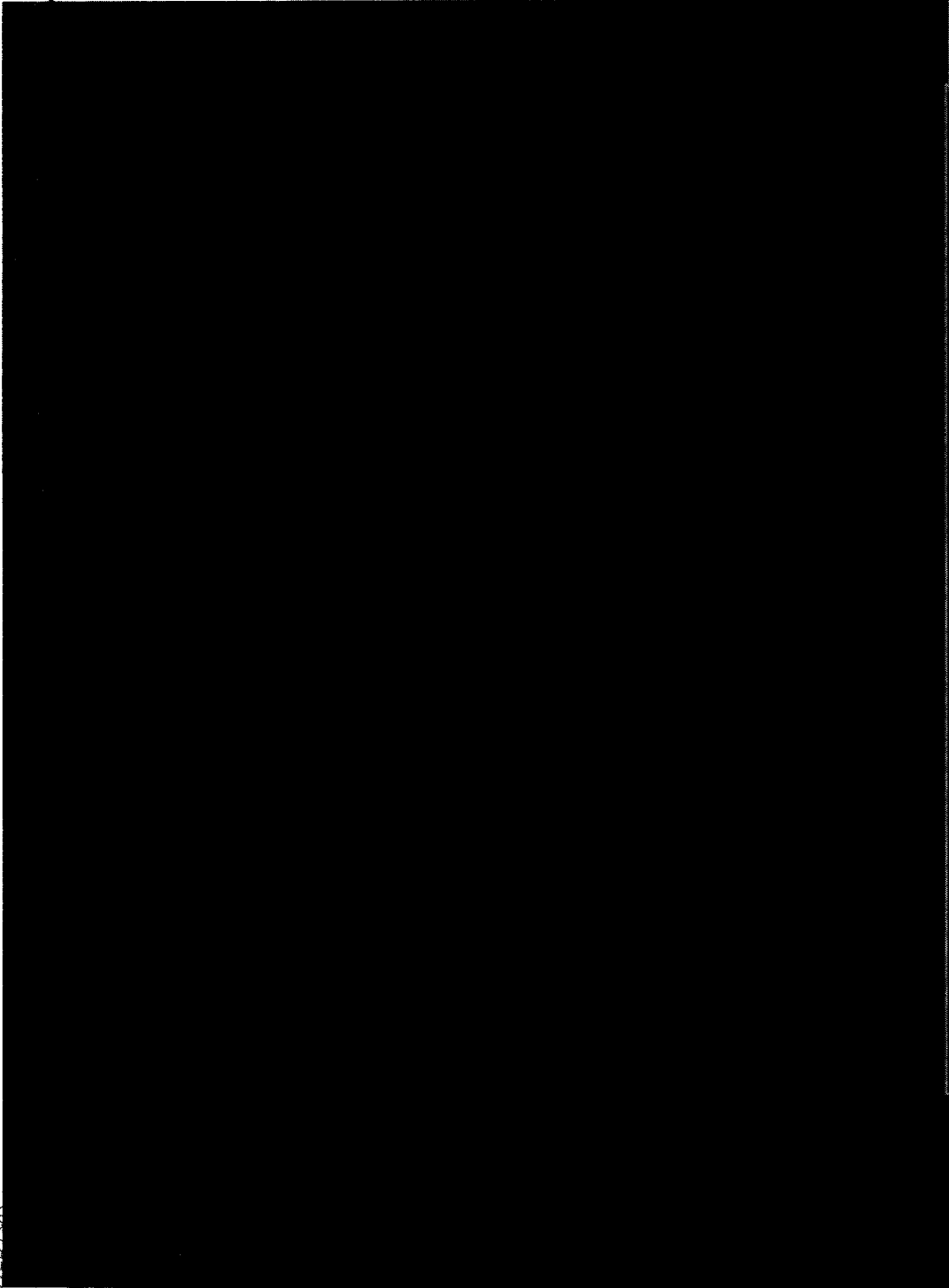


ACQUISITION TELESCOPE
SYSTEM-VIEW AT 127X
FIGURE 1

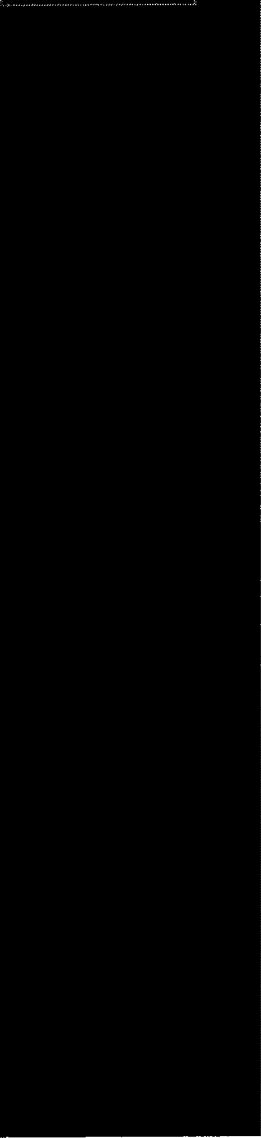
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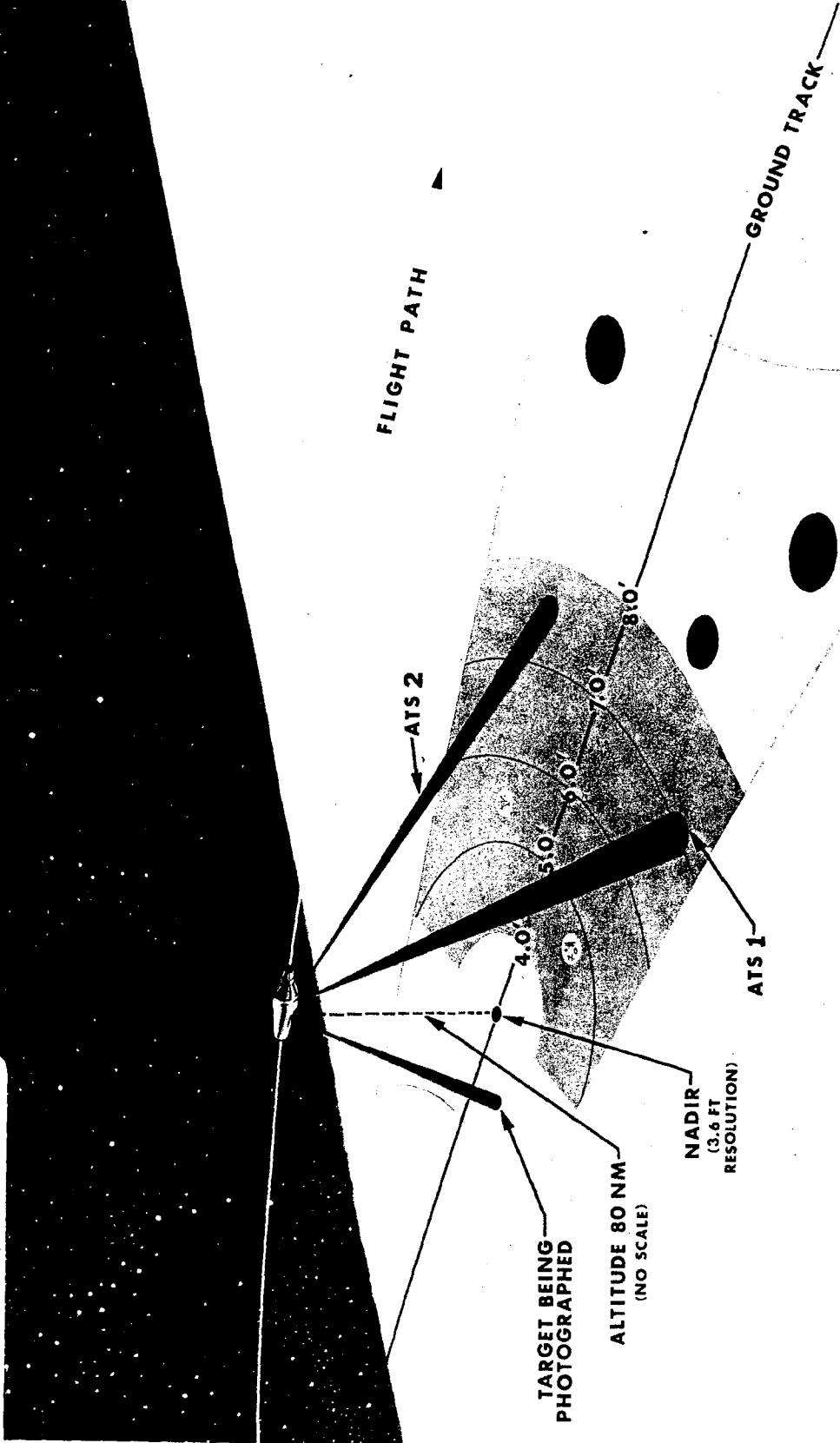


FIGURE 26

RESOLUTION IN ACQUISITION TELESCOPE SYSTEM
CAPABILITY IN FORWARD SCAN FIELD

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CONTROL SYSTEMS JOINTLY

DORIAN

TARGET TYPE	INDICATORS OF TRANSIENT INTELLIGENCE POTENTIAL	RESOLUTION REQUIRED FOR DETECTION (FEET)
OPERATIONAL MISSILE SITES	MISSILES EXPOSED	10
	ERECTION/LOADING EQUIPMENT EXPOSED	10
	VEHICULAR ACTIVITY	10
	INDICATION OF SNOW REMOVAL	10
	GROUND SUPPORT EQUIPMENT EXPOSED	5
	SILO DOOR OPEN	5
AIRFIELDS	PRESENCE OF SPECIAL VEHICLES	3
	AIRCRAFT IN UNUSUAL LOCATIONS	15
	NEW AIRCRAFT PRESENT	3 - 15
	UNUSUALLY CONFIGURED A/C PRESENT	3 - 10
	AIRCRAFT/GROUND EQUIPMENT IN WEAPONS LOADING AREA	10
	AIRCRAFT IN MAINTENANCE AREAS	10
	DISASSEMBLED AIRCRAFT	5
	VEHICULAR ACTIVITY AROUND AIRCRAFT	5
	AIRCRAFT SUBSYSTEMS EXPOSED	3
	GROUND FORCES	VEHICULAR ACTIVITY
VEHICLES PRESENT		10
SPECIFIC MODEL VEHICLE PRESENT		3

