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GENERAL CAMERA INFORMATION

Spotmeter
1. For film setting be sure to set ASA number
2. For luminance reading set ASA 100

Hasselblad Electric
Film magazine - 160 frames color
200 frames B&W

Ring Sight - Inner Ring - 4°
2nd Ring - 7.5°
3rd Ring - 10°

Red Filter - Use only for B&W; open shutter 2.5 f-stops for correction

Lens FOV PWR
80 (2) mm 37° 1
150 mm 21.2° 2
250 mm 12.5° 3

16 mm Camera
Film magazine - 130 feet film

Frame Rate Run Time
1 FPS 87 min
6 FPS 15 min
12 FPS 7.5 min
24 FPS 3.65 min

Lens FOV PWR
5 mm 117.5 x 80.2° <1
18 mm 32.5 x 23.5° <1
75 mm 7.9 x 5.7° 3
200 mm 2.1 x 2.9° 8

Low film "Red Light" on at 6 feet remaining
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**PHOTO STORAGE LIST**

18mm D.A. Cam (CEX-H)
PHOTO STOWAGE LIST (Cont'd)

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MAGAZINE SUMMARY

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TRANSLUNAR/TRANSEARTH

Long Distance Earth And Moon
1/80/C121 Or C SPOT
As Target Is Available
50 Frames Allocated (From Each Film Type)
Log Time

Approximate Times:
3:45  7:00  7:30  8:00  12:00  12:30  13:00
17:00  17:30  18:00  25:00  25:30  26:00  29:00
29:30  30:00  33:00  33:30  34:00  44:00  44:30
45:00  48:00  48:30  49:00  61:00  61:30  62:00
92:00  92:30  93:00  109:00  109:30  110:00
125:00  125:30  126:00  132:00  132:30  133:00
141:30  142:00  142:30

1/250/G121 Or C SPOT
As Moon Is Available After 35:00 GET
8 Frames Allocated
Log Time

Approximate Times:
35:00  44:00  48:00  61:00  61:30  62:00
92:00  92:30  93:00  109:00  125:00

16/75/CEX SPOT
As Target Is Available
.2 Mag Allocated At 1 FPS
Log Time

Approximate Times:
3:45  12:00  17:00  25:00  29:00
34:00  44:00  48:00  61:00  92:00
109:00  125:00  132:00  141:30
LUNAR DARKSIDE

GEGENSCHEIN - S20.115

Photograph and try to observe gegenschein and/or
Moulton point in vicinity of earth's anti-sun point.

MODE A - Hand-held

1/80/HS
SC in lunar orbit and not in
earthshine if possible.
Interior lighting subdued
f2.8, B, infinity.

Inertial

(1) Aim successively at RA 6h Dec +23°,
   RA 7h Dec +22°, and RA 8h Dec +21°.
   Near Gemini, Stabilize within 2°,
   1/2° if possible.

(2) Take 1½ to 2 min exposures.
(3) Take 6 sec exposure at third
    position
(4) Repeat to a total of 12 frames.
DIM LIGHT EARTH

DIM LIGHT EARTH PHOTOGRAPHY - S20.115
Photograph lightning on the earth darkside and the night air glow.

MODE A - Air Glow (Do before Mode B).

1/30/HS BRKT
f2.8, B, infinity.
Interior lighting subdued
Photography window shaded from earthshine and sunshine.

(1) Maneuver SC to get only the dark side of earth in field of view of camera.
(2) Take 5 exposures of 3 seconds each.

MODE B - Lightning

(1) Maneuver SC to get only the dark side of earth in field of view of camera.
(2) Take 1 min and 5 min exposures until film is depleted.

MODE C - Aurora

1/80 or 250/HS F2.8
Exposure 1/8 sec to 90 sec for brightest to faintest aurora.

MILKY WAY

1/80/HS F2.8
Maximum exposure 90 sec.

EXHAUST EFFECTS

EXHAUST EFFECTS/CSM WINDOWS - S20.116
Photograph and scan the SC windows with the spotmeter to record window deposits.

16/5/CEX SPOT
f/11, 1/250, 1 fps.
Ground update: R, P, Y if desired.
0.1 mag allocated

During TL and TE flight:

(1) Maneuver S/C so that sun angle on window is approximately 85° from normal.
(2) Hold D.A. Camera 1 foot from LH Rendz window (other windows HD).
(3) Turn on camera for approximately 10 seconds.
(4) Immediately after photography scan window (4 spots) with spotmeter.
   (a) Set objective focus on 3 ft
   (b) Set ASA on 100
   (c) Hold spotmeter such that window frame is in focus (approx 3 ft).
   (d) Read light level in foot-lamberts, from intensity scale.

