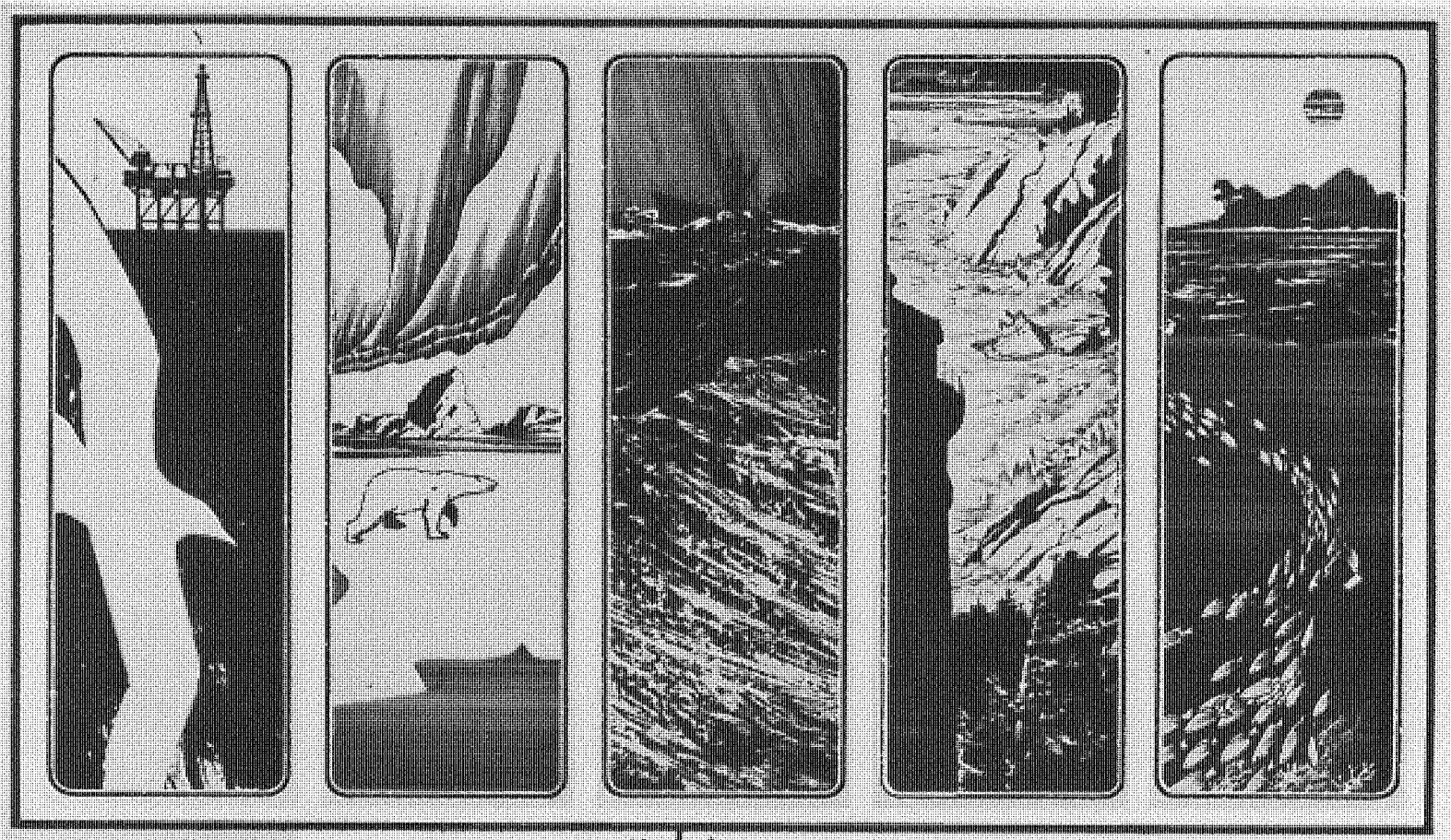

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Global Ocean Monitoring System

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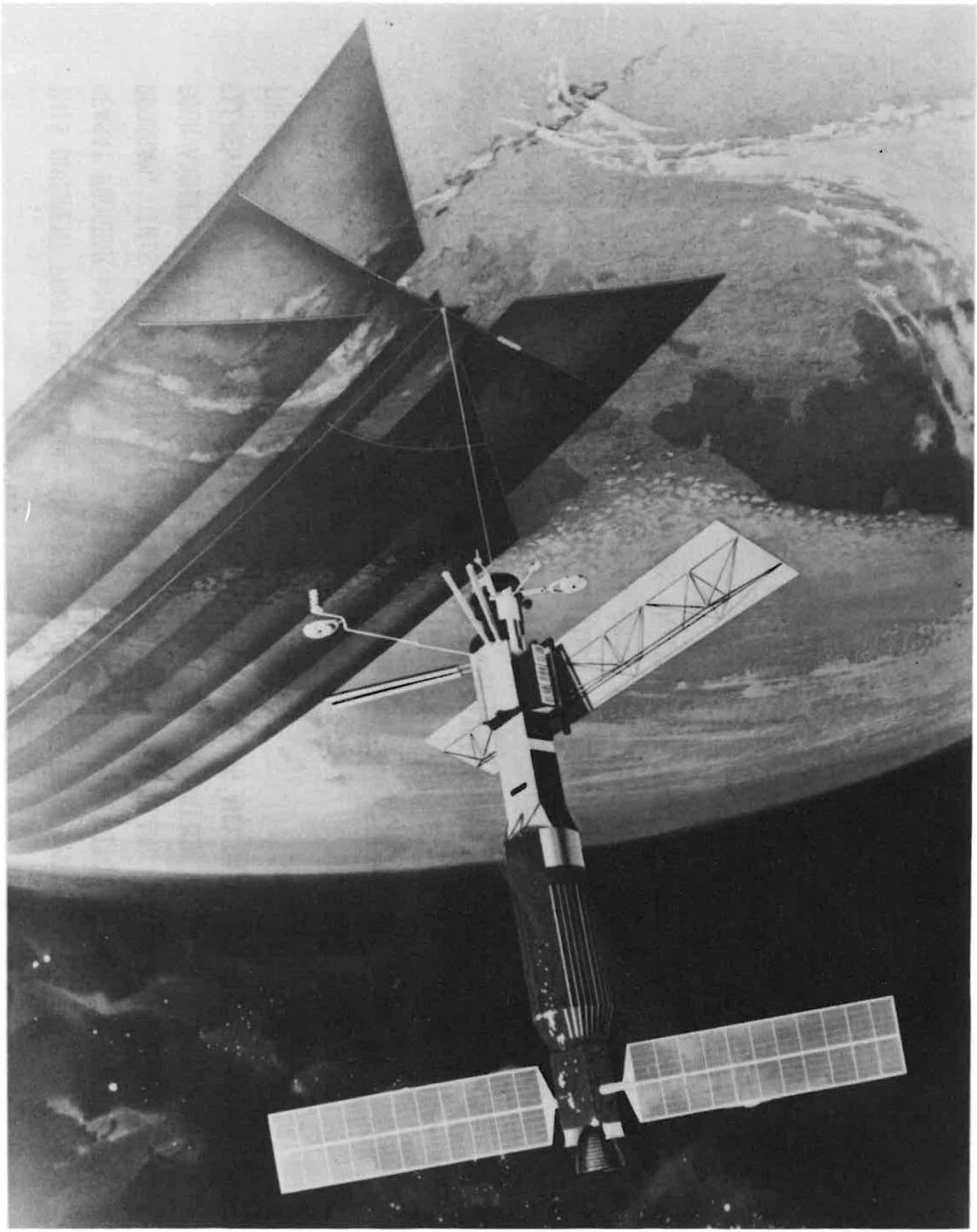


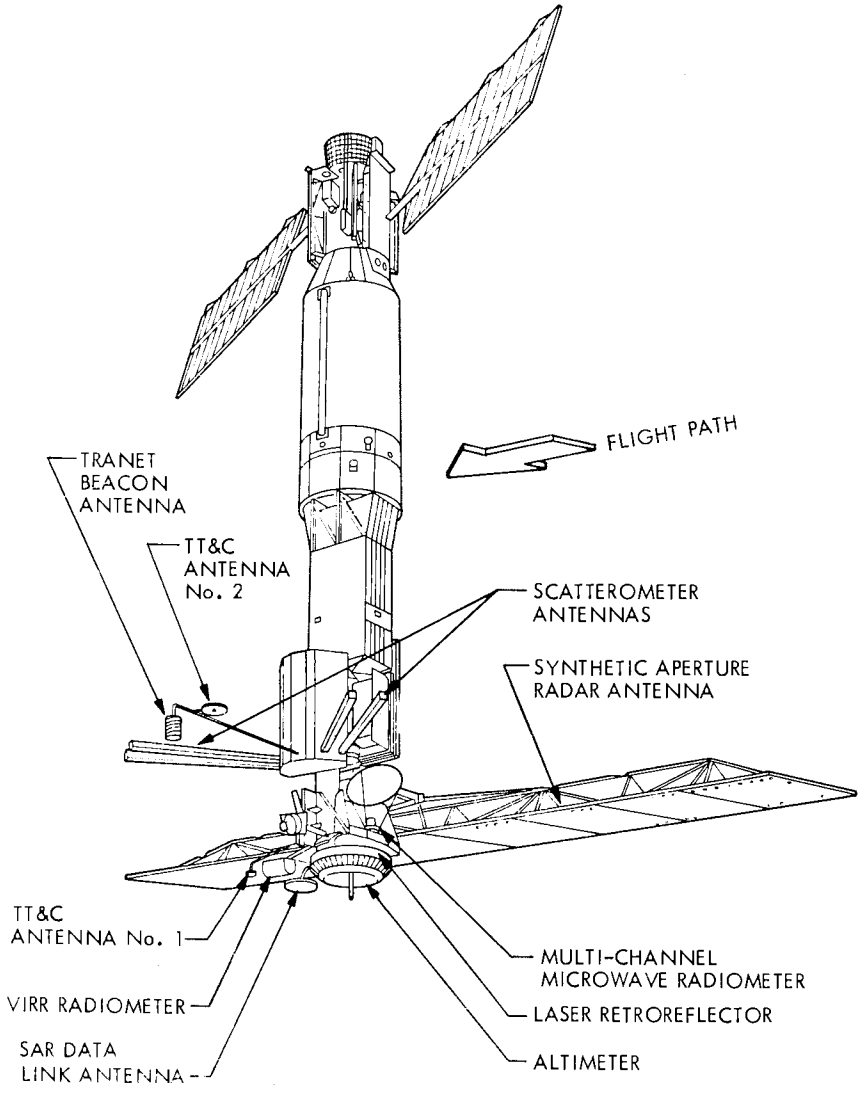
THIS DOCUMENT PROVIDES GENERAL INFORMATION AND DESCRIPTIVE MATERIAL ABOUT THE SEASAT PROGRAM WHICH IS PART OF NASA'S OCEAN CONDITION MONITORING AND DATA UTILITY PROGRAM. THIS IS THE CENTRAL DOCUMENT COVERING THE PROGRAM. IT IS AUGMENTED BY FOUR ADDITIONAL DOCUMENTS WHICH PROVIDE DETAILED INFORMATION ABOUT THE OTHER KEY ELEMENTS OF NASA'S OVERALL "OCEAN CONDITION MONITORING AND DATA UTILITY PROGRAM". THESE SUPPORTING DOCUMENTS ARE:

1. SEASAT-A PROJECT PLAN (PD 622-3)
2. OCEANOLOGY ADVANCED PROGRAM PLANNING - MAY 1977
3. INDUSTRY DEMONSTRATION PROGRAM PLAN - JUNE 1977
4. COOPERATIVE SOLICITATION FOR SCIENTIFIC INVESTIGATIONS.

ADDITIONAL PAPERS AND DESCRIPTIVE DOCUMENTS ARE AVAILABLE FOR THOSE READERS HAVING SPECIFIC INTERESTS IN THE TECHNOLOGY OR SCIENTIFIC ENDEAVORS OF THIS PROGRAM. SHOULD ADDITIONAL INFORMATION BE DESIRED OR IF QUESTIONS ARISE PERTAINING TO THE CONTENT OF THIS DOCUMENT, THE READER IS INVITED TO EITHER WRITE OR CALL:

MR. S. WALTER McCANDLESS
NATIONAL AERONAUTICS & SPACE ADMINISTRATION
OCEANOLOGY PROGRAM MANAGER
CODE ESE
WASHINGTON, D.C. 20546 - (PHONE 202-755-1201)

SEASAT-A MISSION



• MANAGEMENT

- OVERALL - NASA - OFFICE OF APPLICATIONS
- SATELLITE SYSTEM - JPL
- SATELLITE BUS/SENSOR MODULE SYSTEM INTEGRATION - LMSC
- SENSORS
  - SCANNING MULTIFREQUENCY MICROWAVE RADIOMETER - JPL
  - RADAR SCATTEROMETER - GENERAL ELECTRIC
  - SYNTHETIC APERTURE RADAR - JPL
  - RADAR ALTIMETER - APL
  - VISUAL INFRARED RADIOMETER - NOAA

• MISSION OBJECTIVES

- MEASURE GLOBAL OCEAN DYNAMICS AND PHYSICAL CHARACTERISTICS
- DETERMINE KEY FEATURES OF AN OPERATIONAL SYSTEM
- IMPROVE BODY OF SCIENTIFIC OCEAN DATA/KNOWLEDGE
- DEMONSTRATE UTILITY OF DATA TO USER COMMUNITY

• MISSION ORBIT

- ALTITUDE (CIRC) 800 Km
- INCLINATION 108°
- WEIGHT ON ORBIT 1820 Kg

• LAUNCH DATA

- DATE MAY 1978
- SITE VAFB SLC-3W
- VEHICLE ATLAS F/AGENA

• COST DATA

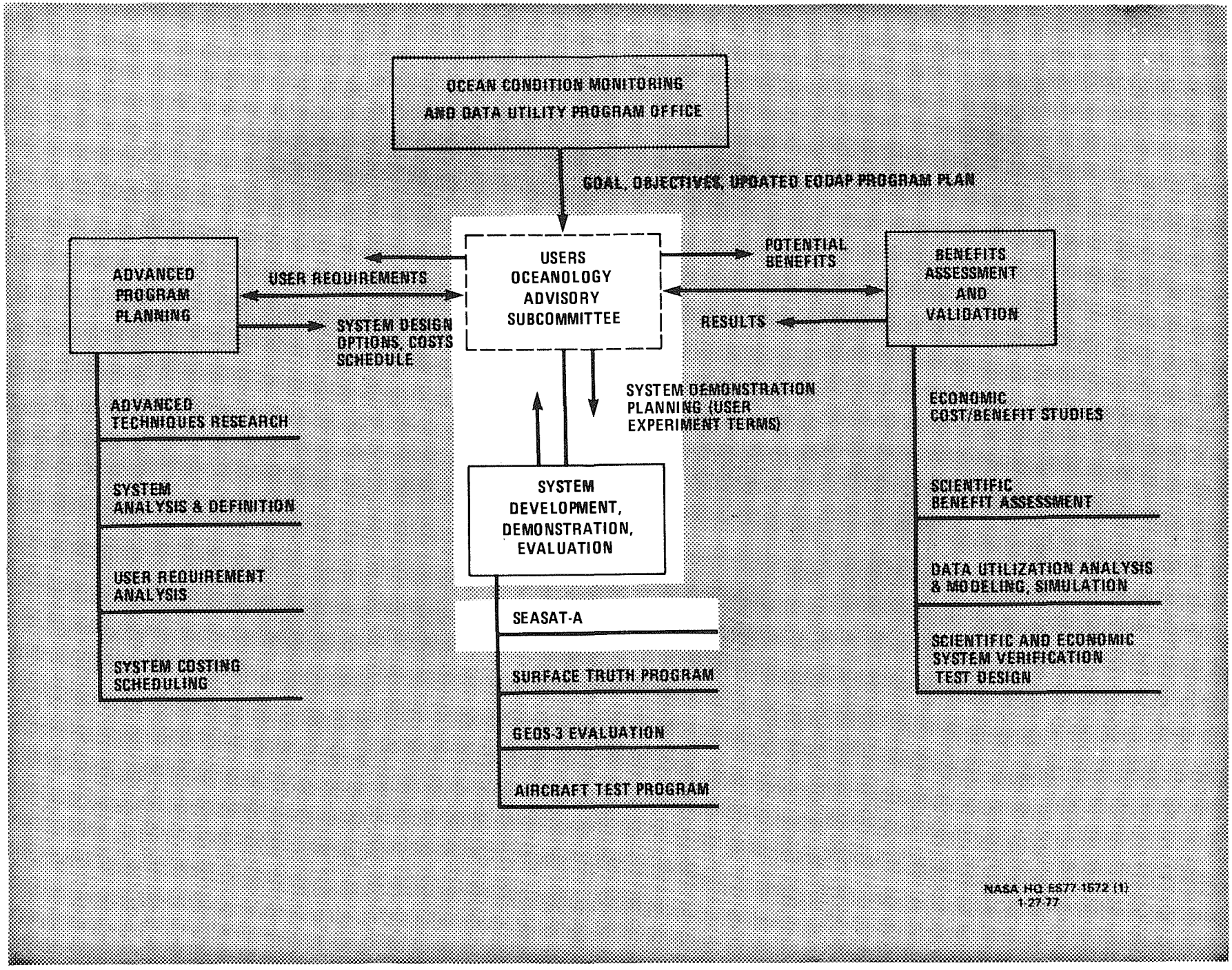
- SPACECRAFT $74M
- LAUNCH SUPPORT $13M

NASA HQ ES77 2143 (1)
Rev. 12-12-77

THE NASA INITIATIVES IN OCEAN RESEARCH AND APPLICATIONS IS EMBODIED IN AN OCEAN CONDITION MONITORING AND DATA UTILITY PROGRAM. THIS PROGRAM IS STRUCTURED INTO THREE MAJOR ELEMENTS, NAMELY: (1) ADVANCED PROGRAM PLANNING, (2) SYSTEM DEVELOPMENT, DEMONSTRATION, EVALUATION, AND, (3) BENEFITS ASSESSMENT AND VALIDATION. A MAJOR USERS GROUP IN THE FORM OF THE OCEANOLOGY ADVISORY SUBCOMMITTEE PROVIDES A FORUM FOR THE DELINEATION OF USER NEEDS AND REQUIREMENTS AND PROVIDES GUIDANCE AND COUNSEL TO THE OVERALL OCEAN PROGRAM.