RESOLUTION REQUIRED TO DETECT PRESENCE OF VARIOUS
TYPES OF "ACTIVITY" AT TARGETS OF INTEREST

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CONTROL SYSTEMS JOINTLY

FIGURE 27

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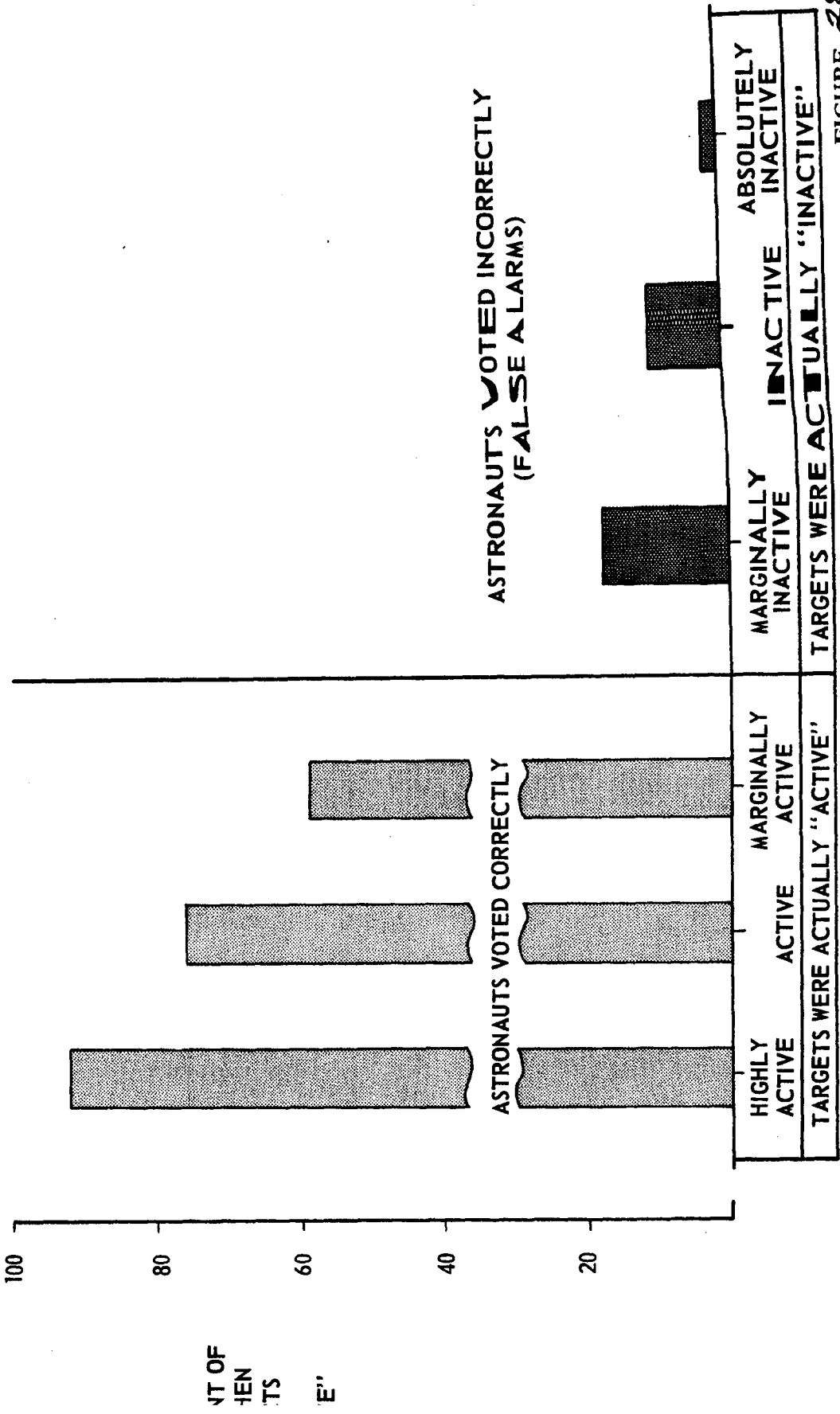
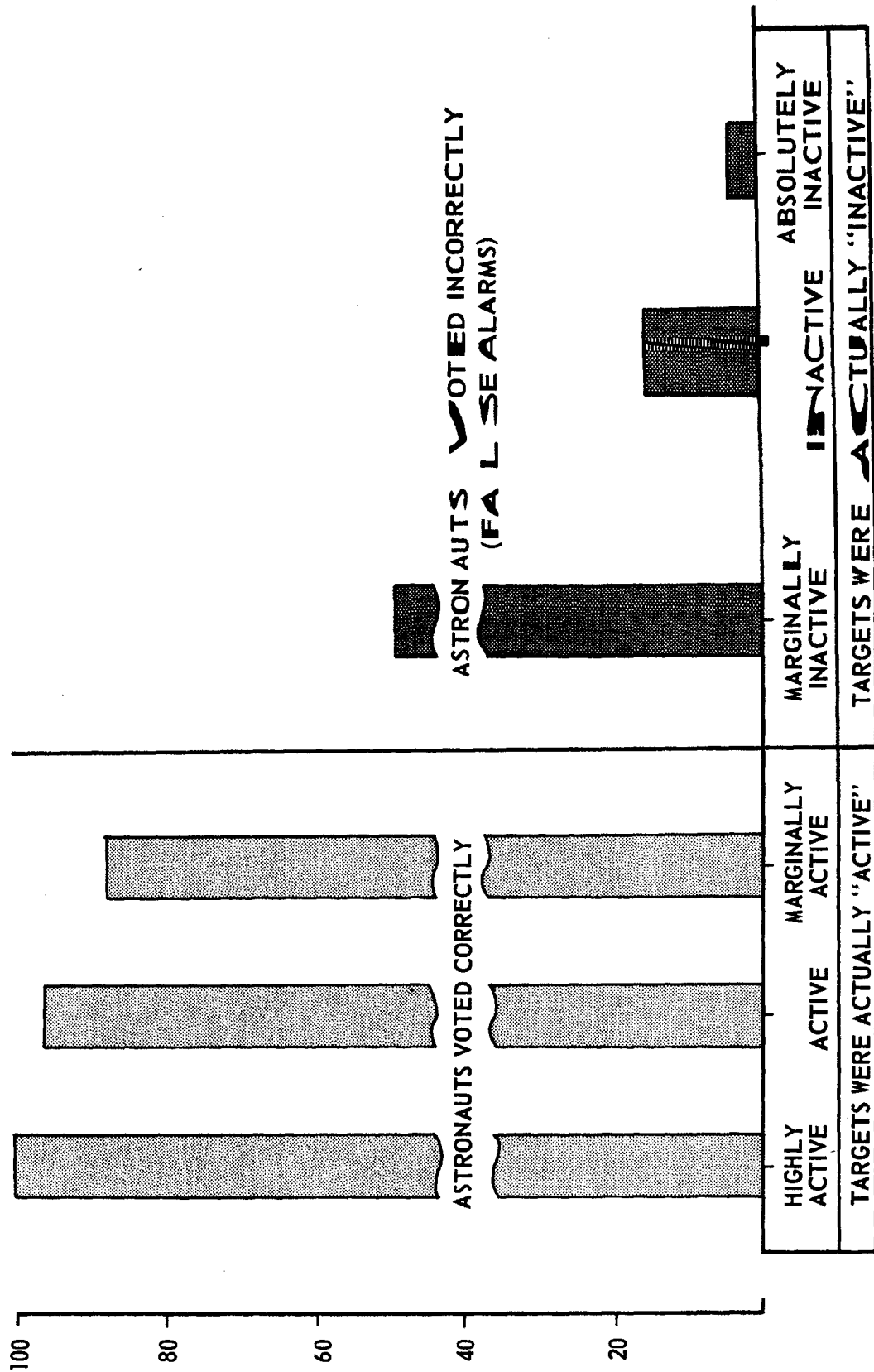