Log: Spotmeter readings and window scanned.
SC EXTERIOR ATMOSPHERIC
PARTICULATE MATTER - S20.115
Photograph SC exterior atmosphere

1/80/HS
Interior lights subdued
f2.8, B (initially), infinity
The following sequence is to be done 90° from
sun once in total darkness, once in sunshine
and, if possible, once in earthshine alone.
Photography window in shade during sunlit
and earthlit sequences.
9 frames allocated.

(1) Photograph stars in constellation
Ursa Major with the following exposures,
in order: 6 sec, 1 sec, 1/60 sec.

(2) Log: GET start, frame no first exposure,
target ID, window condition, visual ob-
servations.

Approximate Times:
3:45
78:45 79:00 79:15
90:00 133:00

OBSERVATION TARGETS

APOLLO SITES (A) 1
BOULDER FIELDS (BF) 3
COLOR (C) 8
CONTACTS (C3) 1
CRATER FILL 3
CONCENTRIC (CF) 9
DOMED (DCF) 6
TURTLE BACK (TBF) 6
DARKNESS (SPACECRAFT) 9
ATMOSPHERE
GEGENSHINE
STARFIELD
ZODIACAL LIGHT
DELTA-RIMMED CRATERS (DR) 6
DOMES (D) 6
EARTHSHINE 9
ERUPTIVE CRATERS 4
CHAIN (CC) 4
DARK HALO (DC) 4
ELONGATE (EC) 4
GRABENS/FAULTS (G/F) 5
HIGH RELIEF SURFACES (HR) 2
IMPACT CRATERS (LARGE, FRESH) (IC) 1
LOW RELIEF SURFACES (LR) 2
OUTCROPS (OTC) 4
RICHES (R) 6
LINES (RL) 7
SLOPES (TERRA) (ST) 3
STRAIN DIAGRAM 5
SUNRISE (SPACECRAFT) 10
SURVEYORS (S) 1
TERMINATORS 8
TRANSIENTS 9
TRANSLUNAR/TRANSEARTH 10
UNCRATERED SURFACES (US) 4
ZERO-PHASE (Z) 8
NOTE CONTACTS OTHER THAN THOSE NOW KNOWN (SEE APOLLO SITE LANDMARK CHART)

- NOTE ALBEDO CONTRASTS AT ZERO PHASE
- REGIONAL CONTACTS, COLOR VARIATIONS, *LANDMARKS

(S) SURVEYORS

- OBSERVE AND PLOT LOCATION OF WHITE SPACECRAFT, THE SPACECRAFT SHADOW, OR SPECULAR FLASHES
  *LOCATION - FLASHES, SHADOW, WHITE SPOT
  POSITION - SURVEYOR V

(C3) CONTACTS

- NOTE OTHER CONTRASTS BESIDES ALBEDO AND/OR TOPOGRAPHY

CONTRAST - COLOR, RELIEF, PATTERNS, CRATERING, BOULDERS

GEOMETRY - *SHARPNESS, SHAPE, ELEVATION CHANGE

(IC) IMPACT CRATERS (LARGE, RAYED)

- DETERMINE OVERLAPPING RELATIONSHIPS BETWEEN PONDS AND OTHER RIM MATERIALS
- IDENTIFY FLOW STRUCTURES IN RIM MATERIALS
- IDENTIFY ANY LAYERS, COLOR DIFFERENCES OR CAVES ON CRATER WALL SCARPS
- IDENTIFY ANY ERUPTIVE CONES, FLOWS OR DOMES AT BASE OF CRATER WALL SCARPS

