NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ROUTING SLIP

MAIL CODE	NAME	Action
		Approval
CB	W.E. THORNTON, MGR.	Call Me
		Concurrence
		File
		Information
		Investigate and Advise
		Note and Forward
		Note and Return
		Per Request
		Per Telephone Conversation
		Recommendation
		See Me
		Signature
		Circulate and Destroy

Bill - As per our telcomm; - Enclosed are: Initial proposal and add'l forms on the Earth Observations Experiment for SMD III.

More detailed info & documentation is being prepared. John K.

NAME	TEL. NO. *(or code)* & EXT.
John L. KALTENBACH	2666
CODE *(or other designation)* TC3	DATE 9/9/76

NASA FORM 26 APR 69 PREVIOUS EDITIONS MAY BE USED

* GPO : 1969 OF—348-365

Bill THORNTON

SPACELAB MISSION DEVELOPMENT TEST (SMD) III EXPERIMENT PROPOSAL

EARTH OBSERVATIONS EXPERIMENT

TABLE OF CONTENTS

1. Identifying Information

Title: Earth Observations Experiment

Investigators: John L. Kaltenbach and Patrick E. Lafferty
(JSC, TC3, Science Payloads Division)

2. Investigation and Technical Plan

a. Summary

SMD III crewmen will be trained to conduct, and will perform, simulated Earth observations. The effectiveness of the crew training program, and of onboard supporting equipment, data, and procedures will be evaluated.

b. Objectives and Significant Aspects

The SMD III Earth Observations Experiment is part of a long-range program that the Science Payloads Division believes is needed to train Shuttle crewmen to visually identify land, air, and ocean phenomena and features that merit exploration and investigation. Knowledge gained from the Skylab and ASTP Visual Observations experiments has shown that man can make significant contributions in Earth Observations programs in the Shuttle era. The presence of trained personnel to visually select specific phenomena and features, and then activate appropriate sensing systems, will enhance the scientific return from Shuttle Earth science investigations. Simulated Earth Observations are proposed for SMD III to evaluate the effectiveness of current concepts of preflight training and inflight crew operations and ground support.

c. Investigation Approach

(1) Method and Procedures

Crewmen will undergo an Earth Observations training program being developed for the Shuttle era. During the simulation the crewmen will make visual observations with their unaided eye, and with binoculars, of projected Earth scenes or passed-in photographs. Based upon the orbital parameters, a preplanned observation program will be devised, utilizing photographs from Skylab and ASTP. A shopping list of "targets of opportunity" may also be provided for observations when time-line changes permit.

The crewmen will also photograph simulated features and phenomena during SMD III to evaluate photographic procedures, equipment handling, stowage, use of onboard Earth Observations Data Package and maps. They will also prepare written and voice recordings of observations.

Simulation of the observations may be accomplished by viewing a rear projected image through the Orbiter windows (aft flight deck) or by viewing photographic prints (passed-in during test). The specific method of simulation has not been determined.

(2) Performance Criteria

The photographs observed by the crewmen during the simulation will have already been analyzed by previous Earth Observations investigators. The effectiveness of the training program can be partially evaluated by comparing the observations of the crewmen with the investigator analyses.

(3) Crew Requirements

(a) Training

A minimum of 15 hours of training of one or more crewmen will be required. Printed training material and slide presentations with taped voice will be available for informal use by the crewmen.

(b) Inflight Activities

The SMD-III flight plan will contain a preplanned observation schedule. Also, real-time targets of opportunity may be simulated. It is expected that no more than eight (8) targets will be scheduled per day of the simulation. However, this number is flexible and can be adjusted to accommodate flight planning constraints and real-time contingencies. It is estimated that each observation will require 10 to 12 minutes of crew time.

(4) Ground Support Requirements

The experiment investigators desire air-to-ground communications to monitor the observing crewmember's voice and to converse directly with the crewman during observing periods. The investigators also desire a daily Earth science crew debriefing period. This is presently estimated to require approximately 10 minutes.

(5) Orbit and Attitude Requirements

The forthcoming OFT-2 mission will be a JSC-managed flight with an Earth science oriented payload. Because of this the OFT-2 trajectory would be desirable for the SMD-III Earth Observations Experiment. However, simulated observation targets could be selected for any other trajectory as well. It is important that the SMD-III trajectory be defined well in advance of the test to provide sufficient lead-time for flight planning, training, and selection of simulation material.

Earth Observations will require the orientation of appropriate Orbiter windows toward the Earth during the daylight portions of selected revolutions. (This contrasts with the SUSS which, in general, must view the sky during the dark portions of selected revolutions)

Inflight deviations from the preflight planned orbit might require real-time replanning of the experiment observation schedule.

(6) Constraints on Other Instruments

It is possible that Earth Observations and the SUSS could constrain one another because of RCS consumption for attitude changes to support the two experiments. This can only be determined after preliminary definition of the experiment observing schedules and determination of RCS budget constraints.