FIGURE 28

CAPABILITY OF MOL ASTRONAUTS TO IDENTIFY "ACTIVE" TARGETS
CORRECTLY, AS FUNCTION OF LEVEL OF ACTIVITY ACTUALLY PRESENT IN SCENE
(MAXIMUM DECISION TIME ALLOWED = 12 SECONDS)

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ACTIVITY LEVEL OF TARGET SCENE

ACCURACY ACHIEVED BY MOL ASTRONAUTS IN CORRECTLY IDENTIFYING "ACTIVE" TARGETS IN THOSE CASES IN WHICH DECISION TIME WAS SIX SECONDS OR LESS

FIGURE 29

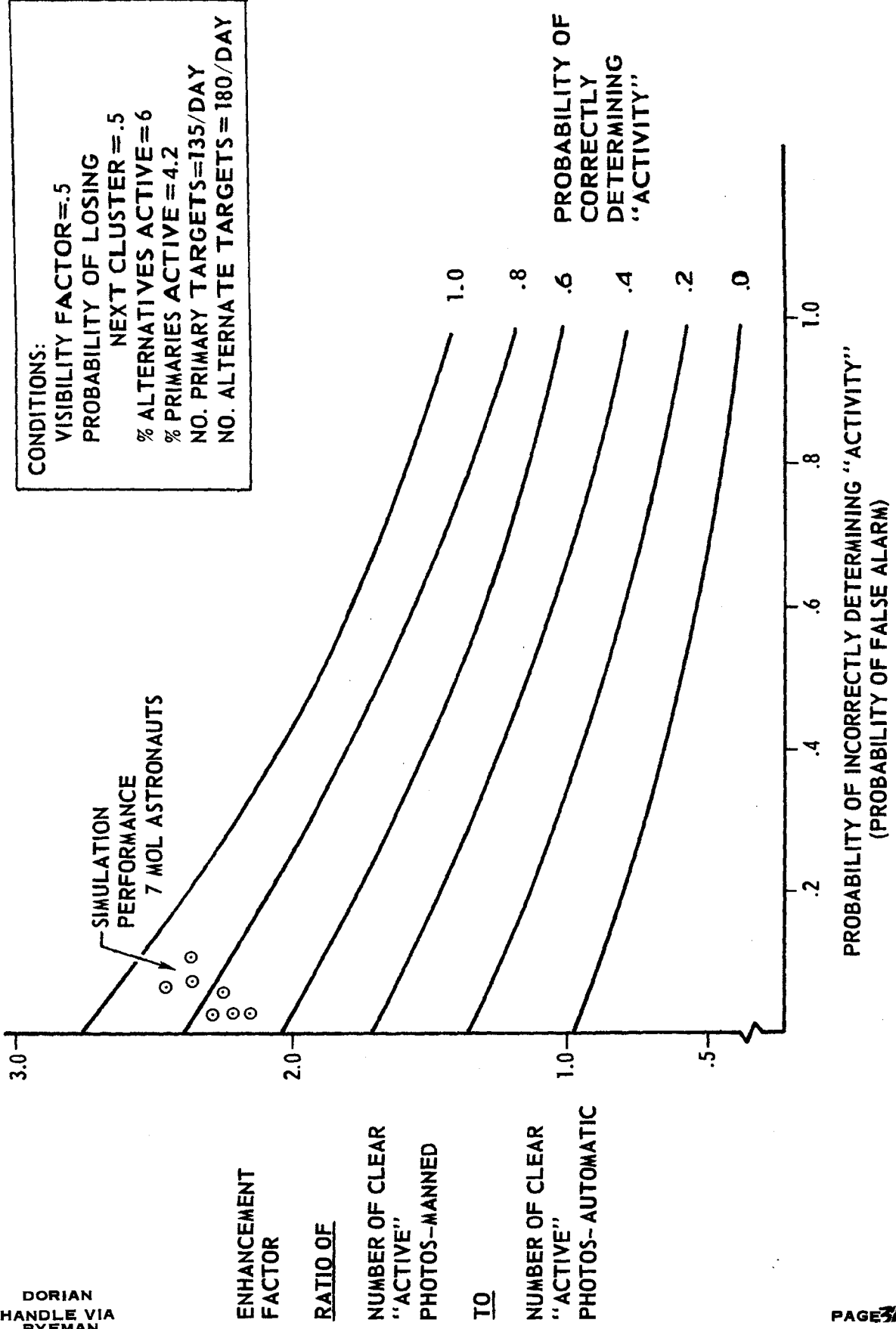
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CONDITIONS:
VISIBILITY FACTOR = .5
PROBABILITY OF LOSING
NEXT CLUSTER = .5
% ALTERNATIVES ACTIVE = 6
% PRIMARIES ACTIVE = 4.2
NO. PRIMARY TARGETS = 135/DAY
NO. ALTERNATE TARGETS = 180/DAY