ADVANCED PROGRAM PLANNING PROVIDES FOR THE FORMULATION OF FUTURE MISSION CONCEPTS AND NEW TECHNOLOGY INITIATIVES EMERGE FROM THIS PROGRAM ELEMENT. BENEFITS ASSESSMENT AND VALIDATION ACTIVITIES CREATE ECONOMIC ANALYSES THAT RESULT IN COST/BENEFIT ESTIMATES WHICH ATTEST TO THE POTENTIAL UTILITY OF PROGRAM CONCEPTS. VALIDATION SCHEMES PROVIDE OPPORTUNITIES TO TEST BENEFIT ESTIMATES WITH REAL DATA DURING SATELLITE FLIGHT OPERATIONS, SYSTEM DEVELOPMENT, DEMONSTRATION, AND EVALUATION EFFORTS PROVIDE FOR FLIGHT PROGRAMS WITH SUPPORTING SURFACE TRUTH ACTIVITIES, INCLUDING AIRCRAFT UNDER-FLIGHT OBSERVATIONS.

THIS DOCUMENT IS ABOUT SEASAT-A, A FLIGHT PROGRAM ELEMENT OF THE SYSTEM DEVELOPMENT, DEMONSTRATION AND EVALUATION SEGMENT OF THE OCEAN PROGRAM. AN OVERVIEW OF THE OCEAN CONDITION MONITORING AND DATA UTILITY PROGRAM WILL BE PROVIDED FOLLOWED BY DESCRIPTIONS OF SEASAT-A, ADVANCED PROGRAM PLANNING AND BENEFITS ASSESSMENT AND VALIDATION ACTIVITIES.


OCEAN CONDITION MONITORING AND DATA UTILITY PROGRAM OFFICE
GOAL, OBJECTIVES, UPDATED EODAP PROGRAM PLAN
ADVANCED PROGRAM PLANNING
USER REQUIREMENTS
SYSTEM DESIGN OPTIONS, COSTS SCHEDULE
USERS OCEANOLOGY ADVISORY SUBCOMMITTEE
POTENTIAL BENEFITS
RESULTS
BENEFITS ASSESSMENT AND VALIDATION
SYSTEM DEMONSTRATION PLANNING (USER EXPERIMENT TERMS)
ADVANCED TECHNIQUES RESEARCH
SYSTEM ANALYSIS & DEFINITION
USER REQUIREMENT ANALYSIS
SYSTEM COSTING SCHEDULING
SYSTEM DEVELOPMENT, DEMONSTRATION, EVALUATION
SEASAT-A
SURFACE TRUTH PROGRAM
GEOS-3 EVALUATION
AIRCRAFT TEST PROGRAM
ECONOMIC COST/BENEFIT STUDIES
SCIENTIFIC BENEFIT ASSESSMENT
DATA UTILIZATION ANALYSIS & MODELING, SIMULATION
SCIENTIFIC AND ECONOMIC SYSTEM VERIFICATION TEST DESIGN
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OCEAN CONDITION MONITORING AND DATA UTILITY PROGRAM

IN RECENT YEARS, THE POTENTIAL FOR REMOTE SENSING OF NATURAL PHYSICAL PHENOMENA HAS BEEN ADVANCED BY RESEARCH AND DEVELOPMENT PROGRAMS IN THE FIELDS OF METEROLOGY AND LAND OBSERVATIONS. WITH THE EXCEPTION OF SURFACE PHOTOGRAPHS, CLOUD COVER PHOTOGRAPHS AND INFRARED DERIVED SURFACE TEMPERATURES, LITTLE USE HAS BEEN MADE OF REMOTE SENSING TECHNIQUES FOR OCEANOLOGICAL PURPOSES. RECOGNIZING THE DYNAMIC NATURE OF THE OCEANS, THEIR AFFECT ON MARITIME COMMERCE, WEATHER, AND THE SCIENCE OF OUR ENVIRONMENT, AND THE DIFFICULTY AND EXPENSE OF OBTAINING IN SITU MEASUREMENTS, USERS BEGAN TO ESTABLISH REQUIREMENTS CONSISTENT WITH THE NEED TO REMOTELY SENSE THE WORLD'S OCEANS. BEGINNING IN 1973; GOVERNMENT, ACADEMIC AND COMMERCIAL USERS INVOLVED IN OCEAN RELATED SCIENCE AND APPLICATIONS FORMED A GROUP TO DEFINE AND PRESCRIBE A PROGRAM DEDICATED TO SERVE THESE NEEDS. THE SEASAT-A PROGRAM HAS BEEN INITIATED AS A "PROOF-OF-CONCEPT" MISSION TO EVALUATE THE EFFECTIVENESS OF REMOTELY SENSING OCEANOLOGICAL AND RELATED METEROLOGICAL PHENOMENA FROM A SATELLITEBORNE PLATFORM IN SPACE THROUGH UTILIZATION OF REMOTE SENSORS DEVELOPED ON PREVIOUS SPACE AND AIRCRAFT TEST PROGRAMS. THE USERS HAVE BEEN AND CONTINUE TO BE THE ARCHITECTS OF THIS EVOLVING PROGRAM. THEY HAVE FORMED AN OCEANOLOGY ADVISORY SUBCOMMITTEE WHICH MEETS REGULARLY TO DEFINE, GUIDE, AND REVIEW THE PROGRAM. REPRESENTED ARE THE DEPARTMENTS OF COMMERCE, DEFENSE, INTERIOR, TRANSPORTATION. ALSO REPRESENTED ARE THE NATIONAL SCIENCE FOUNDATION, NATIONAL ACADEMY OF SCIENCES,

NATIONAL ACADEMY OF ENGINEERING, AND SEVERAL UNIVERSITIES INCLUDING SCRIPPS INSTITUTE AND WOODS HOLE. FROM THE PRIVATE SECTOR, THE USER COMMUNITY INCLUDES REPRESENTATIVES OF THE U.S. SHIPPING INDUSTRY, OIL INDUSTRY, FISHING INDUSTRY AND COASTAL INDUSTRIES. NASA'S GOAL WITH ITS OCEAN APPLICATIONS PROGRAM IS TO DEVELOP AND TRANSFER TO THESE USERS A TECHNOLOGY THAT PRODUCES SCIENTIFIC, COMMERCIAL AND SOCIAL BENEFITS THAT HAVE MEASURABLE IMPACT ON MARITIME AND RELATED OPERATIONS.

PROGRAM DESCRIPTION

ALTHOUGH THE SEASAT-A MISSION IS THE CORE OF THE EXISTING PROGRAM, ADDITIONAL RESEARCH AND DEVELOPMENT, TECHNOLOGY TRANSFER ACTIVITIES, AND SYSTEM DEVELOPMENTS ARE INCLUDED IN THE OCEANS PROGRAM. EXAMPLES OF ADVANCED PROGRAM PLANNING ACTIVITIES ARE CONTINUED IMPROVEMENTS IN SENSOR TECHNOLOGY IN LINE WITH USER MEASUREMENT REQUIREMENTS. AS A CASE IN POINT, THE REMOTE MEASUREMENT OF SURFACE PRESSURE GLOBALLY TWICE A DAY WOULD HAVE PROFOUND EFFECTS ON WEATHER AND SEA CONDITION FORECASTING. AT PRESENT WE ARE INVESTIGATING HOW TO MAKE THESE MEASUREMENTS.

IN THE AREA OF BENEFITS ASSESSMENT AND VALIDATION, THE USERS AND NASA ARE PERFORMING EXPERIMENTS WITH WEATHER AND SEA CONDITION FORECASTING MODELS TO DETERMINE HOW TO USE THE NEW OCEANOGRAPHIC DATA TO IMPROVE THE FORECASTS; AND ALSO WHAT EFFECT DATA IMPROVEMENTS WILL HAVE ON INDUSTRIES ENGAGED IN COMMERCE DEPENDENT ON THE OCEAN ENVIRONMENT.

IN ADDITION TO SEASAT-A, SYSTEM DEVELOPMENTS INCLUDE AN AIRCRAFT SUPPORTED SURFACE TRUTH PROGRAM TO VALIDATE REMOTELY SENSED MEASUREMENTS AND TO AID IN SENSOR RESEARCH AND DEVELOPMENT BEFORE A SATELLITE DESIGN IS UNDERTAKEN. IN ADDITION, THE GEOS-3 PROGRAM HAS BEEN COLLECTING DATA ON SEA SURFACE GEODESY, TOPOGRAPHY AND SURFACE ROUGHNESS OR SEASTATE SINCE THE SPRING OF 1975.

THE GEOS SATELLITE USES A RADAR ALTIMETER TO MAKE THESE MEASUREMENTS AND CAN VIEW SURFACE PHENOMENA THROUGH NORMAL CLOUD COVERS.

SEASAT-A

THE SEASAT SPACECRAFT COMPRISES A STANDARD EXISTING SATELLITE BUS COMMON TO OTHER SATELLITE PROGRAMS AND A CUSTOMIZED SENSOR MODULE WHICH SUPPORTS AND ACCOMMODATES SEASAT SENSORS AND THEIR ANTENNAS.

IN MAY 1978, NASA PLANS TO LAUNCH SEASAT-A IN CIRCULAR NEAR-POLAR 800 Km ORBIT INCLINED AT 108^{o}. IN ADDITION TO FIVE EARTH VIEWING SENSORS, TRACKING AIDS WILL ASSIST THE GROUND SYSTEM IN DETERMINING WHERE THE SATELLITE IS AND WHERE THE SENSORS ARE SCANNING SO THAT DATA CAN BE ACCURATELY GROUND LOCATED.

AS SPECIFIC REQUIREMENTS EVOLVED WITHIN THE USING COMMUNITY, CANDIDATE REMOTE SENSING INSTRUMENTS WERE EVALUATED JOINTLY BY THE USERS AND NASA FOR SEASAT-A APPLICATIONS. A SET OF THREE ACTIVE RADARS AND TWO PASSIVE RADIOMETERS WERE ULTIMATELY SELECTED. THE ACTIVE SENSORS INCLUDE A PULSE-COMPRESSED RADAR ALTIMETER, A MICROWAVE RADAR SCATTEROMETER AND A

SYNTHETIC APERTURE IMAGING RADAR. PASSIVE SENSORS CONSIST OF A SCANNING MULTIFREQUENCY MICROWAVE RADIOMETER AND A VISIBLE/INFRARED SCANNING RADIOMETER.

THE SEASAT RADAR ALTIMETER SERVES TWO FUNCTIONS. IT MONITORS AVERAGE WAVE HEIGHT TO WITHIN 0.5 TO 1 METER. IT ALSO MEASURES TO A PRECISION OF TENS OF CENTIMETERS, THE CHANGES IN THE OCEAN GEOID AND TOPOGRAPHY DUE TO GRAVITY VARIATIONS AND OCEAN TIDES, SURGES, AND CURRENTS.

AS SURFACE WINDS INCREASE, SO DOES FINE SCALE SURFACE ROUGHNESS. THE RADAR SCATTEROMETER MEASURES THIS FUNCTION WHICH CAN BE CONVERTED DIRECTLY INTO WIND SPEED AND DIRECTION. THE SCATTEROMETER WILL MEASURE WIND SPEEDS FROM 3 TO 25M/SEC WITH 2M/SEC ACCURACY, AND DIRECTION WITHIN 20 DEGREES OVER TWO 500 KM SWATHS ON EITHER SIDE OF THE SPACECRAFT GROUND TRACK.

THE FIVE-FREQUENCY MICROWAVE RADIOMETER SERVES FOUR FUNCTIONS: (1) IT MEASURES SURFACE TEMPERATURE WITH A PRECISION OF 1 DEG. C, (2) IT MEASURES FOAM BRIGHTNESS WHICH CAN IN TURN BE CONVERTED INTO A MEASUREMENT OF HIGH (UP TO 50M/SEC) WIND SPEED, (3) IT MAPS ICE COVERAGE AND (4) IT PROVIDES ATMOSPHERIC CORRECTION DATA TO THE ACTIVE RADARS BY MEASURING LIQUID AND GASEOUS WATER CONTENT IN THE UPPER ATMOSPHERE. THE SURFACE SWATH OF THE MICROWAVE RADIOMETER IS 600 KM.

THE VISIBLE AND INFRARED RADIOMETER WILL PROVIDE CLEAR WEATHER SURFACE TEMPERATURE DATA, CLOUD COVERAGE PATTERNS, AND CORROBORATIVE IMAGES OF OCEAN AND COASTAL FEATURES WITH A RESOLUTION OF 5 KM OVER A SWATH OF 1500 KM.

THESE FOUR SENSORS, KNOWN AS THE GLOBAL SENSORS, WILL MONITOR THE OCEANS AND ADJACENT COASTAL WATERS GLOBALLY. THEIR DATA WILL BE RECORDED ON MAGNETIC TAPE RECORDERS ON-BOARD SEASAT AND BE PLAYED BACK WHILE THE SATELLITE IS OVER ONE OF THE GROUND STATIONS SUPPORTING SEASAT.

VIRTUALLY COMPLETE GLOBAL COVERAGE IS ACHIEVED BY THE SCATTEROMETER, THE MICROWAVE RADIOMETER, AND THE VISIBLE AND INFRARED RADIOMETER EVERY 36 HOURS. THE ALTIMETER PROVIDES CONTINUOUS FULL TIME SUBSATELLITE DATA OF SURFACE TOPOGRAPHY AND ROUGHNESS. THE FIFTH SENSOR, THE SYNTHETIC APERTURE RADAR, WILL PROVIDE ALL-WEATHER IMAGERY OF OCEAN WAVES, ICE FIELDS, ICEBERGS, ICE LEADS, AND COASTAL CONDITIONS AND DYNAMIC PROCESSES TO A RESOLUTION OF 25M OVER A 100 KM SWATH. BECAUSE OF THE VERY HIGH DATA BANDWIDTH OF THE RADAR IMAGERY, (110 MEGABITS PER SECOND) THIS SENSOR WITH ITS OWN SEPARATE DATA SYSTEM, WILL BE OPERATED ONLY IN REAL TIME WHILE WITHIN LINE OF SIGHT OF SPECIFIC TRACKING STATIONS EQUIPPED TO RECEIVE AND RECORD ITS DATA.

SEASAT-A'S SCHEDULED "ON-TIME" LAUNCH WAS PLANNED BY THE USERS TO BE SUPPORTIVE OF OTHER EFFORTS SUCH AS THE INTERNATIONAL "GLOBAL ATMOSPHERIC RESEARCH PROGRAM-GARP", AND IN PARTICULAR THE FIRST GLOBAL GARP EXPERIMENT (FGGE) IN 1978.