3. Hardware

a. Aft Flight Deck Equipment

- o Two Hasselblad Model 500EL Data Cameras (HDC)
- o Film/Filters TBD
- o Light meter
- o Voice recorder system
- o 10 x 40 binoculars

It is expected that the above equipment will be provided from the JSC inventory of pilot operational equipment. Weight, volume, and shape of this equipment is described in JSC report CD42-A/SL-997, "Handbook of Pilot Operational Equipment for Manned Space Flight". All equipment requiring power will utilize batteries.

- o Earth orbital map
- o Observation target data book
- o Observation data record book
- o Camera mounting brackets TBD

b. Simulation Facility Equipment

Rear projection still and/or moving picture projection system.

9/9/76

Proposer's Name: John L. Kaltenbach/TC3 (Principal Investigator) Patrick F. Lafferty/TC3 (Participating Investigator) JSC No. 2666 3728

Proposal Title: Earth Observations Experiment

Key Words: Earth Science, Land, Air, Oceans, Visual, Photographic, Earth features/ phenomena, Training, Simulations

Purpose Summary: Train SMD III crewmen to conduct and perform simulated Earth observations. The effectiveness of the crew training program, of onboard supporting equipment used to acquire data and operational procedures will be evaluated.

Experimental Animal: N/A No. Size Sex Inst/Surg

Return: Carcass Live Tissues

Rack Mount: N/A

Animals: W xD xH

Env.Control: Temp Hum Light

Weight

Other Equipment: W xD xH

Temp Humidity

Weight

Stowage: Aft flight deck storage space required for: Two Hasselblad Model 500 EL

Misc. (Surringes,beakers,etc.) data cameras, flim/filters, light meter, voice recorder system, 10 X 40 binoculars, Earth Observations Data Package.

Water N/A Food Solns

Waste N/A

Isotopes: N/A

Stable Activity/animal: Start

Radioactive Remaining: Animal Carcass Tissue Waste

Potential Hazzard to Environ: Yes No . What

Core Equipment N/A

Refrig. Temp N/A Amount

Freezer Temp N/A Amount

Day	1	2	3	4	5	6	7	Other
Payload Spec. Time	0	.5 hr.	.5 hr.	.5 hr.	.5 hr.	.5 hr.	0	
Workbench Time								

Power N/A

Telemetry/Data N/A

Special Requirements

Misc. Notes: A career astronaut may be selected for a "walk-on" role as Pilot during SMD III. The visual observations training, as indicated in the Earth Observations Experiment Proposal, should be given to the Payload Specialist, the Pilot, Mission Specialist, and any additional crewmen.

EXPERIMENT SUMMARY

Spacelab Mission Development Test III

EXPERIMENT TITLE: Earth Observations Experiment

PRINCIPAL AND PARTICIPATING INVESTIGATORS: John L. Kaltenbach (Principal Investigator)
Patrick E. Lafferty (Participating Investigator)

DESCRIPTION AND PURPOSE OF EXPERIMENT: Train SMD III crewmen to conduct and perform simulated observations and data acquisition of selected Earth land, air, and ocean features/phenomena. The effectiveness of the crew training program, of onboard supporting equipment to acquire data and operational procedures will be evaluated for application to Earth science observations in the Shuttle era.

EXPERIMENT TECHNIQUE: Training methods and techniques, material presented, and crewmen's performance during simulation will be documented and evaluated.

APPARATUS: Two Hasselblad Model 500 EL Data Cameras, appropriate film/filters, light meter, voice recorder system, one pair binoculars, Earth Observations Data Package.

MEASUREMENT PARAMETERS: N/A

PRIOR DEVELOPMENT: Dedicated Earth observations training for Skylab 4 and ASTP astronauts. Excellent science data obtained of Earth systems during both missions. Subsequent data analysis performed and documented in NASA science reports.

PROPOSED DEVELOPMENT: Develop a complete Earth observations science training program for Shuttle crewmen to continue acquisition of additional information to better understand the dynamic and interrelationships of the air, land, and ocean systems of our planet.

DISCIPLINE: Major areas of study: Global Tectonics, Oceanography, Meteorology, Arid Lands, Polar/Subpolar Ice, Hydrology, Ecosystems (Forestry, Rangeland, Agriculture, Cultural, Snow, Drought), and Air/Water Contamination.

SMD III REQUIREMENTS: OFT 2 trajectory desirable. SMD III trajectory to be defined well in advance of test to provide leadtime for flight planning, training, and selection of simulation material.

5/4/77

Dr. Thornton,

This is a copy of the site procedures which we will use on SMD III. ~~The enclosed site list has~~. Most of the photos that go with these procedures should be ready late tomorrow afternoon.