MOL MISSION-ENHANCEMENT FACTOR, FOR CONDITIONS INDICATED, AS FUNCTION OF MAN'S ABILITY TO MAKE CORRECT DECISIONS CONCERNING PRESENCE OF "ACTIVITY" AT ALTERNATIVE TARGETS. (SIMULATION RESULTS SUPERIMPOSED)

FIGURE 30

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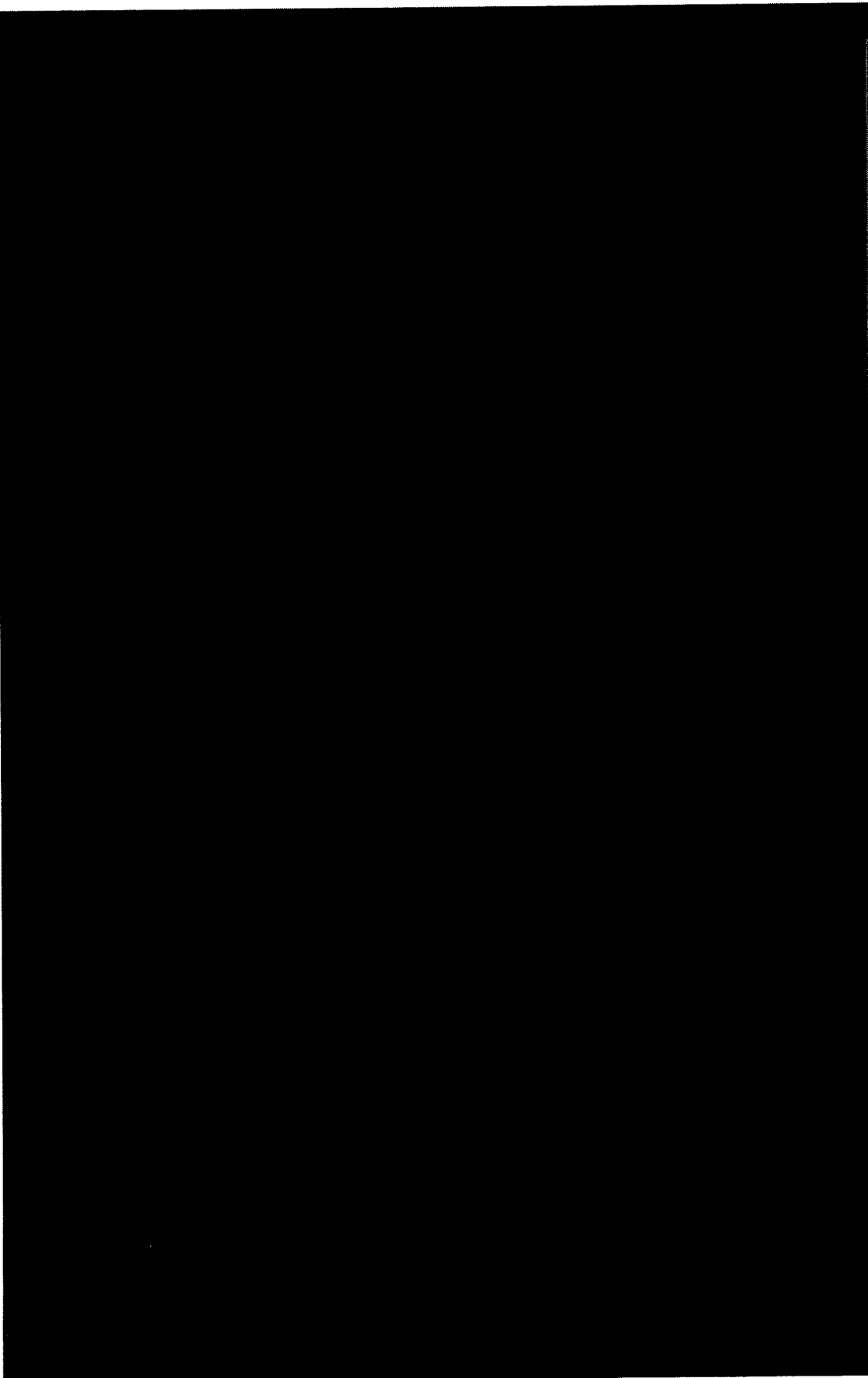