PROVIDING SYSTEMS CAPABLE OF PRODUCING OCEANOLOGICAL DATA IS OF LITTLE VALUE WITHOUT END ITEM USERS THAT REALLY DO NEED THE DATA AND CAN USE IT ULTIMATELY TO PROTECT AND IMPROVE OUR INTERACTION WITH THE ENVIRONMENT. UNLESS WEATHER FORECASTERS CAN PRODUCE A BETTER PRODUCT, OR SHIPPERS AND RESOURCE DEVELOPERS CAN AFFECT SAFER, MORE EFFICIENT AND

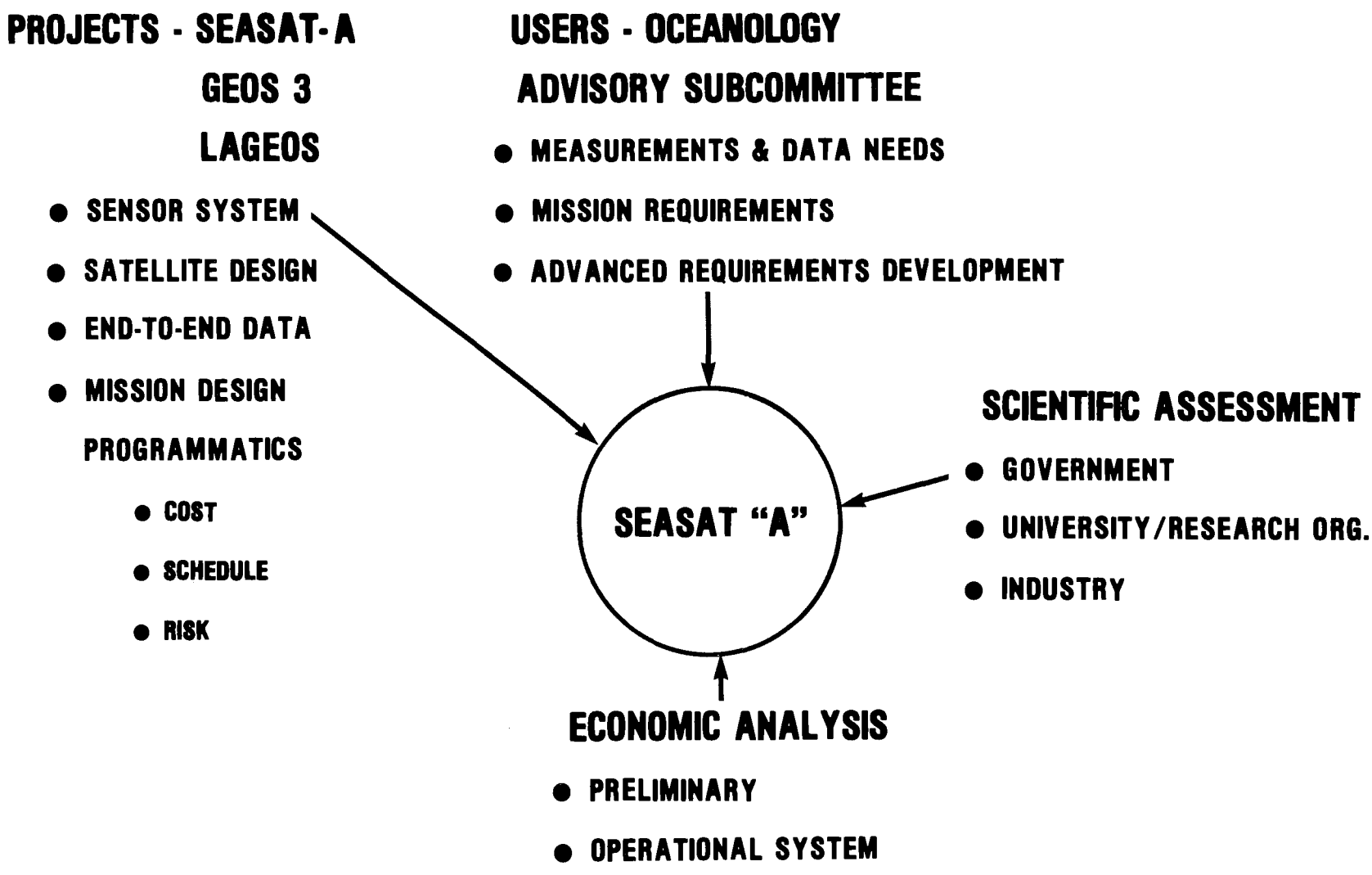
PRODUCTIVE COMMERCE, OR UNTIL SCIENTISTS CAN BETTER UNDERSTAND NATURE AND OUR INTERACTION WITH IT, THE DATA IS OF LIMITED VALUE AND COULD BE CLASSED AS A TECHNICAL CURIOSITY.

THE OCEAN MONITORING AND DATA UTILITY PROGRAM, OF WHICH SEASAT-A IS A PART, HAS DEVELOPED A USER ORIENTED "END-TO-END" DATA SYSTEM BASED ON THE PRINCIPAL THAT IF THE DATA IS VALUABLE, USERS SHOULD PROVIDE THOSE RESOURCES AND FACILITIES REQUIRED TO UNIQUELY PROCESS AND ASSIMILATE THE DATA IN ACCORDANCE WITH THEIR PECULIAR NEEDS. NASA'S JOB IS TO VALIDATE AND DEMONSTRATE SYSTEM PERFORMANCE AND TO TRANSFER THE DATA CONVERSION TECHNIQUES LEARNED DURING THIS PROCESS TO THE USERS. THE NAVY'S FLEET NUMERICAL WEATHER CENTRAL WILL OBTAIN NEAR REAL TIME SEASAT-A DATA VIA A COMMUNICATIONS SATELLITE LINK-UP TO THEIR FACILITY IN MONTEREY, CALIFORNIA, AND PLANS TO PROCESS AND USE DATA IN THEIR DAILY FORECASTS. OTHER USERS SUCH AS NOAA AND THE DEPARTMENT OF INTERIOR HAVE SIMILAR "REAL-TIME" AND NON-REAL DATA EXPERIMENT PLANS. USER INVOLVEMENT IS THE KEY TO SUCCESSFUL SYSTEM DEMONSTRATION AND VALIDATION. IT IS EXPECTED THAT THIS INVOLVEMENT WILL CONTINUE TO EXPAND BEFORE AND AFTER THE LAUNCH. THE USER SPONSORED SOLICITATION AND SUPPORT OF SCIENTIFIC INVESTIGATIONS AND INDUSTRY SPONSORED ECONOMIC VERIFICATION EXPERIMENTS WILL BE THE IMPORTANT MEANS OF DETERMINING THE ULTIMATE VALUE OF OCEAN REMOTE SENSING.

ALTHOUGH INTERNATIONAL USERS ARE NOT CURRENTLY PART OF THE ESTABLISHED PROGRAM, THEIR INVOLVEMENT IS IMPORTANT TO PROGRAM SUCCESS IN EXPANDED COVERAGE AND SENSOR VALIDATION AS WELL AS SCIENTIFIC AND APPLICATIONS SUPPORT. NASA PLANS FOR A PROGRAM BASED ON OPEN USE OF THE DATA MUCH THE SAME AS LANDSAT.

FROM A SYMPOSIUM IN WILLIAMSTOWN, MASS., IN 1969, THE GOALS AND OBJECTIVES FOR OBSERVATION, MEASUREMENT AND INTERPRETATION OF PHYSICAL OCEAN PHENOMENA HAVE EVOLVED, AIDED BY CONTINUING INTERACTION BETWEEN OCEAN USERS AND SYSTEM DESIGNERS. IN 1972, NASA'S EARTH AND OCEANS PHYSICS APPLICATIONS PROGRAMS (EOPAP) OBJECTIVES WERE PUBLISHED; THEY INCLUDED SPECIFIC RECOMMENDATIONS FROM A GROUP OF GOVERNMENTAL, INSTITUTIONAL, AND PRIVATE OCEAN USERS WORKING WITH THE PROGRAM. SINCE THEN A SERIES OF MEETINGS OF THE USERS WORKING GROUP HAVE BEEN HELD TO CONTINUE THE REFINEMENT OF PROGRAM REQUIREMENTS DURING THE PROGRAM DEFINITION PHASE, TO TAKE ADVANTAGE OF ADVANCEMENTS IN THE FIELD OF REMOTE SENSING, AND TO RESOLVE ANY APPARENT CONFLICTS BETWEEN REQUIREMENTS AND CAPABILITIES. THESE SAME USERS ALSO PREPARED A SCIENTIFIC ASSESSMENT OF SEASAT-A CAPABILITIES AND WORKED CLOSELY WITH NASA TO DETERMINE THE POSSIBLE ECONOMIC BENEFITS ASSOCIATED WITH AN OPERATIONAL SYSTEM. CURRENTLY, A FORMALLY ORGANIZED OCEANOLOGY ADVISORY SUBCOMMITTEE UNDER THE AUSPICES OF NASA'S APPLICATIONS ADVISORY COMMITTEE, DERIVED FROM THE USERS WORKING GROUP, CONDUCTS REGULAR BIMONTHLY MEETINGS TO CONTINUE THESE INTERACTIONS. THESE CONTINUING INTERACTIONS HAVE BEEN ESSENTIAL IN CONVERTING USER REQUIREMENTS INTO A TOTAL SYSTEM WITH THE SOLE GOAL OF PROVIDING CONTINUOUS USEFUL DATA TO THE OCEAN USING COMMUNITY IN A TIMELY MANNER.

SEASAT TODAY REPRESENTS A 4 YEAR EFFORT



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SEASAT-A OBJECTIVES

(1) TO DEMONSTRATE THE CAPABILITY FOR:

- GLOBAL MONITORING OF WAVE HEIGHT AND DIRECTIONAL SPECTRA SURFACE WINDS OCEAN TEMPERATURE AND CURRENT PATTERNS.
- MEASURING PRECISE SEA-SURFACE TOPOGRAPHY
- DETECTING CURRENTS, TIDES, STORM SURGES, AND TSUNAMIS
- CHARTING ICE FIELDS AND NAVIGABLE LEADS THROUGH ICE
- MAPPING THE GLOBAL OCEAN GEOID

(2) TO PROVIDE FOR USER APPLICATIONS SUCH DATA AS:

- PREDICTIONS OF WAVE HEIGHT, DIRECTIONAL SPECTRA AND WIND FIELDS FOR SHIP ROUTING, SHIP DESIGN, STORM-DAMAGE AVOIDANCE, COASTAL DISASTER WARNING, COASTAL PROTECTION AND DEVELOPMENT, AND DEEP WATER PORT DEVELOPMENT
- MAPS OF CURRENT PATTERNS AND TEMPERATURES FOR SHIP ROUTING FISHING, POLLUTION DISPERSION AND ICEBERG HAZARD AVOIDANCE.
- CHARTS OF ICE FIELDS AND LEADS FOR NAVIGATION AND WEATHER PREDICTION.
- CHARTS OF THE OCEAN GEOID FINE STRUCTURE

SEASAT-A OBJECTIVES (CON'T)

(3) TO DETERMINE THE KEY FEATURES DESIRED IN FUTURE OPERATIONAL SYSTEMS FOR:

- GLOBAL SAMPLING
- NEAR REAL-TIME DATA PROCESSING AND DISSEMINATION
- USER FEEDBACK FOR OPERATIONAL PROGRAMMING

(4) TO DEMONSTRATE THE ECONOMIC AND SOCIAL BENEFITS OF USER AGENCY PRODUCTS

THE SEASAT SPACECRAFT

THE SEASAT SPACECRAFT BUS, THE AGENA FIRST FLOWN ON MILITARY SPACE MISSIONS IN 1959 AND SUBSEQUENTLY ON OVER 300 MISSIONS, HAS BEEN CONFIGURED TO SUPPORT THE OCEANOGRAPHIC MISSION REQUIREMENTS. THE SEASAT-A SPACECRAFT COMPRISES A STANDARD SATELLITE BUS AND A CUSTOMIZED SENSOR MODULE WHICH SUPPORTS AND ACCOMMODATES SEASAT SENSORS AND THEIR ANTENNAS.

THE AGENA MAIN ENGINE PROPELS SEASAT-A FROM SEPARATION OF THE ATLAS BOOSTER TO INSERTION IN ORBIT. ON ORBIT THE AGENA BUS PROVIDES 626 WATTS AVERAGE, 1180 WATTS PEAK, ELECTRICAL POWER: STABILIZATION AND ATTITUDE CONTROL IS ACHIEVED WITH A MOMENTUM BIAS SYSTEM INCLUDING ORBIT TRIMMING; COMMAND RECEPTION, STORAGE AND EXECUTION; AND DATA STORAGE AND TRANSMISSION ARE ALSO PART OF THE BUS. TRACKING AIDS INCLUDE AN S-BAND TRANSPONDER, DOPPLER BEACON, AND LASER RETRO-REFLECTORS.

THE SEASAT PROGRAM IS A FIRST ATTEMPT TO EXPLOIT THE BROAD APPLICABILITY OF ACTIVE AND PASSIVE MICROWAVE SENSORS, WHICH CAN PENETRATE NOMINAL CLOUD COVER TO ACHIEVE A DAY/NIGHT ALL WEATHER CAPABILITY. THE LEVEL OF NATURAL MICROWAVE ENERGY BACKSCATTERED AND THE SHAPE OF THE RETURN PULSE OF AN ACTIVE RADAR FROM THE OCEAN SURFACE ARE MODULATED BY WINDS, WAVES, TEMPERATURE, SALINITY, NUTRIENT AND POLLUTANT CONTENT, CURRENT AND UP-WELLING MOTIONS, FALLING RAIN, SURFACE PRESSURE, AND THE DISTRIBUTION AND DENSITY IN THE GASEOUS ATMOSPHERIC COLUMN. THE ENERGY EMITTED FROM THE SURFACE IS SIMILARLY MODULATED, ALTHOUGH THE MICRO-PROCESS MAY VARY SOMEWHAT DUE TO THE WAVELENGTHS OF THE ENERGY HAVING DIFFERENT SENSITIVITIES TO FEATURES OF DIFFERENT SIZES AND HAVING DIFFERENT TRANSMISSIVITIES WITHIN THE ATMOSPHERIC COLUMN OR INTO THE OCEAN. THESE DIFFERENCES AT DIFFERENT MICROWAVE AND INFRARED WAVELENGTHS ALLOW US TO SEPARATE AND QUANTIFY THE VARIOUS EFFECTS, USING REMOTE-SENSING TECHNIQUES FROM SATELLITE DISTANCES. THE SENSORS THAT FORM THE SEASAT-A PAYLOAD ARE DESCRIBED IN THE FOLLOWING PAGES.