Ron Wiedenhagen
X-4637

5/04/77
2-1

SMD-III SCHEDULED EARTH OBSERVATION SITES

TRACK NAME & LOCATION	NO. OF SITES	SITE NAME
1. SOUTHERN U.S. (BAJA to SHREVEPORT)	5	1-1. BAJA CALIFORNIA 1-2. GULF OF CALIFORNIA 1-3. WILLCOX PLAYA 1-4. RIO GRANDE 1-5. DALLAS-FORT WORTH
2. WESTERN AFRICA (SENEGAL to TOGO)	4	2-1. AGRICULTURE ALONG SENEGAL RIVER 2-2. NIGER RIVER 2-3. LAKE VOLTA 2-4. TOGO/DAHOMEY COAST
3. BAJA (BAJA to S. MEXICO)	1	3-1. CUMULO-NIMBUS CLOUDS OVER MEXICO
4. WEST INDIES (BIMINI to MARTINIQUE)	5	4-1. ANDROS ISLAND 4-2. TONGUE OF THE OCEAN 4-3. VIRGIN ISLANDS 4-4. GUADELOUPE ISLAND 4-5. CLOUD STREET IN THE CARIBBEAN SEA
5. WESTERN U.S. (NW U.S. to PACIFIC OFF C. AMER)	5	5-1. MONO LAKE 5-2. LAKE MEAD 5-3. CUMULO-NIMBUS CLOUDS IN THE GULF OF MEXICO 5-4. VERACRUZ COASTAL AREA 5-5. COLD CORE EDDIES IN WARM WATER
6. GULF OF MEXICO (NORTHERN NEW MEXICO to YUCATAN)	6	6-1. VALLES CALDERA 6-2. MARAPOSA LAVA FLOW 1-4. RIO GRANDE 6-3. SOUTHERN RIO GRANDE 6-4. PADRE ISLAND 6-5. YUCATAN PENINSULA
7. S. CENTRAL U.S. (PUEBLO to EAST TEXAS)	2	7-1. CROPLANDS IN SOUTHERN COLORADO/OKLAHOMA 7-2. SEVERE STORMS OVER

SMD-III SCHEDULED EARTH OBSERVATION SITES

TRACK NAME & LOCATION	NO. OF SITES	SITE NAME
		SOUTHERN MIDWEST U.S.
8. U.S./MEXICO (SAN FRANCISCO to GUADALAJARA)	4	8-1. SAN FRANCISCO BAY 8-2. SAN ANDREAS FAULT SYS. 8-3. SALTON SEA/IMPERIAL VALLEY 8-4. SIERRA MADRE OCCIDENTAL
9. WESTERN SAHARA (MOROCCO to CAMEROONS)	3	9-1. ATLAS MOUNTAINS (MOROCCO) 9-2. SAND DUNES (MAURITANIA AND MALI) 9-3. AGRICULTURE IN THE SAHEL REGION OF AFRICA
10. N.W. CENTRAL U.S. (CASCADES to S.E. TEXAS)	6	10-1. MOUNT JEFFERSON (CASCADES) 10-2. SNOW PATTERNS 10-3. GREAT SALT LAKE 10-4. SAN JUAN MOUNTAINS 10-5. LUBBOCK, TEXAS 10-6. AUSTIN, TEXAS
11. S. CENTRAL U.S. (ASPEN to GULF OF MEXICO)	3	11-1. ROCKY MOUNTAIN NATIONAL PARK 7-1. SEVERE STORMS OVER SOUTHERN MIDWEST U.S. 11-2. LOUISIANNA COAST
12. INLAND DELTA OF NIGER RIVER S.W to N.E. MALI)	1	2-2. NIGER RIVER
13. N.W. CENTRAL U.S. (S. OREGON to GULF OF MEXICO)	3	10-2. GREAT SALT LAKE 10-3. SAN JUAN MOUNTAINS 13-1. MATAGORDA PENNINSULA
14. S. SOUTH AMERICA (CHILE to BRAZIL COAST)	2	14-1. FALKLAND CURRENT 14-2. RIO DEL LA PLATA
15. U.S./MEXICO (SAN FRANCISCO	2	8-1. SAN FRANSISCO BAY

SMD-III SCHEDULED EARTH OBSERVATION SITES

TRACK NAME & LOCATION	NO. OF SITES	SITE NAME
to SONORA)		8-2. SAN ANDREAS FAULT SYS.

5/03/77

1-1 BAJA CALIFORNIA

GENERAL DESCRIPTION:

Baja California extends southward as a peninsula from southwestern U.S. The Gulf of California separates Baja from the mainland of Mexico. Baja is arid and mountainous with several prominent faults. The tidal variation of the Gulf of Mexico at the mouth of the Colorado River probably helps stir up sediments. Long cloud boundaries are sometimes seen along the Western coast of Baja.