FIGURE 31

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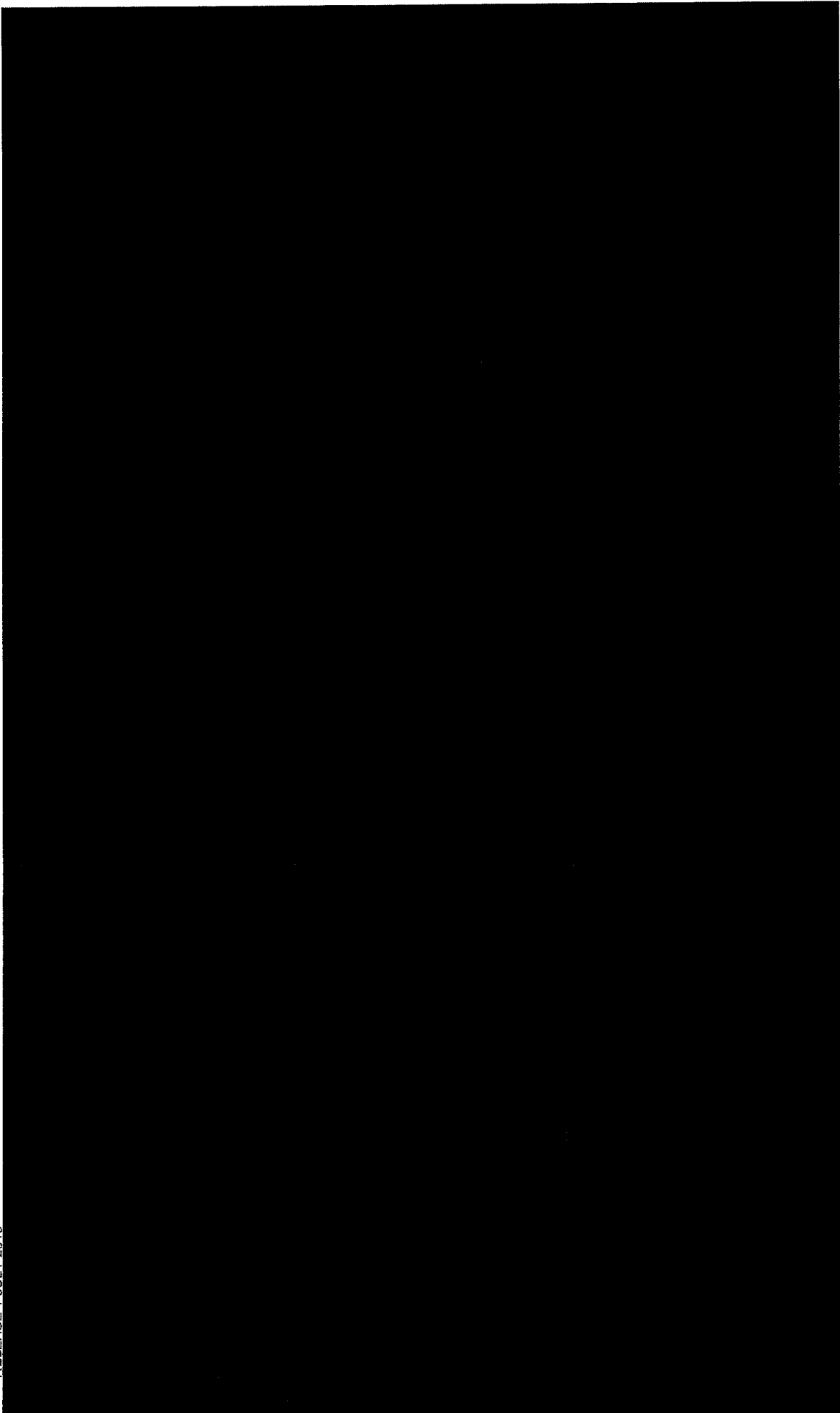
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