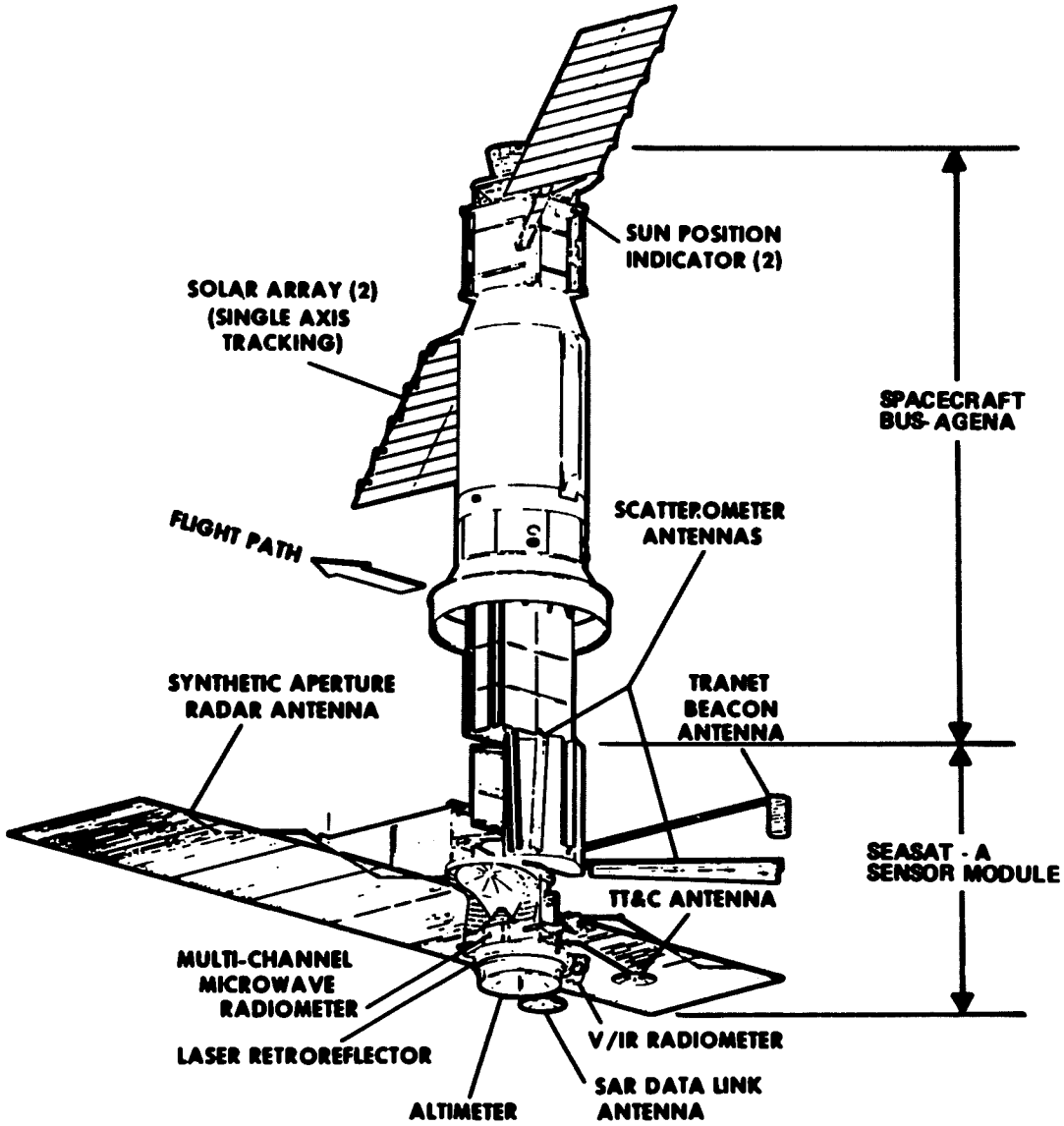

FIGURE 1 SEASAT-A

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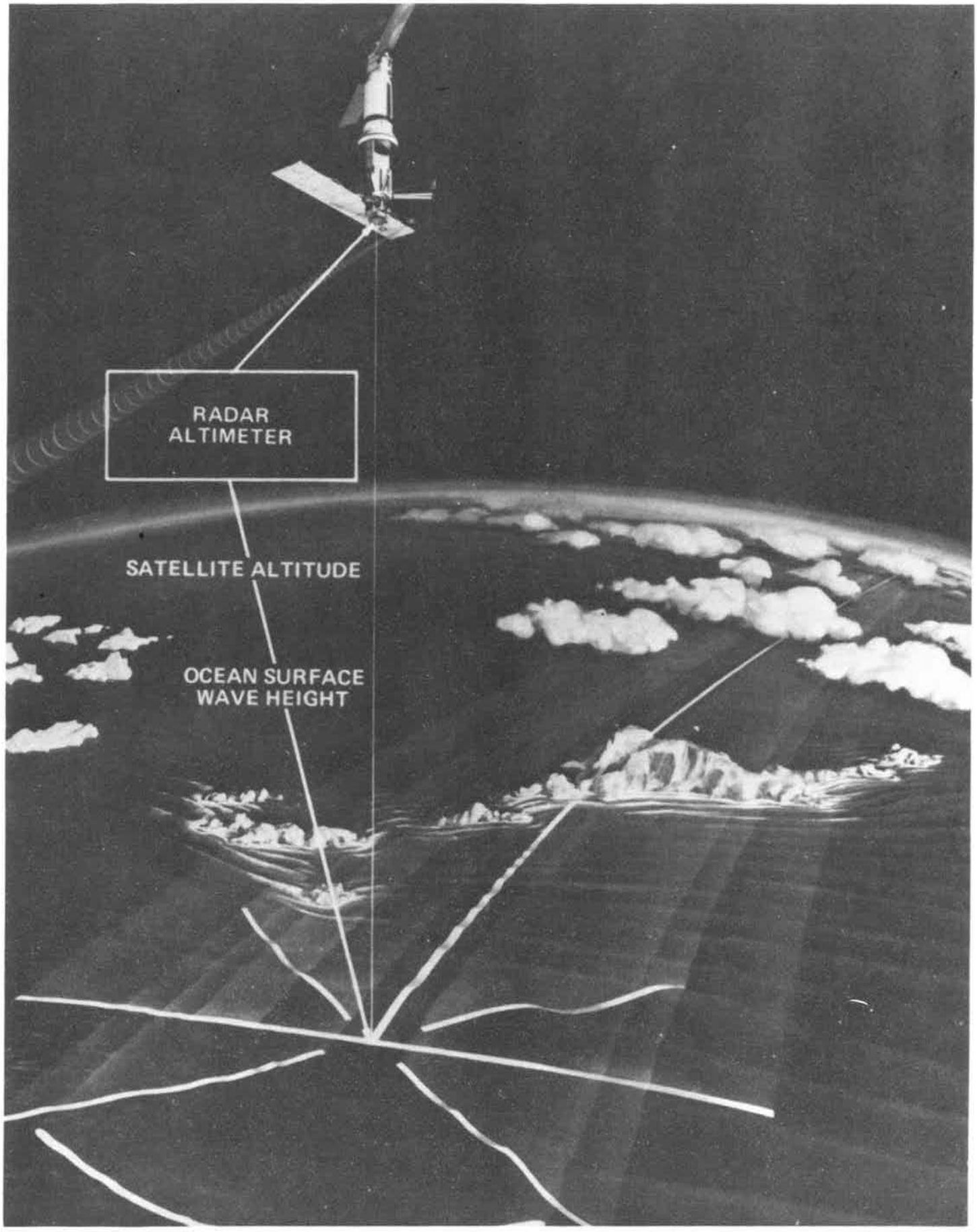
COMPRESSED PULSE RADAR ALTIMETER

THE ALTIMETER OF SEASAT-A WILL HAVE TWO SEPARATE FUNCTIONS: FIRST, TO MEASURE THE ALTITUDE BETWEEN THE SPACECRAFT AND THE OCEAN SURFACE TO +10 CM ROOT-MEAN-SQUARE AND SECOND, TO MEASURE WAVE HEIGHT FROM 1 TO ABOUT 20 METERS WITH AN ACCURACY OF 0.5M OR 10%.

THE INSTRUMENT IS A NEWER AND MORE ACCURATE VERSION OF THE GEOS-C RADAR ALTIMETER NOW IN ORBIT, AND SEASAT'S DATA SYSTEM WILL PERMIT CONTINUOUS GLOBAL MEASUREMENTS WHILE THE GEOS SATELLITE PROVIDES LINE OF SIGHT GROUND STATION AND ATS-6 RELAY SATELLITE DATA COLLECTION. THE SKYLAB ALTIMETER (S-193) WAS THE FIRST TO GIVE A CONTINUOUS DIRECT MEASUREMENT OF THE SEA SURFACE TOPOGRAPHY FROM A SATELLITE. PROMINENT SURFACE DEPRESSIONS DUE TO DEEP OCEAN TRENCHES AND CORRESPONDING ELEVATIONS RESULTING FROM SEAMOUNTS, PLATEAUS, AND RIDGES, ALREADY ROUGHLY OBSERVED FROM SKYLAB, ARE NOW MORE PRECISELY MEASURED BY GEOS-C WITH A SENSOR ACCURACY OF APPROXIMATELY HALF A METER. HAVING A MEASUREMENT PRECISION OF +10 CM WILL ENABLE SEASAT'S ALTIMETER TO IDENTIFY AND "SEE" SUCH TIME-VARYING FEATURES AS MAJOR CURRENTS RANGING UPWARDS FROM 30-50 CM/SEC SINCE THE SLOPE OF THE SURFACE IS PROPORTIONAL TO THE SURFACE SPEED. THE SAME ALTIMETER PRECISION OF +10 CM MIGHT ALSO OBSERVE SPECIFIC PHENOMENA SUCH AS STORM SURGES, HURRICANES, AND MIGHT EVEN ALLOW MEASUREMENT OF THE HEIGHT AND DISTRIBUTION OF TSUNAMIS, THE LONG, FAST WAVES CAUSED BY EARTHQUAKES. HOWEVER, THE SATELLITE MUST BE OVERHEAD AS THESE EVENTS OCCUR, SINCE THE INSTRUMENT LOOKS DIRECTLY DOWN AT THE NADIR.

THE SECOND FUNCTION OF THE SEASAT-A ALTIMETER IS THE MEASUREMENT OF WAVE HEIGHT. THIS MEASUREMENT IS REQUIRED IN ORDER TO ELIMINATE SEA STATE BIAS TOWARD THE GOAL OF REACHING 10 CM ALTITUDE SENSOR MEASUREMENT ACCURACY. ADDITIONALLY, WAVE HEIGHT IS VALUABLE IN ITS OWN RIGHT, SINCE IT PROVIDES A MEASUREMENT OF SURFACE ROUGHNESS AND CAN BE USED TO ESTIMATE SEA STATE AS THE SATELLITE CIRCLES THE GLOBE.

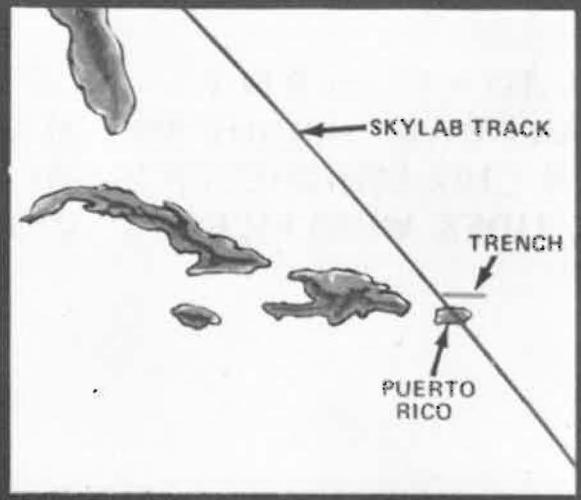
THIS SENSOR WILL BE OPERATED ON A FULL TIME BASIS AND THE DATA WILL BE RECORDED CONTINUOUSLY.

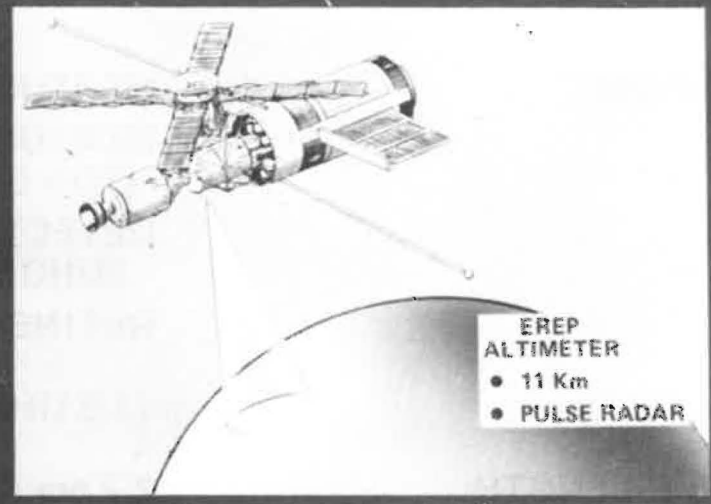

RADAR
ALTIMETER
SATELLITE ALTITUDE
OCEAN SURFACE
WAVE HEIGHT

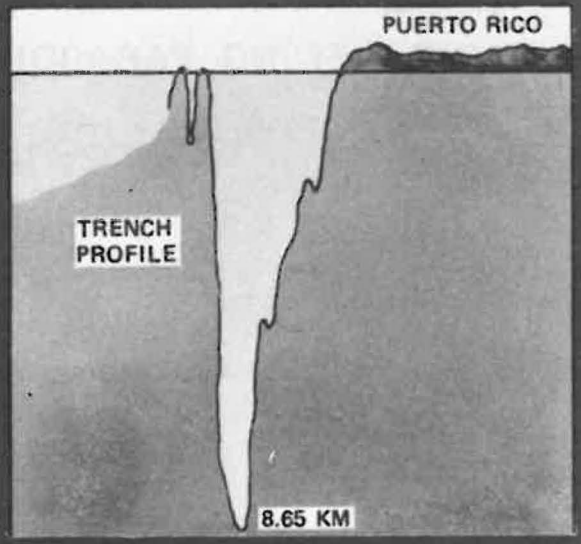
AN EXAMPLE OF ALTIMETRIC MEASUREMENTS IS THIS PICTORIAL DEPICTING SKYLABS MEASUREMENT OF THE PUERTO RICO TRENCH.

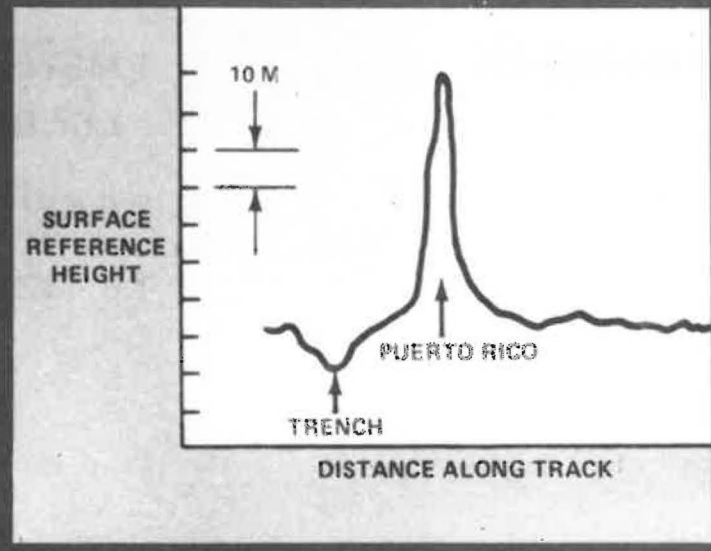
SKYLABS ALTIMETER MEASURED 10-15 METER VARIATIONS IN THE SURFACE REFERENCE OVER THE TRENCH. THESE MEASUREMENTS AGREED WITH EARLIER MEASUREMENTS OF THIS DEPRESSION MADE BY VON ARX OF WOODS HOLE.

GEOIDAL STUDIES PUERTO RICO TRENCH









NASA HQ ML74-5035
1-23-74

SEASAT-A RADAR ALTIMETER

PURPOSE:	MEASURE ALTITUDE TO + 10 cm R.M.S. MEASURE SIGNIFICANT WAVE HEIGHT TO 1-20 METERS TO ± 0.5 METERS OR ± 10% (WHICHEVER IS GREATER) DETECT CURRENTS, TIDES, WIND PILE UPS, AND STORM SURGES REFINE GEOID
FREQUENCY:	13.5 GHz (Ku-Band)
WAVE LENGTH:	2.2 cm
ANTENNA:	1 METER DIAMETER, NADIR VIEWING PARABOLIC 1.5° BEAM WIDTH
DATA RATE:	8.5 KBITS/SEC
SPOT SIZE:	1.6 - 12.0 km

NASA HQ ES76 997A (1)
Rev. 12-12-77

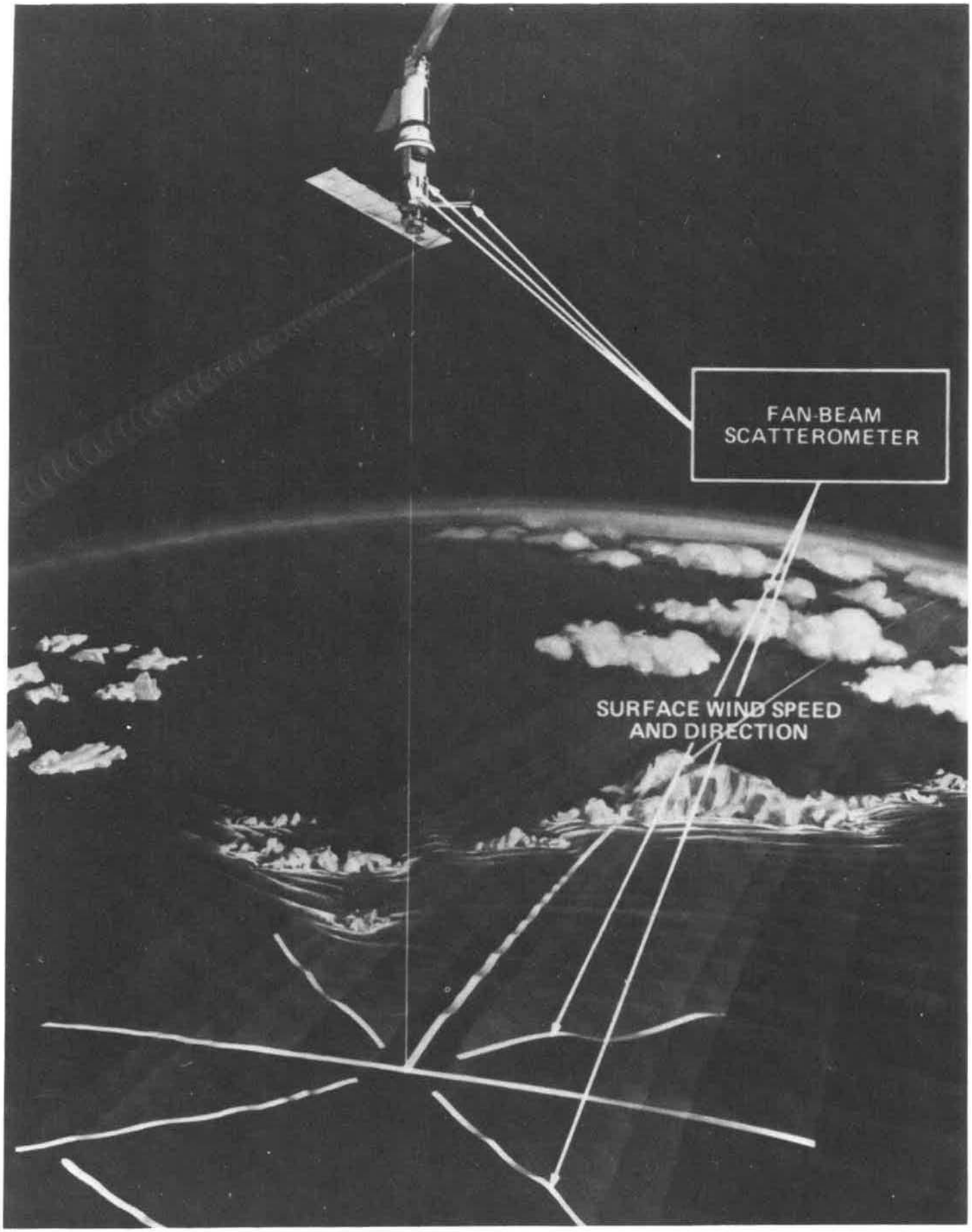
SEASAT-A RADAR ALTIMETER (Cont'd)

PEAK POWER:	2.0 Kw
TRANSMIT PULSE WIDTH:	3μSEC
PRF:	1020 Hz
EFFECTIVE PULSE WIDTH:	3.125 NSEC
SNR:	13 dB
POWER:	177 WATTS
WEIGHT:	95 Kg
SPACECRAFT HERITAGE:	GEOS-C - SKYLAB (S-193)
AIRCRAFT HERITAGE:	AAFE RADAR ALTIMETER WALLOPS/NRL NANOSECOND RADAR
INSTRUMENT REPRESENTATIVE:	W. F. TOWNSEND - WALLOPS
EXPERIMENT TEAM LEADER:	DR. BYRON TAPLEY - UNIV. OF TEXAS

MICROWAVE WIND SCATTEROMETER

THIS ACTIVE RADAR SYSTEM IS INTENDED TO MEASURE WIND SPEED AT THE SURFACE OF THE OCEAN IN THE RANGE FROM LESS THAN 4M/SEC TO GREATER THAN 26M/SEC WITH AN ACCURACY OF ± 10%. INHERITED FROM THE SKYLAB EXPERIMENTAL SCATTEROMETER, IT WILL DETERMINE WIND DIRECTION WITHIN 20^{o} SECTORS OF A FULL 360^{o} RANGE WITH AMBIGUITY. THE SCATTEROMETER WILL TAKE MEASUREMENTS OVER TWO 500KM -WIDE SWATHS EQUALLY DISPLACED ABOUT THE NADIR BY 200 KM. A HIGH WIND SWATH ON EACH SIDE ADDS AN ADDITIONAL 250 KM OF COVERAGE AT THE SWATH WIDE EXTREMITIES.