TYPE - RAYED, BRIGHT-HALO, SHARP-RIMMED, LOW-RIMMED, SUBDUED

SHAPE - CIRCULAR, ASYMMETRIC, POLYGONAL, TERRACED

(CONT)
SECONDARIES - FIELDS, LOOPS, BRANCHINGS, CLUSTERS

RIM - RADIAL PATTERNS, CONCENTRIC PATTERNS, BOULDER FIELDS, DUNE FIELDS, *FLOW PATTERNS, COLORS

*PONDS - SIZE LIMIT, SURFACE TEXTURE, FLOW PATTERNS, BOULDERS, SUPERPOSITION, SOURCES

WALLS - TEXTURES, PATTERNS, *LAYERS, CONTACTS, FLOWS, CHANNELS, *CAVES, COLORS

BENCHES - RIM RELATION, *POND RELATION, *WALL CONTACT, CHANNELS, *ERUPTIVE FEATURES

FLOOR - TEXTURES, FLOW PATTERNS, FRACTURE PATTERNS, BOULDER FIELDS, *ERUPTIVE FEATURES, COLORS

CENTRAL PEAK - *LAYERS, *LAYER ORIENTATION, CONTACTS, COLORS

(HR) HIGH RELIEF SURFACES

- DETERMINE ANY LOCAL VARIATIONS IN ALBEDO OR COLOR

TYPE - *KNOBBY TERRA, *DOMED TERRA, CRATERED TERRA, HUMMOCKY TERRA, PARALLEL RIDGES, ARCULATE RIDGES

ASSOCIATIONS - *ERUPTIVE FEATURES, PATTERNS, BOULDER FIELDS, CRATER FIELDS, SUPERPOSITION, ELONGATE CRATERS

COLOR - VARIATION, CHANGE SHARPNESS, ASSOCIATIONS, SHAPE

*SOURCE - POINT, LINE, MULTIPLE, COVERED, DIRECTION

(LR) LOW RELIEF SURFACES

- IDENTIFY SOURCE OF ANY OBSERVED FLOWS

TYPE - MARE BASIN, MARE REGION, VERY DARK REGION, LIGHT BASIN, SMOOTH TERRA, VERY LIGHT REGION

RELIEF - LOW DOMES, LOW RIDGES, RIMLESS DEPRESSIONS, PATTERNS, BOULDERS, HALO CRATERS

COLOR - VARIATION, CHANGE SHARPNESS, ASSOCIATIONS, SHAPE

*SOURCE - POINT, LINE, MULTIPLE, COVERED, DIRECTION

*BENCHES - TYPE, COLOR CONTRAST, PATTERN CONTRAST, CRATER CONTRAST, FRONT SLOPE RELATIONS, SUPERPOSITION

(DF/TBF/CF) DOMED/TURTLE BACK/CONGENERIC CRATER FILL

- IDENTIFY ANY ASSOCIATED ERUPTIVE FEATURES

TYPE - CONCENTRIC, DOMED, POLYGONAL, KNOBBY, COMBINATION

ASSOCIATION - CRATER TYPE, *ERUPTIVE FEATURES, AGE RELATIONS

CHARACTERISTICS - RELIEF, PATTERNS, COLOR, BOULDERS, FILLING LEVEL

(ST) SLOPES (TERRA)

- NOTE ANY INDICATIONS OF LAYERS OR OTHER STRUCTURE

*LAYERS, *CONTACTS, *OUTCROP, BOULDERS, PATTERNS, COLOR

(BF) BOULDER FIELDS

- NOTE MINIMUM AND MAXIMUM SIZES OBSERVED 10 TO 25° FROM THE TERMINATOR

*SOURCE SET TRACKING OF BOULDER CM

- NOTE ASSOCIATION AND DIRECTION OF BOULDER TRACKS

ASSOCIATION - ISOLATED, CRATER RIM, CRATER WALL, SLOPE, DARK HALO, TALUS, SLIDE

GEOMETRY - SIZE, SHAPE, PATTERN, *BOULDER SIZES
4. TRACKS - DIRECTION, LENGTH, STARTING POSITION
   SOURCE - EROSION, IMPACT, ERUPTION, *OUTCROP
   (US) UNCRATERED SURFACES
   • NOTE POSITION AND DESCRIBE CHARACTERISTICS
     *CHARACTERISTICS - RELIEF, COLOR, ALBEDO,
     REFLECTIONS, PATTERNS, BOULDERS, FRACTURES
   (UTC) OUTCROPS
   • NOTE LOCATION AND ASSOCIATIONS OF ANY OBSERVED
     OUTCROPS
     *ASSOCIATION - CRATER WALL, CENTRAL PEAK, RILLE
     WALL, TERRA SLOPE, ERUPTIVE FEATURE
     *CHARACTERISTICS - SIZE, SHAPE, COLOR,
     REFLECTIONS, ACCESSIBILITY
   (DC/EC/CC) DARK HALO/ELONGATE/CHAIN CRATERS
   • IDENTIFY ANY SHALLOW IMPACT CRATER FIELDS NEAR
     BASE OF CONE
   • IDENTIFY ANY ASSOCIATED FLOWS, CHANNELS OR COLOR
   • IDENTIFY ANY LAYERS OR CAVES IN CRATER WALL
     SHAPE - CIRCULAR, ELIPTICAL, ARCULATE, LINEAR
     HALO - SHAPE, LIMITS, RELIEF, PATTERNS, RAYS,
     *BOULDERS, SMALL CRATERS, COLORS, SUPER-
     POSITION
     CONE - SHAPE, BREACHING, *CHANNELS, PATTERNS,
     BOULDERS, *COLORS
     CRATER - SHAPE, WALL TEXTURE, CAVES, CHANNELS,
     BOTTOM, *COLORS
     *ASSOCIATIONS - ALIGNMENTS, DOMES, FLOWS, FAULTS,
     CONTACTS, GEOLOGIC UNITS, AGE RELATIONS