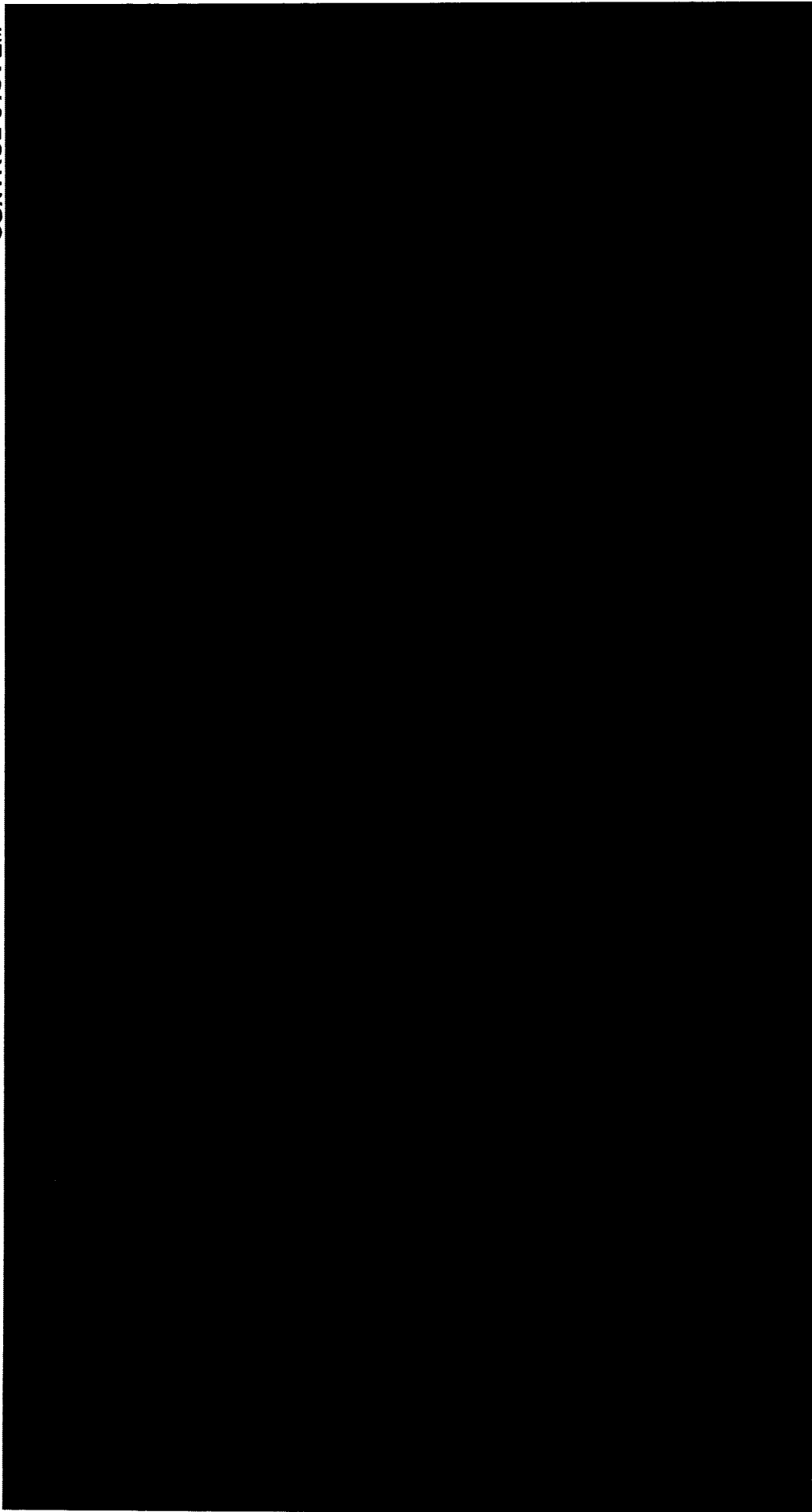
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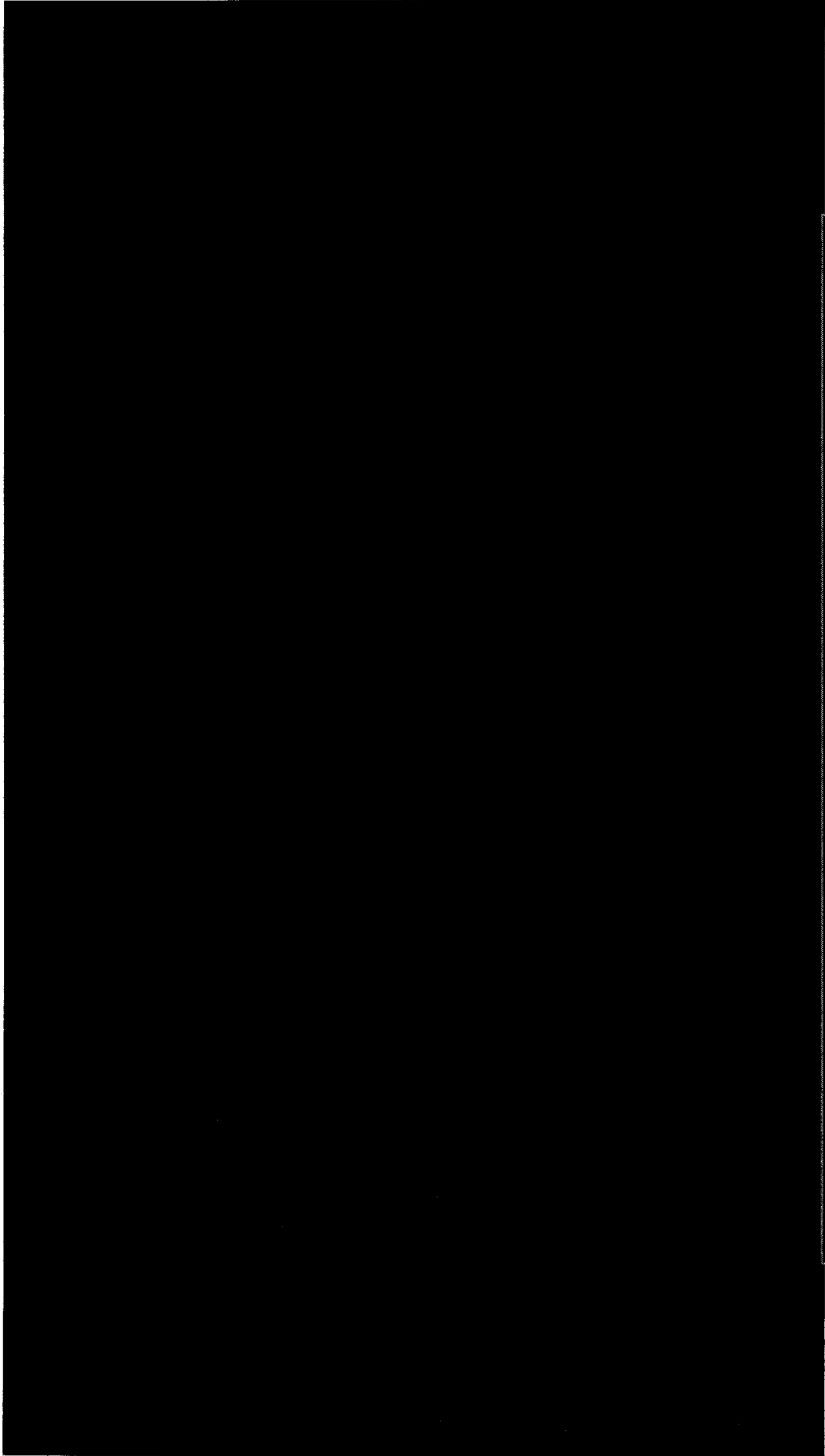
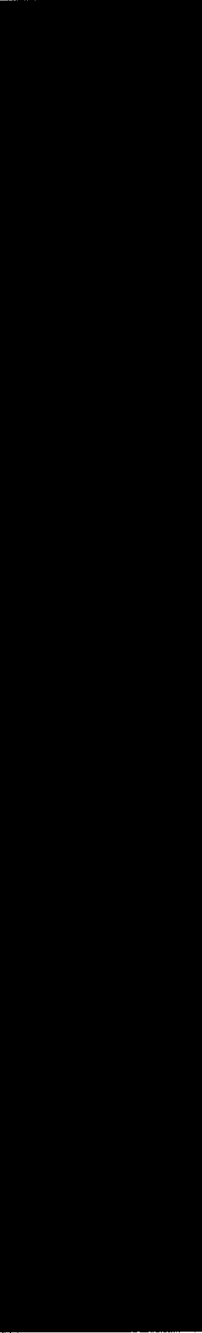