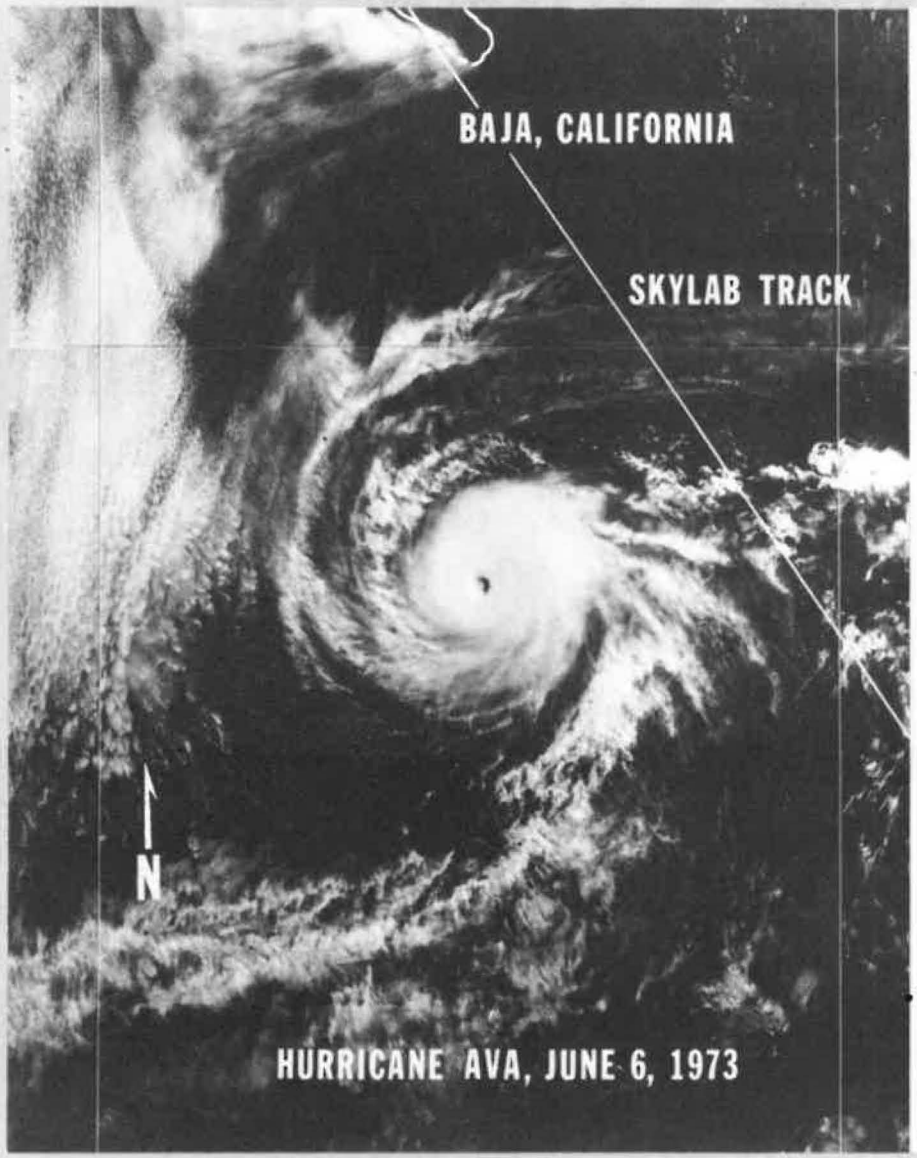
THIS SENSOR WILL BE OPERATED ON A FULL TIME BASIS AND THE DATA WILL BE RECORDED CONTINUOUSLY.

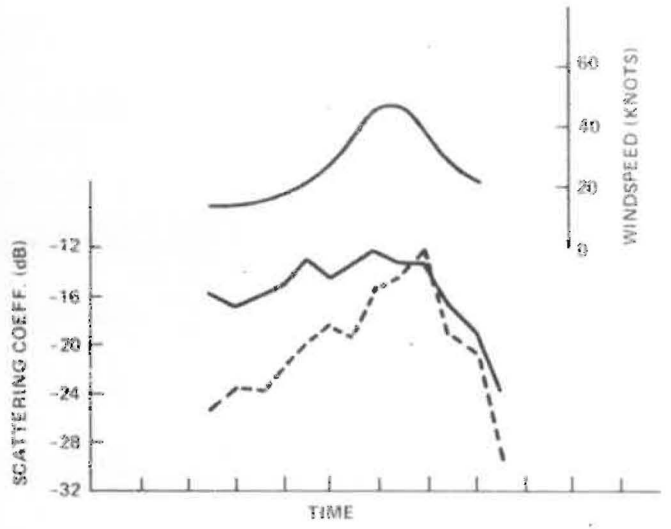

FAN-BEAM
SCATTEROMETER
SURFACE WIND SPEED
AND DIRECTION

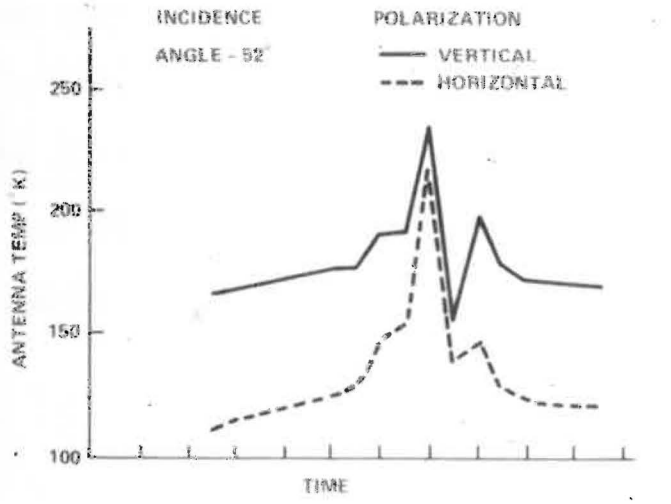
SKYLAB WIND MEASUREMENTS

IN 1973 THE SKYLAB OBSERVED WINDS NEAR THE PACIFIC HURRICANE AVA NEAR THE COAST OF BAJA CALIFORNIA. THESE WIND MEASUREMENTS AGREED CLOSELY WITH SURFACE OBSERVATIONS MADE BY A LOW FLYING AIRCRAFT BEING OPERATED BY THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION.

HURRICANE AVA OBSERVATIONS (JUNE 6, 1973)







NASA HQ ML74-5032
1-23-74

SEASAT-A RADAR SCATTEROMETER

PURPOSE:	MEASURE OCEAN SURFACE WIND SPEED FROM 4 M/S TO GREATER THAN 26 M/S WITH ACCURACY OF + 2 M/S OR 10% MEASURE WIND DIRECTION TO 20^{o} (with Ambiguity)
FREQUENCY:	14.59927 GHz (Ku-Band)
WAVELENGTH:	2.1 cm
ANTENNA BEAMS:	FOUR 25^{o} x 0.5^{o} POINTED 42^{o} OFF VERTICAL ALIGNED 45^{o} OFF SPACECRAFT TRACK ONE 40^{o} x 0.5^{o} ALONG SPACECRAFT TRACK DUAL POLARIZATION
COVERAGE:	TWO 500 km SWATHS WITH 400 km SEPARATION
RESOLUTION:	50 km
GRID SPACING:	100 km

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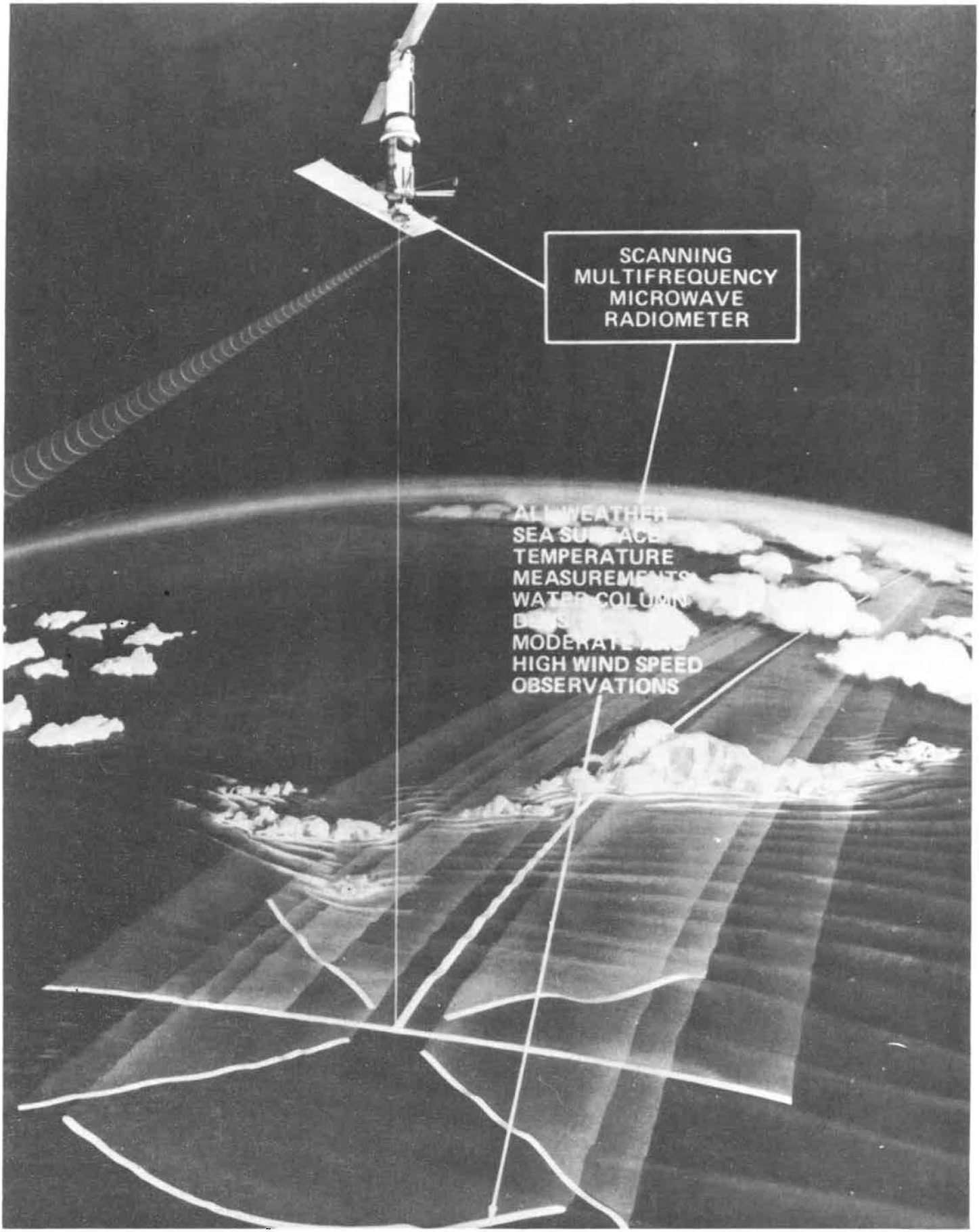
Rev. 12-12-77

SEASAT-A RADAR SCATTEROMETER (Cont'd)

TRANSMIT PULSE WIDTH:	5 mSEC
PRF:	34 Hz
PEAK TRANSMIT POWER:	125 WATTS
DOPPLER CELLS:	15
DATA RATE:	2 KBITS/SEC
POWER:	140 WATTS
WEIGHT:	60 Kg
SPACECRAFT HERITAGE:	SKYLAB RADSCAT (S-193)
AIRCRAFT HERITAGE:	AAFE/LANGLEY RADSCAT
INSTRUMENT REPRESENTATIVE:	WILLIAM GRANTHAM - LANGLEY
EXPERIMENT TEAM LEADER:	PROF. WILLARD PIERSON - CUNY

NIMBUS-G/SEASAT-A SCANNING MULTI-SPECTRAL (5 FREQUENCY) MICROWAVE RADIOMETER - SMMR

THIS SENSOR WILL USE A 80 CM MECHANICALLY SCANNING DISK ANTENNA WITH THE FIVE FREQUENCIES COMBINED IN A COMMON FEED SYSTEM. A 600 Km SWATH OFF CENTER WITH 560 Km TO THE RIGHT OF NADIR WILL BE ACHIEVED BY SCANNING 50^{o} CROSS TRACK AND 45^{o} AHEAD AND OFF NADIR OF THE SATELLITE. THE RADIOMETER WILL PROVIDE ALL WEATHER SEA SURFACE TEMPERATURES TO 1.5^{o} ABSOLUTE OR 1^{o} K RELATIVE ACCURACY. THIS SENSOR WILL ALSO PROVIDE HIGHER SPEED WIND AS WELL AS ICE MEASUREMENTS.


SCANNING
MULTIFREQUENCY
MICROWAVE
RADIOMETER
TEMPERATURE
HIGH WIND SPEED
OBSERVATIONS

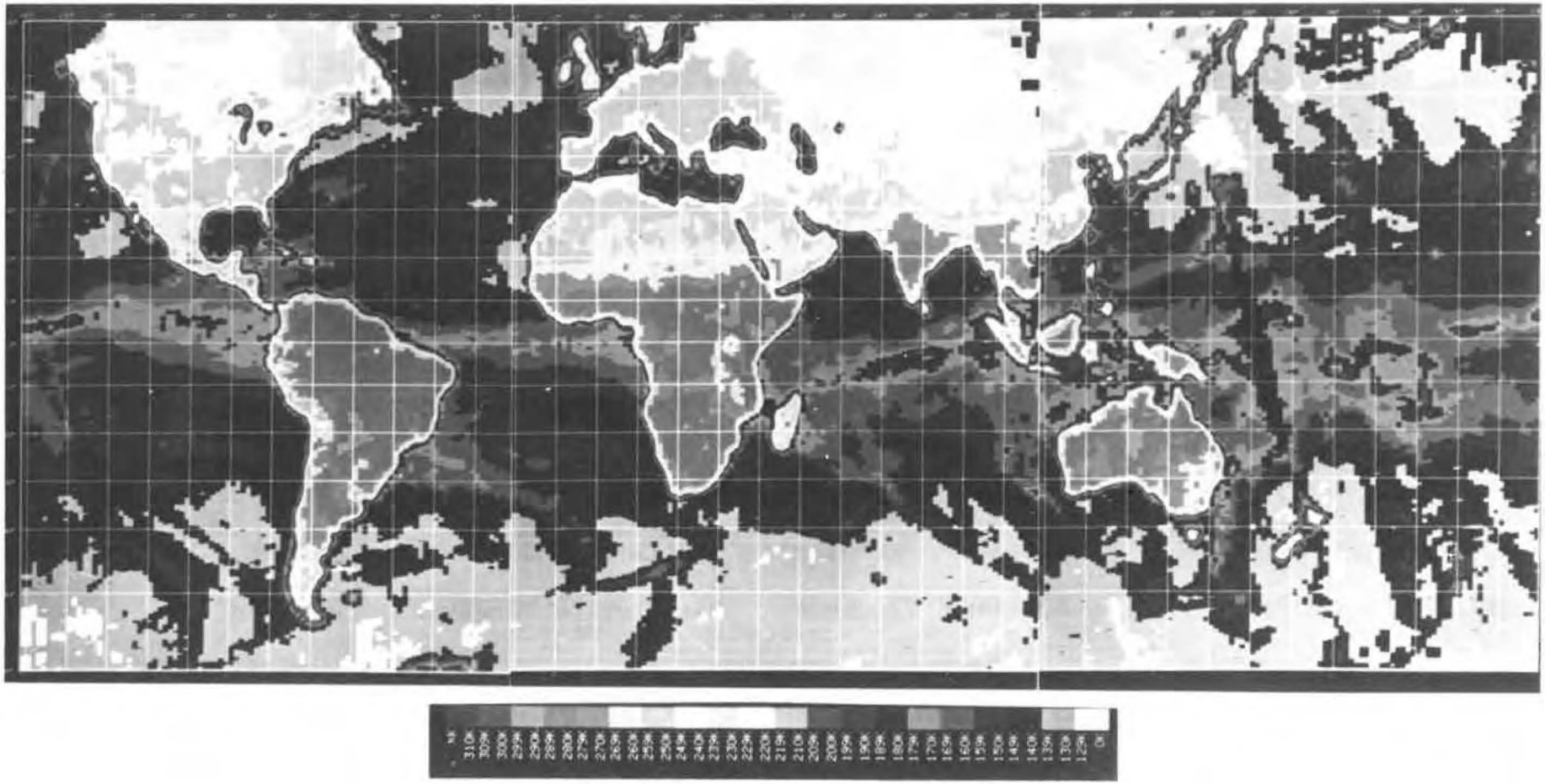
MICROWAVE BRIGHTNESS TEMPERATURE

THE SMMR WILL PRODUCE MAPS OF MICROWAVE BRIGHTNESS TEMPERATURES WHICH CAN BE CONVERTED TO PHYSICAL TEMPERATURES. THIS MAP OF MICROWAVE BRIGHTNESS, PRODUCED BY A PREDECESSOR INSTRUMENT ON NIMBUS-5, IS REPRESENTATIVE OF ONE DATA DISPLAY THAT CAN BE CREATED WITH THIS TYPE OF SENSOR.