PROCEDURES:

A. DESCRIBE CLOUD PATTERNS OFF THE COASTLINE OF BAJA CALIFORNIA.

B. IDENTIFY THE AQUA BLANCA FAULT AND LOOK FOR AN EXTENSION OF THE FAULT PAST THE MOUNTAIN RANGE TO THE EAST.

4/28/77

1-2 GULF OF CALIFORNIA

GENERAL DESCRIPTION:

The Gulf of California separates Baja California from the the mainland of Mexico. Sediment flows out of the Colorado River into the top of the Gulf of California. (Also see general description for site 1-1)

PROCEDURES:

A. DESCRIBE SEDIMENT PATTERNS IN THE GULF OF CALIFORNIA. DRAW PLUMES ON ENCLOSED PHOTOS.

5/03/77

1-3 WILLCOX PLAYA

GENERAL DESCRIPTION:

Willcox Playa is a dry lakebed in Arizona. It's coloration changes as a function of moisture. Information about drainage can be determined from photographs of the coloration patterns.

PROCEDURES:

A. PHOTOGRAPH COLORATION PATTERNS IN WILLCOX PLAYA.

CAMERA DATA: TBD

4/28/77

1-4 RIO GRANDE

GENERAL DESCRIPTION:

The Rio Grande flows from Colorado through New Mexico into Texas and forms a large portion of the border between the United States and Mexico. The Rio Grande brings water into the arid lands of New Mexico and southwestern Texas and supports a great amount of agriculture there. Irrigation from the Rio Grande supports agriculture in a band surrounding the river. Periodic photos of the Rio Grande can be used to determine increases in the amount of agricultural land.

PROCEDURES:

A. PHOTOGRAPH VEGETATION ALONG THE RIO GRANDE.

CAMERA DATA: TBD

4/28/77

1-5 DALLAS-FORT WORTH

GENERAL DESCRIPTION:

The Dallas-Fort Worth areas lies in Eastern Texas. Dalles is the second largest city in Texas, so this areas supports a large number of people. To supply water and recreation to this community several lakes were constructed around the cities. Sediment flows into these lakes from various streams. A comparison of the amount of sediment in each lake and the sediment patterns would be useful in assessing water runoff conditions upstream.

PROCEDURES:

A. DESCRIBE AND COMPARE THE SEDIMENT PATTERNS IN THE LAKES SURROUNDING THE DALLES-FORT WORTH AREA.

B. PHOTOGRAPH ANY PARTICULARLY INTERESTING PATTERNS.

CAMERA DATA: TBD

4/28/77

2-1 AGRICULTURE ALONG SENEGAL RIVER

GENERAL DESCRIPTION:

The Senegal River begins in the mountains of Guinea and flows to Saint Louis on the coast of Senegal. This land is semi-arid but may be rich enough to support some agriculture along the river.

PROCEDURES:

A. ARE THERE ANY PATTERNS WHICH WOULD INDICATE AGRICULTURE ALONG THE SENEGAL RIVER?

B. IF PATTERNS ARE VISIBLE, IS THERE A COMMON SHAPE?

4/28/77

2-2 NIGER RIVER

GENERAL DESCRIPTION:

The Niger River flows through central Mali and forms an inland delta. The inland delta is a low area that is very suitable for agriculture. However, because of the recent drought conditions in the area, much vegetation has been lost. This results in higher seasonal floods and loss of much stored water. Since most flooding occurs during Spring, photos and descriptions of the Niger River in flood stage would be useful in assessing trends.

PROCEDURES:

A. DESCRIBE THE NIGER RIVER FLOOD PLAIN.

B. PHOTOGRAPH ANY FLOODING CONDITIONS ALONG THE RIVER.

CAMERA DATA: TBD

4/28/77

2-3 LAKE VOLTA

GENERAL DESCRIPTION:

Lake Volta is located in east central Ghana and is one of the two largest lakes in northern Africa. The fast-flowing Black Volta and White Volta rivers which feed the lake should bring in large quantities of sediment.

PROCEDURES:

A. DESCRIBE ANY SEDIMENT PATTERNS IN LAKE VOLTA.

B. IF SEDIMENT PLUMES ARE VISIBLE, INDICATE SOURCE ON ENCLOSED MAP.

4/28/77

2-4 TOGO/DAHOMEY COAST

GENERAL DESCRIPTION:

The Togo and Dahomey coastline lies southeast of Lake Volta. Sediments from Lake Volta should be forming sediment plumes along the coast. Documentation of these will result in better understanding of the current patterns along the coast.

PROCEDURES:

A. PHOTOGRAPH SHALLOW WATER PATTERNS AND SEDIMENT PLUMES ALONG THE COAST.

B. DESCRIBE ANY UNUSUAL CLOUD PATTERNS ALONG THE COAST.

CAMERA DATA: TBD

4/28/77

3-1 CUMULO-NIMBUS CLOUDS OVER MEXICO

GENERAL DESCRIPTION:

Cumulo-nimbus clouds are large storm formations which extend over 50,000 feet into the upper atmosphere. They often contain turrets (overshooting cloud tops) near the center of the top of the cloud.

PROCEDURES:

A. PHOTOGRAPH ANY LARGE CUMULO-NIMBUS CLOUDS, ESPECIALLY THOSE WITH OVERSHOOTING CLOUD TOPS.

CAMERA DATA: TBD

4/28/77

4-1 ANDROS ISLAND

GENERAL DESCRIPTION:

Andros Island is located in the Bahama Islands southeast of Miami. There are two main segments of the island with a channel between them.