(G/F) GRABENS/FAULTS
   • NOTE NATURE, AGE AND DIRECTION OF OFFSETS
   • DETERMINE ASSOCIATED STRAIN RELATIONSHIPS
     SHAPE - LINEAR, ENNECHHELON, ANGULAR
     ASSOCIATIONS - ERUPTIVE FEATURES, RILLES,
     PARALLELISM, CONSTANT ANGLES, AGE RELATIONS
     *OFFSETS - CONTACTS, RIDGES, CRATERS, PATTERNS
     ENDS - SHAPE, TERMINATION POINT
- Identify any attached or superimposed flows, cones or dikes.
- Determine associated strain relationships.
  - Type: Mare, Terra
  - Shape: Rounded, flat-topped, wrinkle, branching, composite
  - Characteristics: Colors, age relations
- Association: Cones, domes, dikes, local flows, rilles, fractures

(D) DOMES
- Identify any attached or superimposed flows, cones or dikes.
- Type: Mare, Terra
- Shape: Rounded, flat-topped, elongate branching, lobate
- Characteristics: Size, slopes, lobes, colors, age relations
- Central crater: Size, shape, rim, wall texture, caves, channels, bottom, colors
  - Superimposed cone: (see Dark Halo Crater Checklist)
- Associations: Surface, eruptive features, dikes

(DR) DELTA-RIMMED CRATERS
- Determine if rim is a composite of cones, domes and/or flows.
- Shape: Circular, polygonal
  - Rim: Extent

*CREST - Cones, breaching, slumps
- Walls: Textures, patterns, layers, cones, contacts, caves, colors
- Floor: Filling type, flow patterns, eruptive features, source

(RL) RILLES
- Observe tails of sinuous rilles for evidence of alluvial deposits.
- Observe heads of sinuous rilles for evidence of exact source of any erosion agents.
- Note any interruptions in continuity of small sinuous rilles, such as ridges or bridges.
- Determine any interruptions in continuity of small sinuous rilles, such as ridges or bridges.
- Determine strain relationships near angular and arculate rilles.
- Shape: Sinuous, linear, angular, arculate, combination
- Head: Type, association, breaching, colors, age relations
- Body: Sharpness, continuity, floor features, bridges, leveses, layering, colors, age relations
  - Tail: Low fans, fine branching, leveses, terminations, colors, age relations
- Associations: Control features, parallelism, constant angles, patterns
(C) COLOR
• IF VISIBLE COLOR IS OBSERVED, NOTE ASSOCIATED FEATURES IN AS MUCH DETAIL AS POSSIBLE
  70/80/C/1-250/SPOT
• NOTE ANY COLOR CONTRASTS ON CLIFFS OR STEEP SLOPES

*ASSOCIATION — MARE BENCH, HALO CRATER, DOME, CLIFF, BOULDER FIELD, RILLE, VERY DARK OR VERY LIGHT/FRESH AREAS
*COLOR CHART — BEST MATCH, RANGE, PHASE VARIATION

CONTACTS — CHANGE, SHARPNESS, ASSOCIATED VARIATIONS

(2) ZERO-PHASE
• AT ZERO PHASE POINT ON MARE APPROXIMATELY 16° FROM TERMINATOR, NOTE HORIZONTAL AND VERTICAL LIMITS OF EFFECTIVE WASHOUT 70/80/BW/1-250/F11
• JUDGE LIMITING LIMITS FOR AN LANDING
• NOTE ANY ALBEDO CONTRASTS ON CLIFFS AND STEEP SLOPES