RADIO BRIGHTNESS OF THE WORLD

NIMBUS-5 ELECTRICALLY SCANNED MICROWAVE RADIOMETER

($\lambda = 1.55$ cm)



12 – 16 January 1973

NIMBUS-G/SEASAT-A SCANNING MULTICHANNEL MICROWAVE RADIOMETER (SMMR)

PURPOSE:	IMAGE SURFACE RADIATION AT 5 MICROWAVE FREQUENCIES DETERMINE SEA SURFACE TEMP. TO 2^{o} K ABSOLUTE, 1^{o} K RELATIVE DETERMINE OCEAN SURFACE WIND SPEED 0-50 M/S TO + 2 M/S DETERMINE INTEGRATED LIQUID WATER CONTENT DETERMINE INTEGRATED WATER VAPOR CONTENT DETERMINE RAIN RATE DETECT ICE AGE, EXTENT, CONCENTRATION AND DYNAMICS				
FREQUENCY:	6.6 GHz	10.7 GHz	18.0 GHz	21.0 GHz	37.0 GHz
SPOT SIZE (IFOV):	87x144km	58x89km	31x53km	27x42km	16x25km

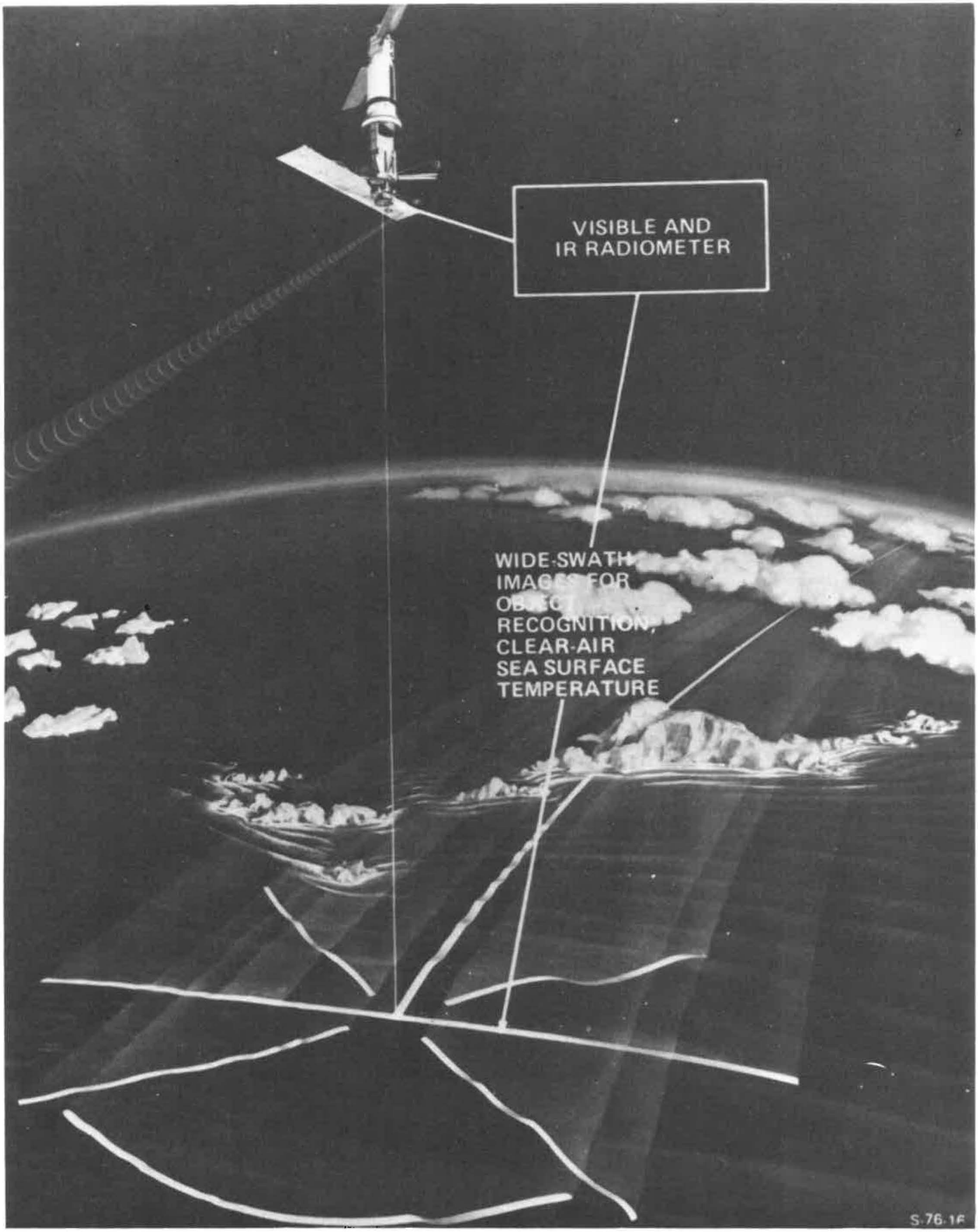
NASA HQ ES76 999A (1)
Rev. 12-12-77

NIMBUS-G/SEASAT-A SCANNING MULTICHANNEL MICROWAVE RADIOMETER (SMMR) (Cont'd)

COVERAGE:	900 km SWATH CENTERED ON SPACECRAFT TRACK
BANDWIDTH:	100 MHz
POWER:	60 WATTS
WEIGHT:	42 Kg
DATA RATE:	2 KBITS/SEC
SPACECRAFT HERITAGE:	NIMBUS-5 NEMS AND NIMBUS-E ESMR
AIRCRAFT HERITAGE:	NUMEROUS AIRCRAFT RADIOMETERS
INSTRUMENT REPRESENTATIVE:	BILL LANE - JPL
EXPERIMENT TEAM LEADER:	DUNCAN ROSS - NOAA

SCANNING VISIBLE/INFRARED RADIOMETER - V/IR

THIS SENSOR, ORIGINALLY FLOWN ON ITOS, WILL PROVIDE IMAGES OF VISIBLE AND THERMAL INFRARED EMISSION FROM OCEANS, COASTAL AND ATMOSPHERIC FEATURES IN SUPPORT OF THE OTHER INSTRUMENTS AND WILL HELP IDENTIFY CURRENTS AND STORMS. FROM ITS IMAGERY, CLEAR WEATHER TEMPERATURES CAN ALSO BE DEDUCED. THIS SENSOR WILL BE OPERATED ON A FULL TIME GLOBAL BASIS AND DATA WILL BE RECORDED ON A CONTINUOUS BASIS FOR TRANSFER TO GROUND RECEIVING STATIONS.


VISIBLE AND
IR RADIOMETER
WIDE-SWATH
IMAGES FOR
OBJECT
RECOGNITION,
CLEAR-AIR
SEA SURFACE
TEMPERATURE
S-76-1F

VISIBLE IMAGE OF SOUTHEASTERN U.S. FROM ITOS

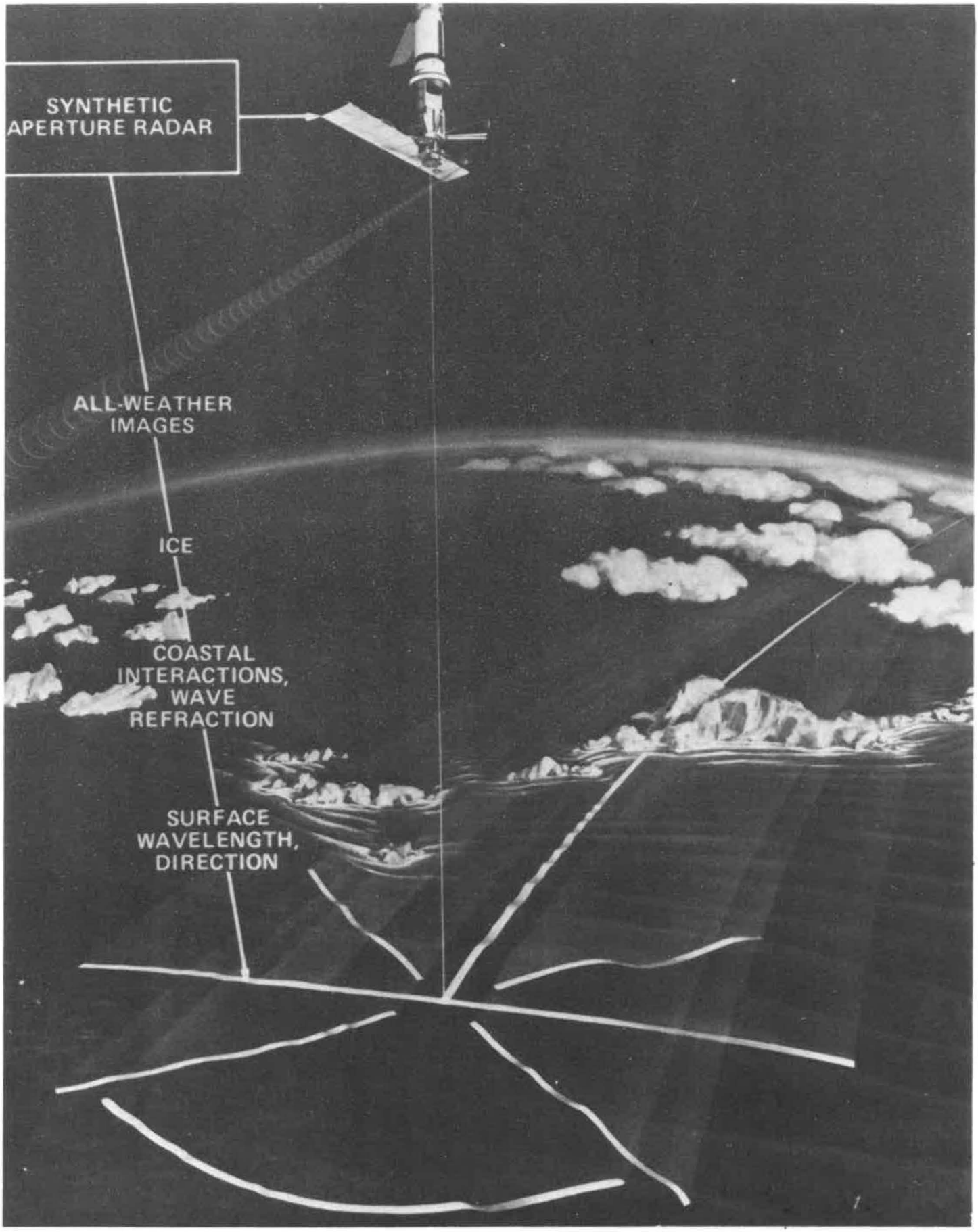
THIS IS THE SAME SENSOR TO BE CARRIED ON SEASAT-A. THE SEASAT-A ORBIT IS LOWER IN ALTITUDE THAN ITOS AND IS NOT SUN SYNCHRONOUS LIKE THE ITOS ORBIT. THESE DIFFERENCES PROVIDE AN OPPORTUNITY TO STUDY THE DIURNAL VARIATIONS IN CLOUD FEATURES AS WELL AS TO PROVIDE FEATURES IDENTIFICATION AND GROSS TEMPERATURE MEASUREMENTS FOR COMPARISON WITH THE OTHER SENSORS IN THE SEASAT COMPLIMENT.

SEASAT-A VISIBLE/IR SCANNER

PURPOSE:	IMAGE OCEAN AND COASTAL FEATURES AND CLOUDS DETECT CLOUD-FREE SEA SURFACE TEMPERATURE BOUNDARIES
VISIBLE WAVELENGTH:	0.49 - 0.94μm
INFRARED WAVELENGTH:	10.5 - 12.5μm
COVERAGE:	1800 km SWATH CENTERED ON NADIR
SPOT SIZE:	3 km (Visible) 5 km (IR)
POWER:	10 WATTS
WEIGHT:	20 Kg
DATA RATE:	12 KBIT/SEC
SPACECRAFT HERITAGE:	ITOS-E THROUGH ITOS-J
AIRCRAFT HERITAGE:	OCEAN TEMPERATURE SCANNER (OA Meteorology SRT)
PRECISION ACCURACY:	3^{o} / 5^{o} K
INSTRUMENT REPRESENTATIVE:	KEITH FELLERMAN - GODDARD
EXPERIMENT TEAM LEADER:	DR. E. PAUL McLAIN - NOAA

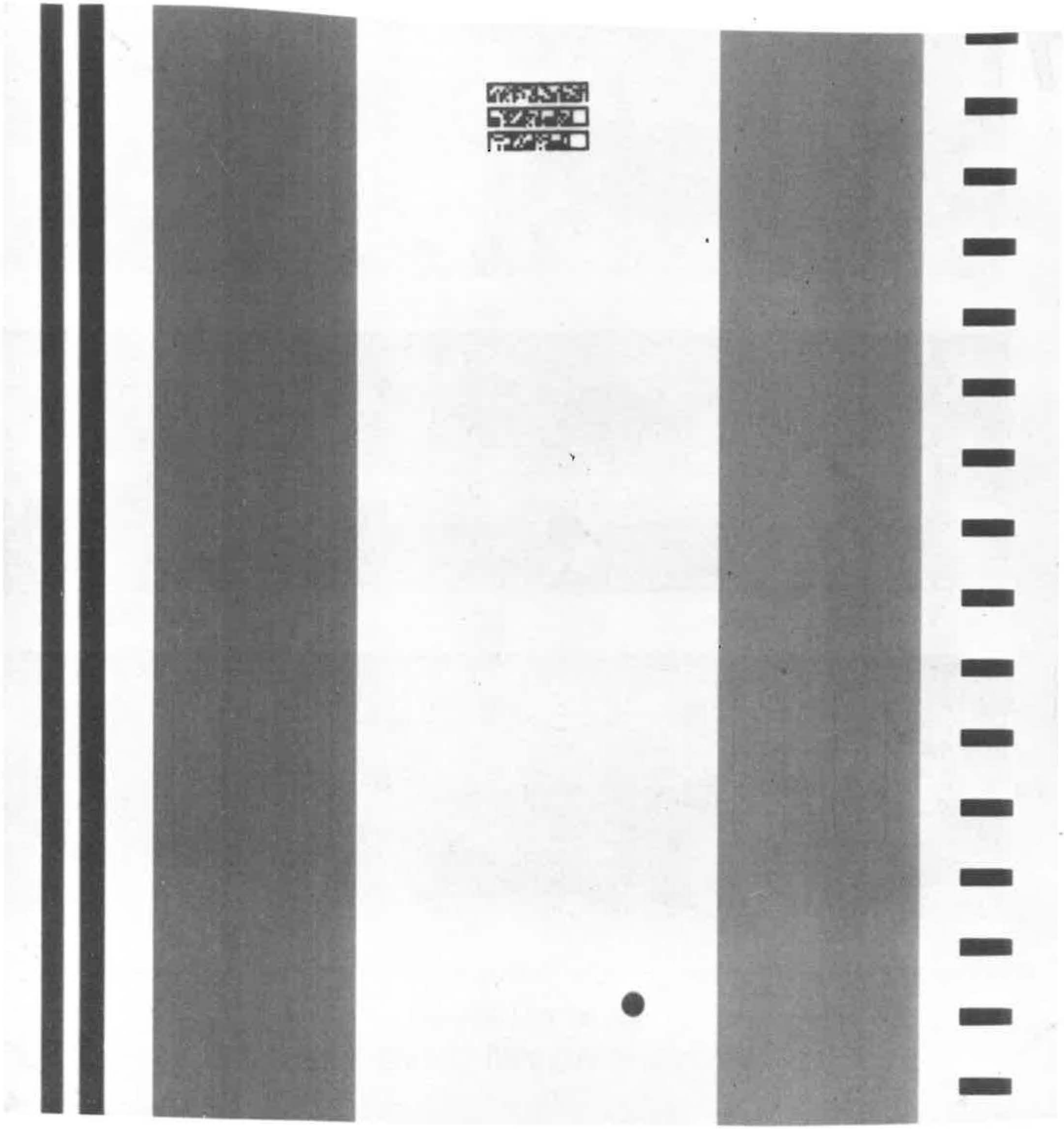
SYNTHETIC APERTURE IMAGING RADAR

INFORMATION ON WAVE PATTERNS AND DYNAMIC BEHAVIOR WILL BE OBTAINED BY USING THE COHERENT IMAGING RADAR TO OBTAIN IMAGES OF THE OCEAN. WAVE HEIGHTS MAY BE COMPUTED FROM THE DATA FOR FULLY DEVELOPED SEAS, BUT THE LENGTH/HEIGHT RELATIONSHIPS FOR DEVELOPING SEAS NEED THE WIND AND WAVE INFORMATION ANTICIPATED FROM SEASAT-A AND SUPPORT BY GROUND TRUTH TO PERMIT THE WAVE PHYSICS AND RADAR IMAGING RELATIONSHIPS TO BE BETTER ESTABLISHED. THE IMAGING RADAR CAN FUNCTION THROUGH CLOUDS AND NOMINAL RAIN TO PROVIDE WAVE PATTERNS NEAR THE SHORE AND ALSO HIGH RESOLUTION PICTURES OF ICE, OIL SPILLS, CURRENT PATTERNS NEAR SURFACE SHOALS AND OTHER FEATURES THAT CAN BE OBSERVED USING SURFACE IMAGES. THE DATA RATE FROM ANY HIGH RESOLUTION IMAGING DEVICE IS NECESSARILY HIGH, AND ON-BOARD DATA PROCESSING FOR GLOBAL DATA COLLECTION AND STORAGE IS COSTLY. FOR SEASAT-A AN EXPERIMENTAL RADAR WILL ALLOW JUDICIOUS USE OF THE DEVICE WITHOUT A FULLY GLOBAL OPERATIONAL DEMONSTRATION. NEVERTHELESS, IT WILL BE POSSIBLE TO SAMPLE WAVE SPECTRA OVER SIGNIFICANT PATCHES OF OCEAN WITHIN THE LINE OF SIGHT OF ANY GROUND STATIONS WITH HIGH DATA RATE CAPABILITY, SUCH AS LANDSAT GROUND STATIONS. THE IMAGES WILL BE ESPECIALLY USEFUL FOR THE MAPPING OF ICE LEADS AND OPEN WATER AND WILL YIELD STORM WAVE PATTERNS NEAR POTENTIAL OFFSHORE NUCLEAR POWER PLANT SITES, DEEP WATER OIL PORTS, HARBORS, AND BREAKWATERS ALONG THE NORTH AMERICAN CONTINENT.