PROCEDURES:

A. PHOTOGRAPH ANY SURFACE PATTERNS WHICH INDICATE A CURRENT FLOWING THROUGH THE CHANNEL EXTENDING THROUGH ANDROS I.

CAMERA DATA: TBD

4/28/77

4-2 TONGUE OF THE OCEAN

GENERAL DESCRIPTION:

The Tongue of the Ocean is a deep ocean tongue than extends into the Great Bahama Bank. There is a sharp ocean boundary here with a significant difference in color between the shallow and deep ocean floor depths. There are sand dunes visible in the water along the shallow side of ocean boundary.

PROCEDURES*

A. PHOTOGRAPH THE DEEP-WATER OCEAN TONGUE.

B. PHOTOGRAPH THE SUBMERGED SAND DUNES ALONG THE OCEAN BOUNDARY BETWEEN SHALLOW AND DEEP WATER.

CAMERA DATA: TBD

4/28/77

4-3 VIRGIN ISLANDS

GENERAL DESCRIPTION:

The Virgin Islands are located directly east of Puerto Rico. The two main islands in the group are Saint Thomas and Saint John. There are numerous reefs and cays in the area. Any upwelling areas may indicate fish concentrations.

PROCEDURES:

A. PHOTOGRAPH SAINT JOHN, SAINT THOMAS, AND ITS SURROUNDING AREA.

CAMERA DATA: TBD

4/28/77

4-4 GUADELOUPE ISLAND

GENERAL DESCRIPTION:

Guadeloupe Island is the largest island in the Lesser Antilles. The western half is mountainous with many fast-flowing streams. A study is underway to analyze the drainage patterns in these mountains.

PROCEDURES:

A. TAKE STEREO PHOTOGRAPHS OF THE MOUNTAINOUS AREA IN WESTERN GUADELOUPE ISLAND. (TAKE 6 PHOTOS AT 3 SECOND INTERVALS)

CAMERA DATA: TBD

4/28/77

4-5 CLOUD STREETS IN THE CARIBBEAN SEA

GENERAL DESCRIPTION:

Cloud streets can occur anywhere. They consist of parallel bands of cumulus clouds with regular widths. Studies are being performed which are attempting to link cloud streets in the formation of circular currents.

PROCEDURES:

A. PHOTOGRAPH ANY LARGE REGULAR CLOUD STREET PATTERNS, PARTICULAR THOSE ASSOCIATED WITH ISLANDS.

CAMERA DATA: TBD

4/28/77

5-1 MONO LAKE

GENERAL DESCRIPTION:

Mono Lake is located in eastern California directly east of San Francisco. It receives drainage from the eastern slopes of the Sierra Nevada range.

PROCEDURES:

A. PHOTOGRAPH THE DRAINAGE PATTERNS WEST OF MONO LAKE.

CAMERA DATA: TBD

4/28/77

5-2 LAKE MEAD

GENERAL DESCRIPTION:

Lake Mead is located in southern Nevada along the Arizona/Nevada border. Great quantities of sediments are brought into Lake Mead by the Colorado River. The geology in the area is very interesting because of the occurance of several types of minerals, such as copper.

PROCEDURES:

A. DESCRIBE OR PHOTOGRAPH ANY SEDIMENT PLUMES THAT ARE VISIBLE IN LAKE MEAD. DO THE SEDIMENTS APPEAR TO SETTLE OUT AS THEY APPROACH THE DAM?

B. DESCRIBE OR PHOTOGRAPH ANY PECULIAR COLORATION IN THE ROCKS IN THE SURROUNDING MOUNTAINS.

CAMERA DATA: TBD

4/28/77

5-3 CUMULO-NIMBUS CLOUDS IN THE GULF OF MEXICO

GENERAL DESCRIPTION:

Cumulo-nimbus clouds are large storm formations which extend over 50,000 fett into the atmosphere. They often contain turrets (overshooting cloud tops) near the center of the top of cloud.

PROCEDURES:

A. PHOTOGRAPH ANY LARGE CUMULO-NIMBUS CLOUDS, ESPECIALLY THOSE WITH OVERSHOOTING CLOUD TOPS.

CAMERA DATA: TBD

4/28/77

5-4 VERACRUZ COASTAL AREA

GENERAL DESCRIPTION:

Veracruz is located along the Mexican Gulf Coast east of Mexico City. A sediment plume should exist along the coast showing the direction of prevailing current flow.

PROCEDURES:

A. DETERMINE DIRECTION OF PREVAILING CURRENT FLOW PARALLEL TO THE COASTLINE OFFSHORE FROM VERACRUZ.

4/28/77

5-5 COLD CORE EDDIES IN WARM WATER

GENERAL DESCRIPTION:

Cold core eddies are a recently discovered phenomena which was first seen in Skylab photography. It is a mechanism of air/sea energy transfer which is very important in the understanding of overall energy flow between the sea and atmosphere. It is characterized by a circular ring of clouds enclosing a clear area above the cold water.