ALBEDO — *CONTACTS, FEATURES, DETAILED ASSOCIATIONS

*WASHOUT — HORIZONTAL LIMITS, VERTICAL LIMITS, RANGE FUNCTION, TERRAIN FUNCTION, RELIEF DEFINITION LIMIT

TERMINATOR
• IDENTIFY ANY FLOW FRONTS ON LOW RELIEF SURFACES
• IDENTIFY ANY ALLUVIAL AND/OR BRAIDED FANS AT THE TAILS OF SINUOUS RILLES
• NOTE ANY GLOWS OR OBSCURATIONS AT LUNAR SUNRISE (NEARISIDE) TERMINATOR 70/250/BW/1-60/F5.6/1MG
*SUBTLE RELIEF — BENCHES, FLOWS, PATTERNS, ROUGHNESS, BOULDER FIELDS
*LUNAR SUNRISE — GLOWS, OBSURATIONS

EARTHSHINE
• EVALUATE LANDING AND LANDMARK TRACKING FEASIBILITY 70/80/HS/1-4/F2.8/1MC
• WASHOUT — HORIZONTAL LIMITS, VERTICAL LIMITS, RANGE FUNCTION, TERRAIN FUNCTION, RELIEF DEFINITION LIMIT
• VISIBILITY — DARK ADAPTATION, FEATURES VISIBLE, MINIMUM CRATER SIZE, EARTH ANGLE FUNCTION
• FEATURES — KNOWN DETAIL, RELIEF CONTRAST

ZERO PHASE — ALBEDO CONTRAST, WASHOUT, *SPOTMETER

*LANDMARKS — SMALLEST CRATER, INITIAL POINTS

TRANSIENTS
• NOTE ASSOCIATED FEATURES AND TEMPORAL VARIATIONS

POSITION — DECLINATION/DIRECTION, *ASSOCIATION

CHARACTERISTICS — BRIGHTNESS, COLOR, TYPE, SIZE, SHAPE, OBSURATION, FLASH

*VARIATION — TEMPORAL, MOVEMENT, TERMINATOR POSITION

*SOURCE — FEATURE, AREA

DARKNESS (SPACECRAFT)

NOTE CELESTIAL POSITION AND COVERAGE OF ANY OBSERVED DIM LIGHT PHENOMENA SUCH AS:

STAR FIELD — GENERAL DENSITY, IDENTIFICATION

GEGENSHINE — ANTISOLAR (GEMINI), INTENSITY, SHAPE, 70/80/HS/B60 SEC/F28

ZODIACAL LIGHT — 90° FROM SUN TO CORONA, 70/80/HS/B60 SEC/F2.8

ATMOSPHERE — STAR HALO, GLOW AFTER SUNSET OR PRIOR TO SUNRISE, 70/80/HS/B2 SEC/F2.8/1MC

ILLUMINATION POINTS — CENTRAL GAMING BEG triangle COSIN AT 00 (CONT)
SUNRISE (SPACECRAFT)

- NOTE CELESTIAL LIMITS OF SOLAR CORONA
- NOTE BEGINNING AND EXTENT OF LIMB BRIGHTENING PRIOR TO SUNRISE
- NOTE FIRST OBSERVATION OF CONTAMINATION CLOUD AND CHANGE IN VISIBILITY IMMEDIATELY AFTER SUNRISE

LIMB BRIGHTENING - START GET, START POSITION, MAX GET, MAX POSITION, COLORS, DIFFUSE LIGHT GET, DIFFUSE LIGHT POSITION

SOLAR CORONA - FIRST LIGHT GET, BOUNDARY GET, STREAMER DIRECTION, BEAD GET, BEAD POSITION, COLORS

EXTERIOR CONTAMINATION - CLOUD GET, VISIBILITY CHANGE STAR RECOGNITION, S/C SHADOW

TRANSPLANETARY/TRANSFER

- NOTE CELESTIAL POSITION AND COVERAGE OF ANY DIM LIGHT PHENOMENA

AURORA - SHAPE, COLOR, LIMITS

EXTERIOR CONTAMINATION - STAR FIELD DEGRADATION, TEMPORAL CHANGES

LIBRATION POINTS - 21.5 HOURS GET, PISCES(c), ARIES (c), PLEIADES 70/80/HS/B5 MIN/F2.8

CAMERA CALIBRATION - BRACKET, STAR FIELD, 70/80/HS OR BW/B2 SEC/F2.8

LUNAR - GENERAL COVERAGE, B&W FILTER, 70/80/B&W SPOT, 10 STARS WIDER