SYNTHETIC APERTURE RADAR
ALL-WEATHER IMAGES
ICE
COASTAL INTERACTIONS, WAVE REFRACTION
SURFACE WAVELENGTH, DIRECTION

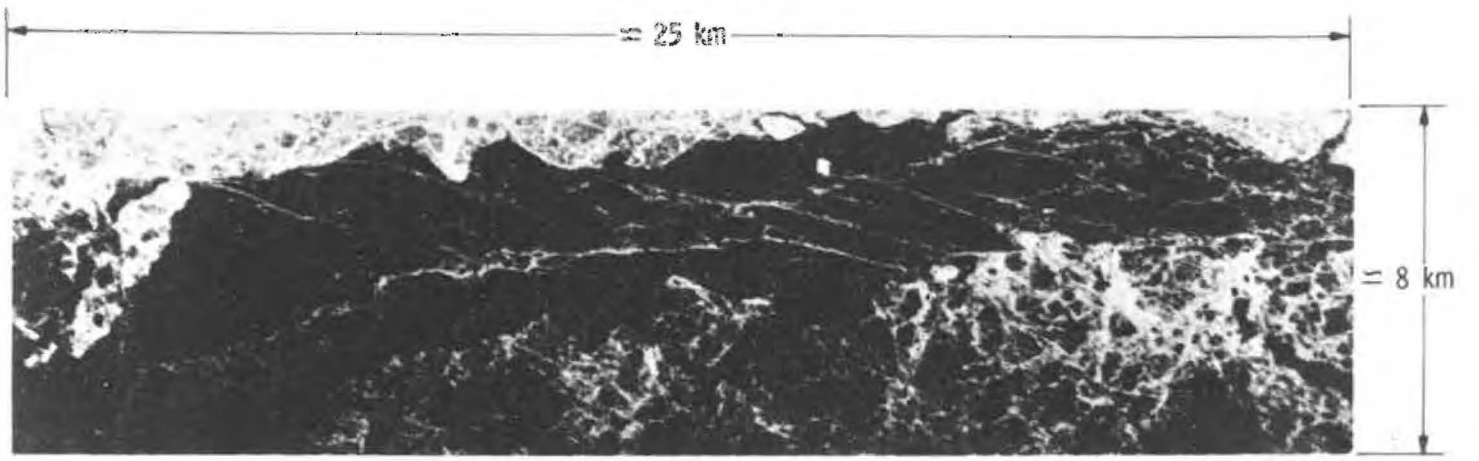
SYNTHETIC APERTURE RADAR IMAGES

THE SYNTHETIC APERTURE RADAR DOES NOT PROVIDE IMAGES IN THE LINE SCAN OR MULTI-DETECTOR METHODS TYPICAL OF VISIBLE AND INFRARED RADIOMETERS OR VIDICONS. INSTEAD IT PRODUCES A RELATIVELY INCOMPREHENSIBLE SIGNAL PHASE HISTORY AS SHOWN ON THE RIGHT OPPOSITE. THIS PHASE HISTORY CONTAINS THE RETURN SIGNAL AND ITS RANGE AND DOPPLER LOCATION. THE PHASE HISTORY IS THEN PROCESSED IN AN OPTICAL OR DIGITAL CORRELATOR WHERE THE SIGNAL CONTENT IS CONVERTED INTO THE FINE-RESOLUTION GREY - SCALE PATTERNS MORE-TYPICALLY EXPECTED. AN ICE IMAGE IS PROVIDED ON THE NEXT PAGE LEFT AS AN EXAMPLE. BY SHORTENING THE DYNAMIC RANGE, THE SENSITIVITY CAN BE BROUGHT UP WHEREBY EVEN WAVE PATTERNS, LIKE THOSE SHOWN ON THE NEXT PAGE RIGHT, CAN BE DISPLAYED. THESE WAVE PATTERNS CAN FURTHER BE PROCESSED TO RECTIFY GROUND CURVATURE AND SPINNING EARTH DISTORTIONS OR TO EXTRACT WAVE SPECTRA THROUGH A FOURIER TRANSFORM PROCESS. THE RESULTS OF THE FOURIER TRANSFORM ARE SHOWN WITH THE WAVE IMAGE. WAVE LENGTH IS INVERSELY PROPORTIONAL TO THE DISTANCE FROM THE CENTER AND THE DIRECTION IS CENTERED THROUGH THE MAIN BRIGHTNESS POINT. THE EXAMPLE SHOWS ONE MAJOR WAVE TRAIN BUT SEVERAL ARE SIMULTANEOUSLY MEASURABLE. IN ADDITION, OTHER FORMS OF INFORMATION EXTRACTION CAN BE CARRIED OUT TO LOCATE AND IDENTIFY SHIPS, ICEBERGS, OIL SPILLS, ETC.

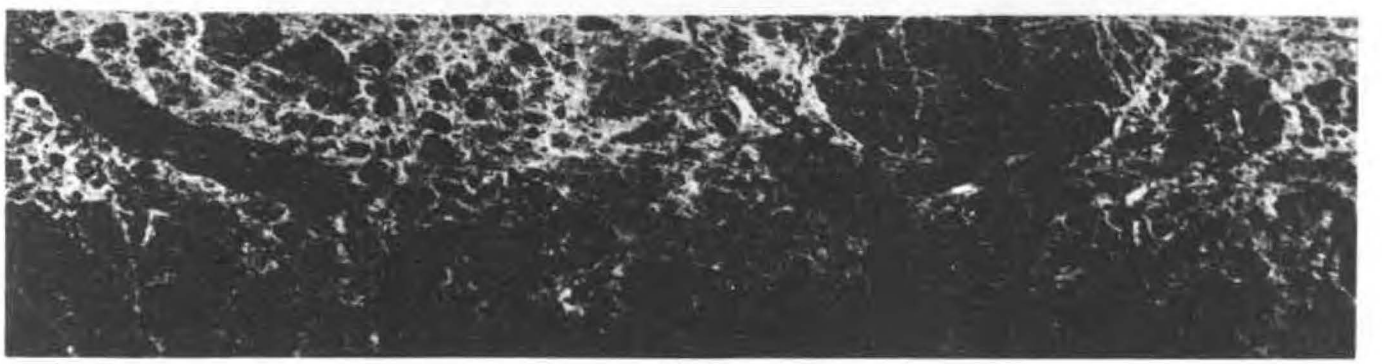


JPL L-BAND IMAGING RADAR

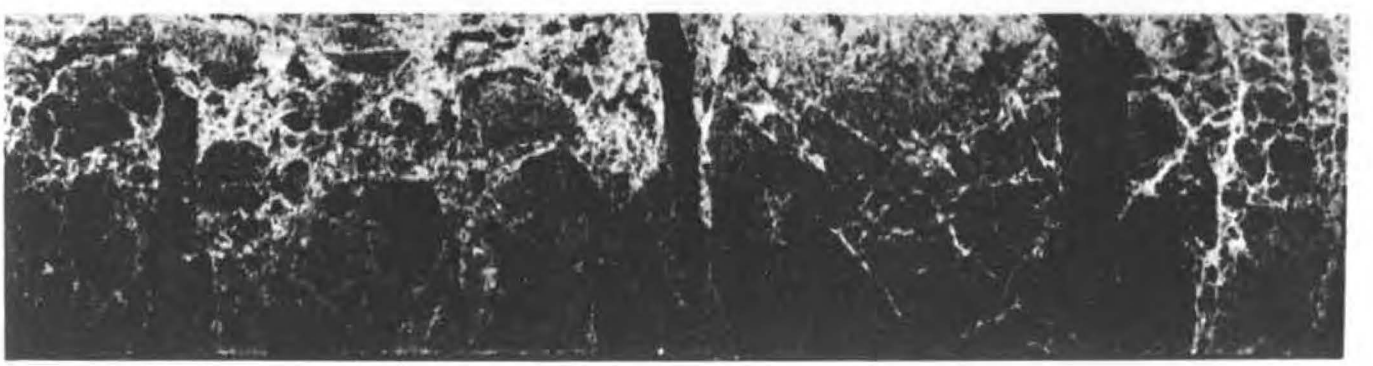
SPRING POLAR ICE



(a)



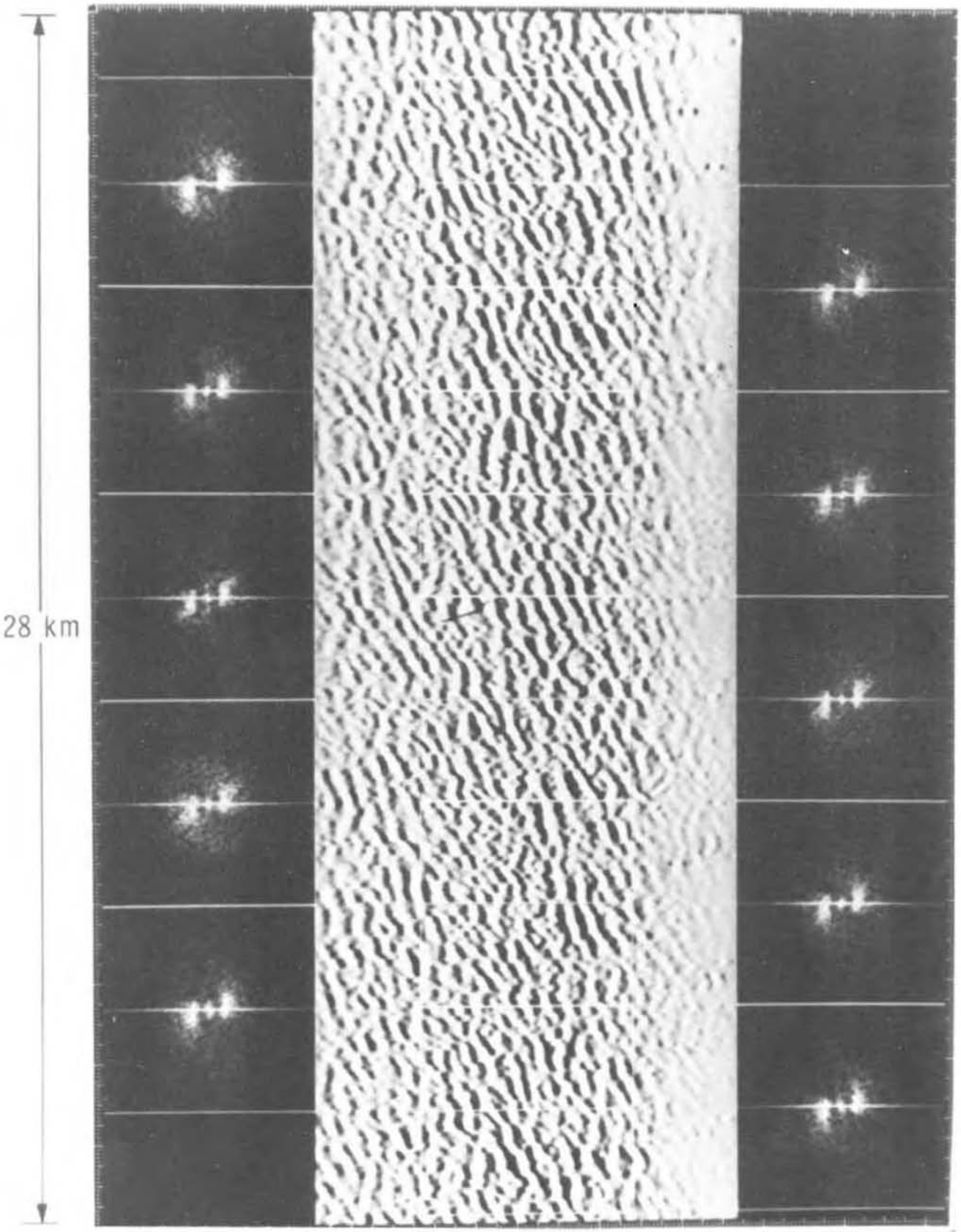
(b)



(c)

JPL IMAGING RADAR, OCEAN SWELLS

DIGITAL 2-D INTENSITY SPECTRA AND ENHANCEMENT



SEASAT-A SYNTHETIC APERTURE RADAR (SAR)

PURPOSE:	OBTAIN IMAGES OF SEA SURFACE AND SEA ICE DETECT AND MEASURE OCEAN WAVELENGTH AND DIRECTION DETECT SLICKS, CURRENT PATTERNS, ICE BERGS, ICE LEADS, ICE COVERAGE, ICE TYPE
FREQUENCY:	1275 Mhz (L-Band)
WAVELENGTH:	22 cm
ANTENNA:	10.74 x 2.16 m
ANTENNA BEAM:	1.1^{o} x 6.2^{o} 20.5^{o} OFF VERTICAL
COVERAGE:	100 km SWATH, 250-350 km OFF NADIR
RESOLUTION:	25 m PROCESSED
TRANSMIT PULSE WIDTH:	19 Mhz LINEAR FM CHIRP
PRF:	1464, 1540, 1580, 1647 PPS

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Rev. 12-12-77

SEASAT-A SYNTHETIC APERTURE RADAR (SAR) (Cont'd)

RANGE COMPRESSION RATIO:	644
PEAK TRANSMIT POWER:	1200 NOMINAL WATTS
POWER:	574 WATTS
WEIGHT:	128 Kg
DOWN LINK:	19 Mhz ANALOG
OPERATION:	LINE-OF-SIGHT ONLY
INTEGRATED SIDE LOBES:	-15 Db
AIRCRAFT HERITAGE:	JPL X-L BAND RADAR NUMEROUS MILITARY RADARS
INSTRUMENT REPRESENTATIVE:	WALTER E. BROWN JR. (JPL)
EXPERIMENT TEAM LEADER:	DR. PAUL TELEKI - USGS

GLOBAL COVERAGE WITH SEASAT-A

SEASAT-A IS CONSIDERED A FIRST STEP TO ACHIEVING GLOBAL COVERAGE OF MEASUREMENTS DESIRED BY THE SEASAT USERS. IN GENERAL, SEASAT-A WILL PRODUCE SEA-SURFACE TOPOGRAPHY; WAVE HEIGHT, LENGTH AND DIRECTION MEASUREMENTS; AND FINE-DETAIL COASTAL AND ICE PROCESS DATA ON A LIMITED-SWATH, NON-GLOBAL DEMONSTRATION BASIS. SEA-SURFACE WINDS AND TEMPERATURES WILL BE MEASURED GLOBALLY ON AN ESSENTIALLY 36-HOUR, FULL-COVERAGE REPEAT CYCLE. SEASAT-A IS TO HAVE A MINIMUM LIFE IN ORBIT OF ONE YEAR WITH A THREE-YEAR POTENTIAL. THE FIRST SIX MONTHS OF OPERATION WILL BE DEDICATED TO DEMONSTRATION, CALIBRATION, AND SPECIAL EXPERIMENTS. DURING THE REMAINING TIME (TO END OF LIFE), THE SYSTEM HAS THE POTENTIAL TO OPERATE NEAR-OPERATIONALLY, WITH A SHORT TURN-AROUND TIME FOR THE AVAILABILITY OF PROCESSED AND LOCATED DATA.