PROCEDURES:

A. PHOTOGRAPH ANY LARGE COLD CORE EDDIES IN GULF OF MEXICO OR PACIFIC OCEAN.

B. DESCRIBE AND PHOTOGRAPH ANY CLOUD STREETS ASSOCIATED WITH COLD CORE EDDIES.

CAMERA DATA: TBD

4/28/77

6-1 VALLES CALDERA

GENERAL DESCRIPTION:

The Valles Caldera is located directly west of Los Alamos near the Rio Grande and is approximately 10 Miles in diameter.

PROCEDURES:

A. PHOTOGRAPH VALLES CALDERA.

CAMERA DATA: TBD

5/03/77

6-2 MARAPOSA LAVA FLOW

GENERAL DESCRIPTION:

The Maraposa lava flow is located in New Mexico near White sands. This lava is coal black in appearance and is long and narrow in shape. Islands of different colored rock are scattered throughout the lava flow. Since this is a difficult area for field trips, additional photos from space would be valuable.

PROCEDURES:

A. PHOTOGRAPH MARAPOSA LAVA FLOW WITH EMPHASIS ON DOCUMENTING THE LOCATIONS OF DIFFERENT COLORED ROCK ISLANDS.

CAMERA DATA: TBD

4/28/77

6-3 SOUTHERN RIO GRANDE

GENERAL DESCRIPTION:

The southern portion of the Rio Grande forms the boundary between the United States and Mexico. Irrigation from the Rio Grande provides water for croplands along most of this section of the river, especially in the Rio Grande Valley near Brownsville, Texas. Periodic photos of the Rio Grande can be used to determine increases in the amount of agricultural land being supported by the river.

PROCEDURES:

A. PHOTOGRAPH VEGETATION ALONG THE RIO GRANDE.

CAMERA DATA: TBD

4/28/77

6-4 PADRE ISLAND

GENERAL DESCRIPTION:

Padre Island is located along the coast of Southern Texas near Corpus Christi. Knowledge of current patterns in the area is important to the fishing industry.

PROCEDURES:

A. PHOTOGRAPH SEDIMENT PLUMES ALONG PADRE ISLAND.

CAMERA DATA: TBD

6-5 YUCATAN PENINSULA 4/28/77

GENERAL DESCRIPTION:

The Yucatan Peninsula is located in southern Mexico and separates the Gulf of Mexico from the Caribbean Sea. There is little accurate mapping in the area. Photos of the area would help in the determination of a landuse inventory.

PROCEDURES:

A. PHOTOGRAPH ANY CLEAR AREAS NEAR THE SPACECRAFT TRACK.

CAMERA DATA: TBD

5/04/77

7-1 CROPLANDS IN SOUTHERN COLORADO/OKLAHOMA

GENERAL DESCRIPTION:

In the driest portion of the Midwest (Southeastern Colorado) crops are grown along river valleys where water is available. As one travels east, however, the croplands spread out and finally cover most of the land in Oklahoma and Texas. Photographs of croplands along river valleys are useful in predicting irrigation demands.

PROCEDURES:

A. PHOTOGRAPH ANY CROPLANDS ALONG RIVER VALLEYS.

CAMERA DATA: TBD

5/04/77

7-2 SEVERE STORMS OVER SOUTHERN MIDWEST

GENERAL DESCRIPTION:

The southern midwest, particularly Kansas and Oklahoma, is situated where severe storms and tornados are likely to occur. Large cumulo-nimbus clouds, and associated cloud streets, can often be seen during the summer months.

PROCEDURES:

A. PHOTOGRAPH IN STEREO ANY LARGE AREA OF CUMULO-NIMBUS CLOUDS, ESPECIALLY THOSE WITH OVERSHOOTING CLOUD TOPS.

CAMERA DATA: TBD

8-1 SAN FRANCISCO BAY 5/04/77

GENERAL DESCRIPTION:

San Francisco Bay is located along the northern California coast. It is fed by the Sacramento and San Joaquin Rivers which carry sediments into the bay. These sediment patterns indicate the present current patterns. The San Andreas Fault passes through San Fransisco on its way out to the Pacific.

PROCEDURES:

A. PHOTOGRAPH SEDIMENT PATTERNS IN SAN FRANSICO BAY.

B. LOCATE AND PHOTOGRAPH THE AREAS WHERE THE SAN ANDREAS FAULT FIRST COMES ON LAND NORTH OF SAN FRANSISCO.

CAMERA DATA: TBD

8-2 SAN ANDREAS FAULT SYSTEM 5/04/77

GENERAL DESCRIPTION:

The San Andreas Fault system extends through western California beginning at San Fransisco and ending near the Gulf of California. There are numerous other faults in the system which either branch off the San Andreas or run parallel to it.