FIGURE 34

FORIAN
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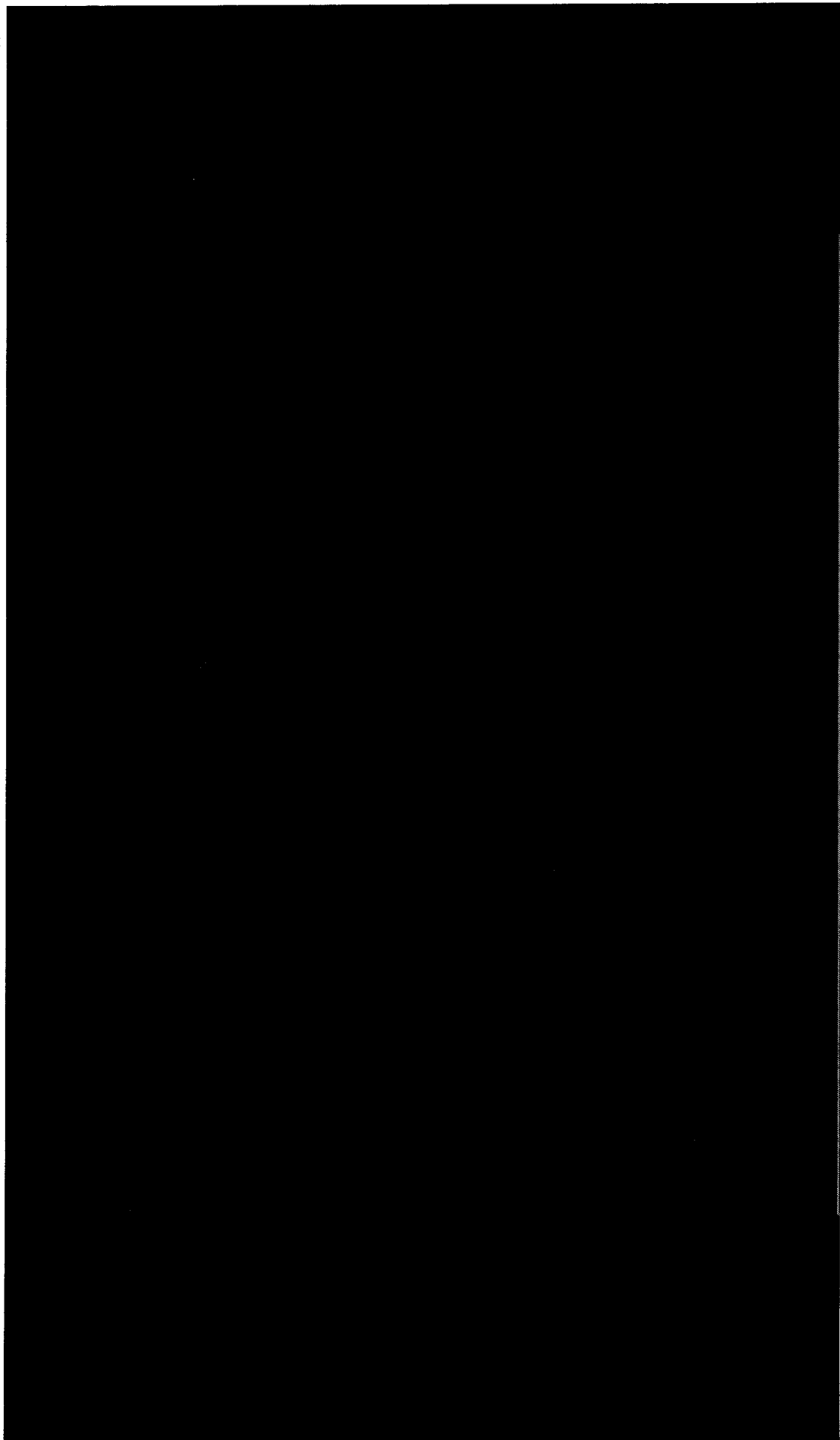


FIGURE 35

DORIAN
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DORIAN
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PLANET	MOL SYSTEM RESOLUTION CAPABILITY*			GROUND-BASED TELESCOPE RESOLUTION CAPABILITY	
	LINES PER MILLIMETER	ANGULAR (ARC-SEC)	SURFACE (MILES)	ANGULAR (ARC-SEC)	SURFACE (MILES)
MERCURY	120	.13	52	1	405
VENUS	120	.13	39	1	301
MARS	106	.15	35	1	234
JUPITER	64	.25	440	1	1760
SATURN #	59	.27	975	1	3612
URANUS #	56	.28	2193	1	7831
NEPTUNE #	54	.29	3410	1	11756
PLUTO #	32	.50	8160	1	--

* FOR OPTICAL QUALITY FACTOR .70

REQUIRED EXPOSURE TIMES BEYOND CAPABILITY OF PRESENT MOL CAMERA

FIGURE 36

MOL SYSTEM CAPABILITY FOR ACCOMPLISHMENT OF PLANETARY
PHOTOGRAPHY, COMPARED TO GROUND-BASED TELESCOPE SYSTEMS

DORIAN
HANDLE VIA
BYEMAN
CONTROL SYSTEM

~~TOP SECRET~~

NRO APPROVED FOR
RELEASE 1 JULY 2015

~~TOP SECRET~~

BYEMAN
Control System
DORIAN/GAMBIT

DORIAN GAMBIT

Handle via
BYEMAN
Control System

~~TOP SECRET~~

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