PROCEDURES:

A. PHOTOGRAPH THE EXTENSION OF THE EAST-WEST TRENDING GARLOCK FAULT WHICH BRANCHES OFF THE SAN ANDREAS NORTHEAST OF LOS ANGELES.

B. VISUALLY DETERMINE THE FARTHEST POINT SOUTH THAT THE SAN ANDREAS FAULT IS VISIBLE.

CAMERA DATA: TBD

5/04/77

8-3 SALTON SEA/IMPERIAL VALLEY

GENERAL DESCRIPTION:

The Salton Sea is located in southern California and is below sea level. Below the Salton Sea is a large area of cropland called the Imperial Valley which produces many kinds of vegetables. Pollen can sometimes land on the surface of the Sea and move along with the water currents. Therefore if patterns of pollen visibly exist on the surface of the Sea, they will indicate the water currents.

PROCEDURES:

A. PHOTOGRAPH ANY CURRENT PATTERNS IN THE SALTON SEA.

B. PHOTOGRAPH THE EXTENT OF CROPLAND SOUTH OF THE SALTON SEA.

CAMERA DATA: TBD

5/04/77

8-4 SIERRA MADRE OCCIDENTAL

GENERAL DESCRIPTION:

The Sierra Madre Occidental are located in northwesern Mexico and extend along the eastern border of the Gulf of California. This range is near the eastern edge of a plate boundary so numerous small faults exist throughout the mountains most of which have not been fully studied. Photos of lakes in this mountainous region will help the Mexican water resouces studies in the area.

PROCEDURES:

A. PHOTOGRAPH ANY LINEAR PATTERNS WHICH MAY INDICATE THE PRESENCE OF GEOLOGICAL FAULTS.

B. PHOTOGRAPH ANY CIRCULAR FEATURES WHICH MAY INDICATE PRESENCE OF VOLCANICS.

C. PHOTOGRAPH LARGE MOUNTAIN LAKES.

CAMERA DATA: TBD

9-1 ATLAS MOUNTAINS (MOROCCO) 4/29/77

GENERAL DESCRIPTION:

The Atlas Mountains are located along the northwest coast of Africa and extend through Morocco, northern Algeria, and northern Tunisia. These mountains contain many faults most of which have not been studied fully. Snowcover on the high portions of this range is important for water storage for the people who live in the region.

PROCEDURES:

A. PHOTOGRAPH ANY FAULT SYSTEMS WHICH ARE VISIBLE IN THE ATLAS MOUNTAINS.

B. PHOTOGRAPH ANY LARGE PEAKS OR RIDGES WHICH STILL HAS SNOW.

CAMERA DATA: TBD

9-2 SAND DUNES (MAURITANIA & MALI) 4/29/77

GENERAL DESCRIPTION:

Northeastern Mauritania and northeastern Mali are located on the Sahara Desert. Various types of sand dunes exist in the Sahara including: LINEAR DUNES, STAR DUNES, CRESCENT DUNES, STAR DUNE CHAINS, AND RETICULATE DUNES. Wind direction is very important in the study of dunes.

PROCEDURES:

A. PHOTOGRAPH DUNE PATTERNS (LOW SUN ANGLE IS PREFERRED).

B. DESCRIBE DUNE TYPES.

C. PHOTOGRAPH IN STEREO ANY INDICATORS OF WIND DIRECTION (SUCH AS SMOKE PLUMES, DUST STORMS, ETC.)

CAMERA DATA: TBD

5/04/77

9-3 AGRICULTURE IN THE SAHEL REGION OF AFRICA

GENERAL DESCRIPTION:

The Sahelian Region of Africa is located directly below the Sahara Desert. It is a semi-arid region which gradually begins to convert to desert during periods of drought. Proper range management and irrigation practices are critical in the production of food in the region. Agricultural planning is difficult when people move yearly as a function of water availability.

PROCEDURES:

A. PHOTOGRAPH ANY EVIDENCE OF AGRICULTURE IN MALI AND NIGER.

B. IDENTIFY AND PHOTOGRAPH (IN RELATION TO IDENTIFIABLE GEOLOGICAL FEATURES) ANY INTERDUNAL WATER.

CAMERA DATA: TBD

4/29/77

10-1 MOUNT JEFFERSON (CASCADES)

GENERAL DESCRIPTION:

Mount Jefferson is located in the Cascade Range of Oregon. It is a glacier-covered mountain of volcanic origin. Much water is tied up in the ice and snow of Mount Jefferson which is used during the summer months in nearby cities. Because of the dry Winter in the Cascade, a good estimate of all water storage is needed.

PROCEDURES:

A. PHOTOGRAPH THE GLACIERS ON MOUNT JEFFERSON IN STEREO.

CAMERA DATA: TBD

5/04/77

10-2 SNOW PATTERNS

GENERAL DESCRIPTION:

Snow covers much of the Cascade Mountains and high plains during the Winter. Unusual snow patterns may indicate geothermal sources, melting, or areas which did not get snow. Rivers often show up when they are not ice-covered.

PROCEDURES:

A. PHOTOGRAPH IN STEREO ANY UNUSUAL SNOW PATTERNS.

B. PHOTOGRAPH IN STEREO ANY UNFROZEN RIVERS.

CAMERA DATA: TBD

5/04/77

10-3 GREAT SALT LAKE

GENERAL DESCRIPTION:

The Great Salt Lake is located in northern Utah in the eastern portion of the Great Salt Lake Desert (a dry salt flat). A railroad bridge divides the Great Salt Lake in half and limits water flow between the portions. This results in different water conditions (different color) between the two halves. Salt Lake City lies on the SE shore of the lake.

PROCEDURES:

A. PHOTOGRAPH THE METROPOLITAN AREA OF SALT LAKE CITY.

B. PHOTOGRAPH AND DESCRIBE THE COLOR DIFFERENCES BETWEEN TWO HALVES OF THE GREAT SALT LAKE.

CAMERA DATA: TBD

5/04/77

10-4 SAN JUAN MOUNTAINS

GENERAL DESCRIPTION:

The San Juan Mountains are located in southern Colorado. The snow accumulation in these mountains provides water for many cities in the area. Estimates of the amount of water stored in snow is important for resources planning efforts.

PROCEDURES:

A. PHOTOGRAPH IN STEREO ANY LARGE MOUNTAIN VALLEYS WHICH ARE VISIBLE IN THE AREA.

CAMERA DATA: TBD

5/04/77

10-5 LUBBOCK, TEXAS

GENERAL DESCRIPTION:

Lubbock is located in northern Texas. It is primarily an agricultural community with many farms throughout the area.

PROCEDURES:

A. PHOTOGRAPH THE FARMLAND AROUND LUBBOCK.

CAMERA DATA: TBD

5/04/77

10-6 AUSTIN, TEXAS

GENERAL DESCRIPTION:

Austin, Texas, is located in central Texas and is it's capital. There is one major interstate highway flowing north/south through the city. Studies are being made of Austin's current growth pattern. Photos of the overall area will be useful in analyzing directions of growth.

PROCEDURES:

A. PHOTOGRAPH THE AUSTIN AREA.

CAMERA DATA: TBD

5/02/77

11-1 ROCKY MOUNTAIN NATIONAL PARK

GENERAL DESCRIPTION:

Rocky Mountain National Park is located thirty miles north of Denver, Colorado. Forest inventory studies are presently being done. A photo from space would save flying an expensive aerial photography mission for the large-scale data needed.

PROCEDURES:

A. PHOTOGRAPH IN STEREO THE ROCKY MOUNTAIN NATIONAL PARK AREA.

CAMERA DATA: TBD

5/02/77

11-2 LOUISIANNA COAST

GENERAL DESCRIPTION:

There is much offshore drilling operations off the Louisianna Coast. An oil spillage will remain on the ocean surface for a while. If patterns of oil can be seen in this area, support can be given for studies concerning pollution monitoring from space.

PROCEDURES:

A. PHOTOGRAPH ANY OIL SLICKS OFF THE COAST OF LOUISIANNA. (USE SUNGLINT IF POSSIBLE)

CAMERA DATA: TBD

5/02/77

13-1 MATAGORDA PENNINSULA

GENERAL DESCRIPTION:

The Matagora Penninsula extends along the Texas coast southwest of Houston. It lies at the mouth of the Colorado River which transports sediments out into the Gulf. Sediments are carried by the currents after they enter the Gulf of Mexico. Documentation of these sediment plumes gives an indication of the prevailing ocean currents along this portion of the Texas coast. A good knowledge of these currents is important in determining the environmental impact of a deep-water port nearby.

PROCEDURES:

A. PHOTOGRAPH THE SEDIMENT PLUME OF THE COLORADO RIVER.

CAMERA DATA: TBD

5/02/77

14-1 FALKLAND CURRENT

GENERAL DESCRIPTION:

The Falkland Current extends along the southeastern coast of South America. It begins near the Falkland Islands and leaves the coast of Brazil joining another current to flow east across the Atlantic. This current has many eddies associated with it and upwellings bringing nutrients which cause plantom blooms at certain times of the year.

PROCEDURES:

A. PHOTOGRAPH THE FALKLAND CURRENT, PARTICULARLY ANY PLANKTON BLOOMS THAT ARE VISIBLE ALONG THE CURRENT.

CAMERA DATA: TBD

5/02/77

14-2 RIO DEL LA PLATA

GENERAL DESCRIPTION:

The Rio Del La Plata enters the Atlantic Ocean at Montvideo, Uraguay. Between Buenos Aires and Montevideo, the river enters a long bay. The red sediments from the river are easily visible here and extend a distance which varies with rainfall conditions upstream.

PROCEDURES:

A. PHOTOGRAPH THE MOUTH OF THE RIO DE LA PLATA SHOWING THE EXTENSION OF THE RED SEDIMENTS.

CAMERA DATA: TBD