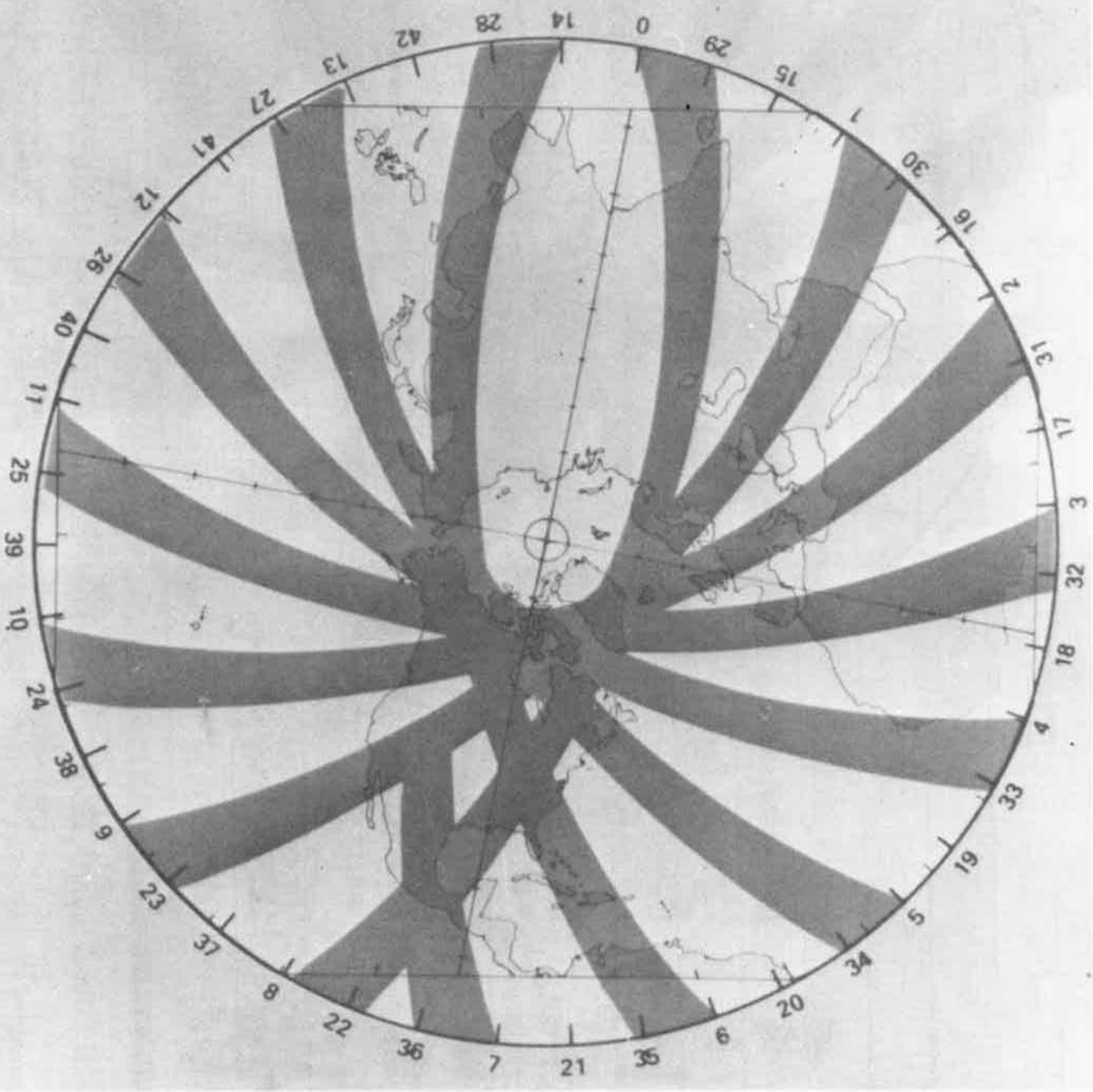
THE SINGLE SEASAT-A SATELLITE IS TO BE LAUNCHED IN THE SECOND QUARTER OF CALENDAR YEAR 1978 FROM THE WESTERN TEST RANGE INTO A HIGH-INCLINATION (108^{o}), CIRCULAR (.002 ECCENTRICITY) ORBIT. THE SATELLITE WILL CRUISE AT AN ALTITUDE OF APPROXIMATELY 800KM, CIRCLING THE EARTH EVERY 100 MINUTES. SENSORS WITH 1000KM CROSS-TRACK COVERAGE WILL PROVIDE GLOBAL REPEAT COVERAGE EVERY 36 HOURS, USING BOTH DAY AND NIGHT PASSES TO COMPLETE THE FILL IN. EQUATOR PASSES PRECESS ABOUT 25 DEGREES EACH ORBIT. AT LEAST ONE TRACKING AND REAL TIME TELEMETRY PASS PER ORBIT IS ANTICIPATED. LASER TRACKING WILL ALSO BE PROVIDED WHEN SATELLITE VIEWING AND SYSTEM AVAILABILITY PERMIT.

THE DIAGRAM ON THE RIGHT AND THE TWO SUCCEEDING PAGES DEPICT THE COVERAGE PROVIDED BY THE MICROWAVE WIND SCATTEROMETER, THE SCANNING MULTI-FREQUENCY MICROWAVE RADIOMETER AND THE VISIBLE AND INFRARED SCANNING RADIOMETER DURING EACH 36 HR PERIOD.

SEASAT-A

36 HR ORBITAL COVERAGE

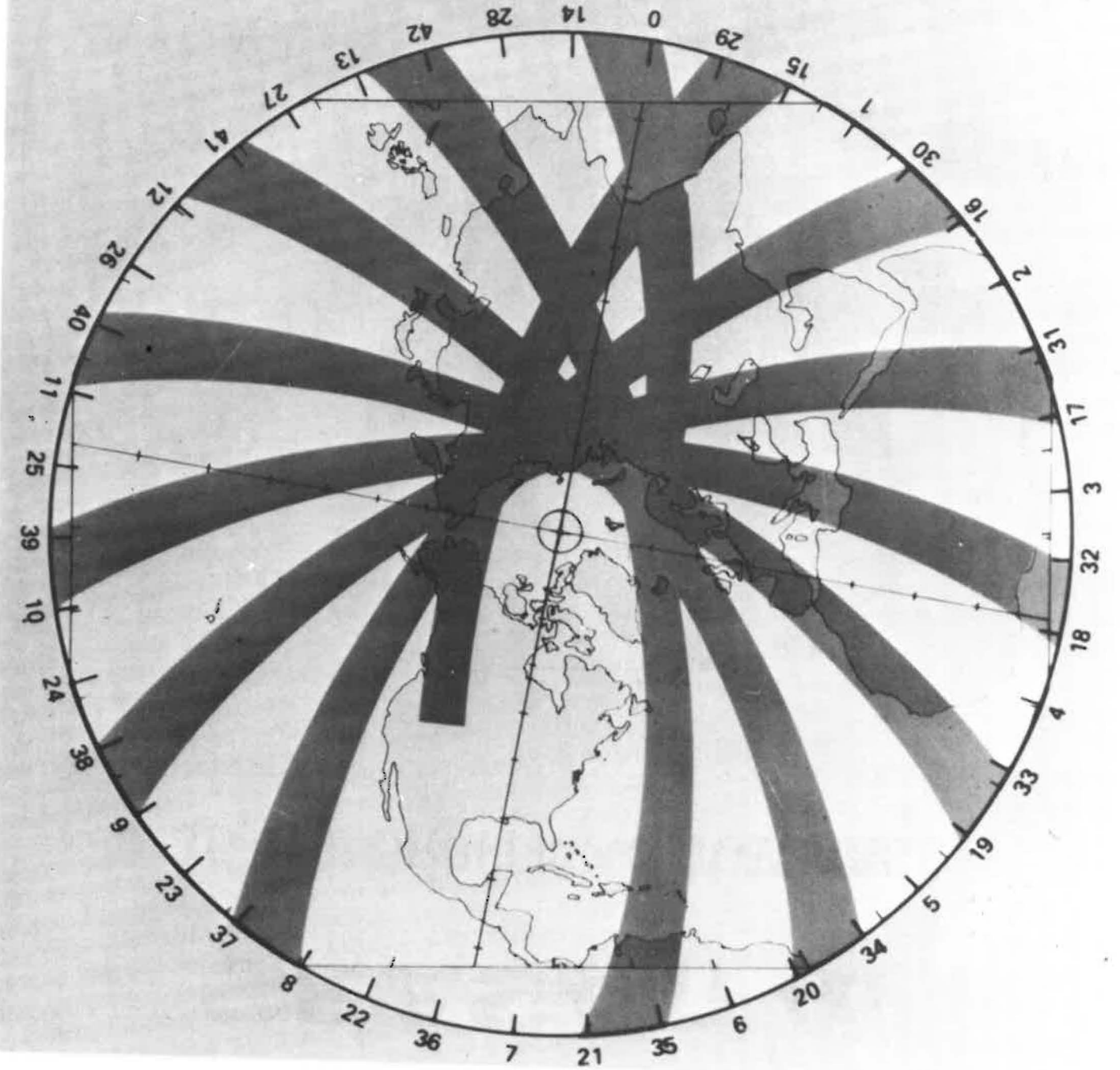
0-12 HRS COVERAGE



SEASAT-A

36 HR ORBITAL COVERAGE

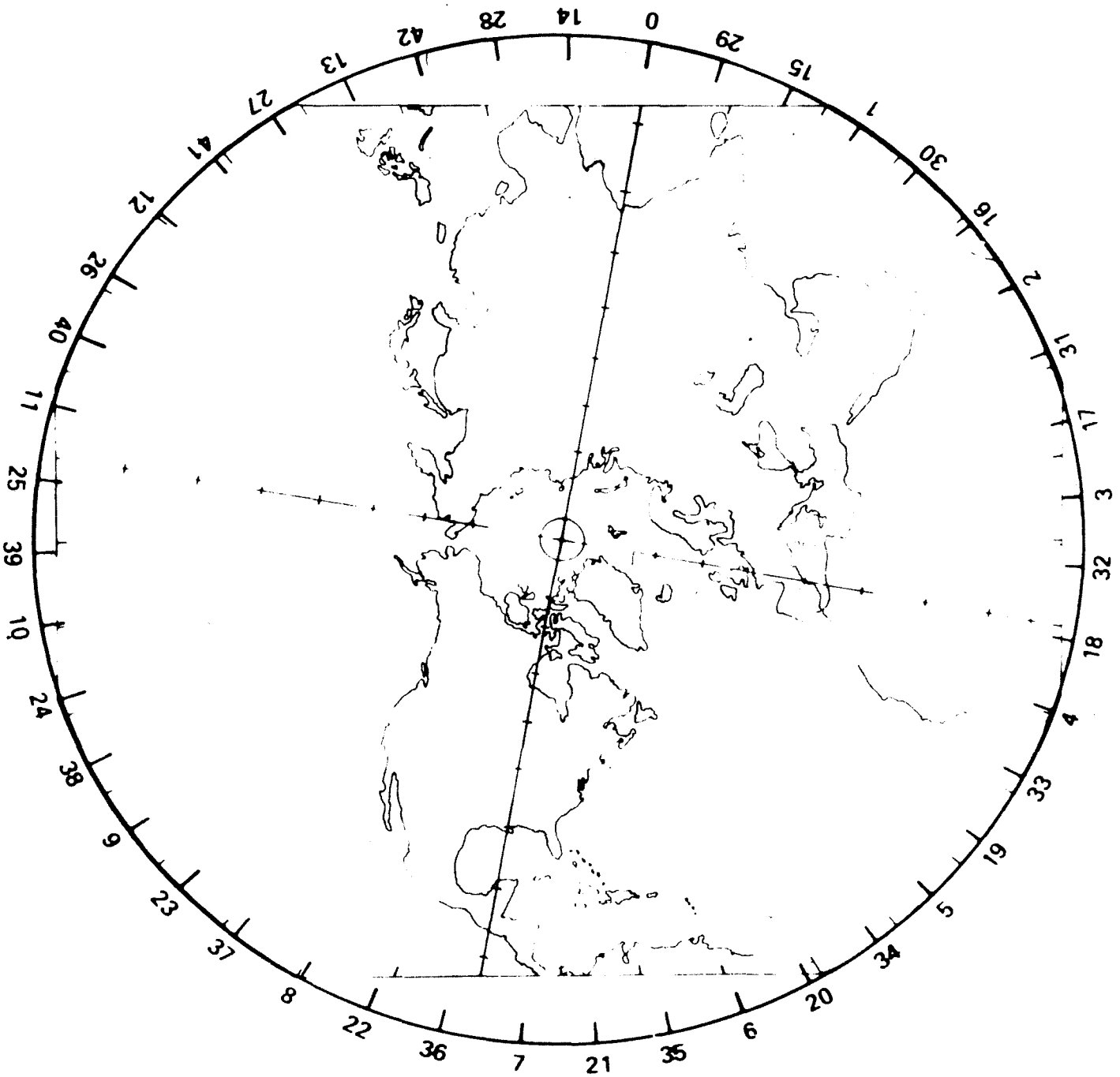
12-24 HRS COVERAGE



SEASAT-A

36 HR ORBITAL COVERAGE

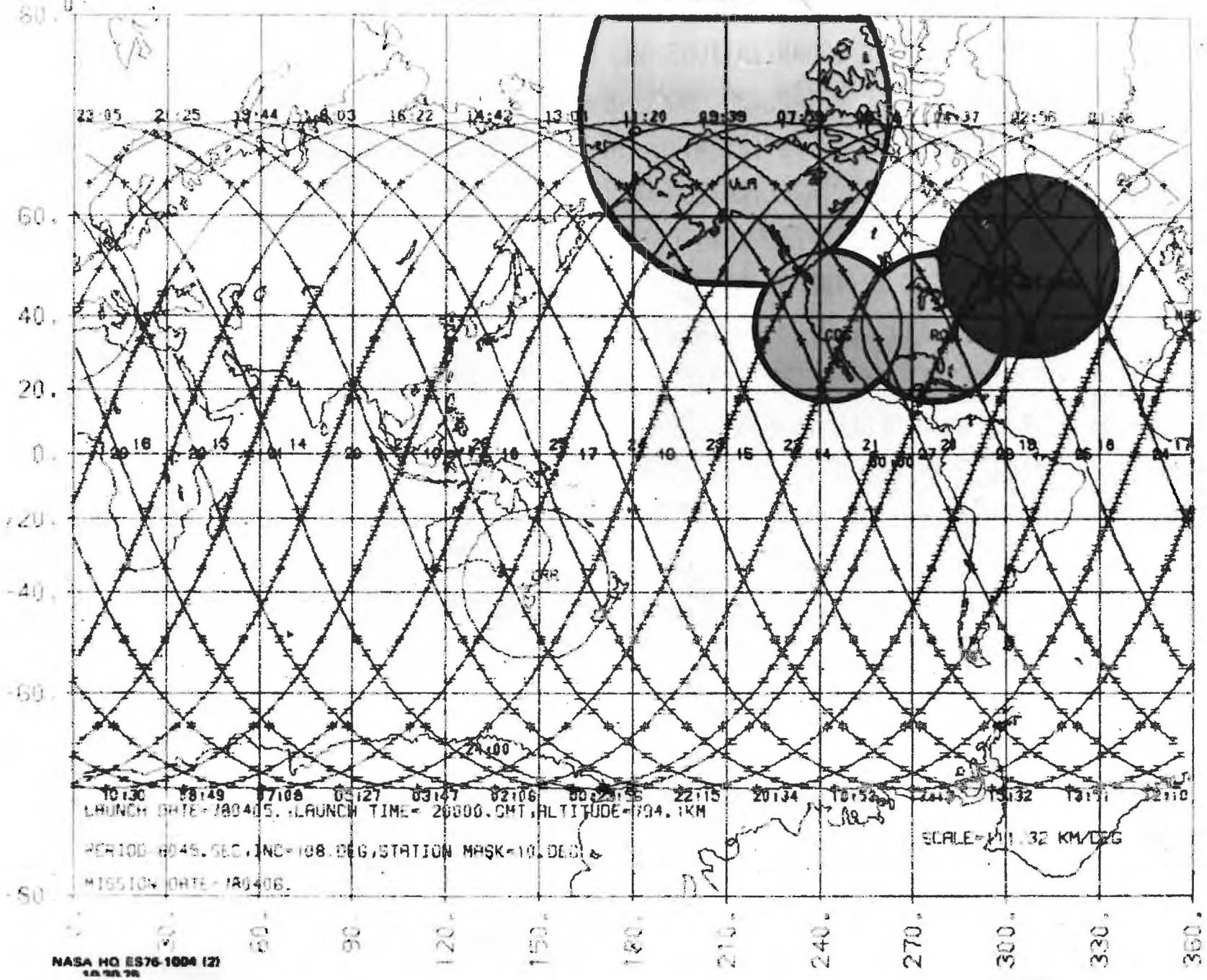
24-36 HRS COVERAGE



SYNTHETIC APERTURE RADAR COVERAGE

ALL OF THE INSTRUMENTS (EXCEPT THE IMAGING RADAR) ARE EXPECTED TO BE OPERATED CONTINUOUSLY DURING MOST OF THE MISSION TO PROVIDE GLOBAL COVERAGE THROUGH ON-BOARD STORAGE AND THEN DATA RETRIEVAL OVER ONE OF THE FIVE NASA GROUND STATIONS EXPECTED TO BE ACTIVE IN THAT PERIOD. THE IMAGING RADAR IS TO OPERATE IN REAL-TIME ONLY WHEN IT IS OVER APPROPRIATE HIGH-DATA-RATE STDN GROUND STATIONS. PRESENT PLANS FOR THE IMAGING RADAR USE EXISTING STATIONS IN ALASKA (ULA), CALIFORNIA (GOS), AND CAPE KENNEDY, FLORIDA (MILA-2), ALSO SHOWN IS A PROPOSED CANADIAN PARTICIPATION IN SEASAT-A WITH A CANADIAN RECEIVING STATION NEAR ST. JOHN'S NEWFOUNDLAND. NOT SHOWN IS A PROPOSED EUROPEAN SPACE AGENCY STATION NEAR LONDON. LANDSAT STATIONS REQUIRE A SEASAT UNIQUE DEMODULATOR AND HIGH-DATA-RATE (120 MBPS) RECORDERS TO RECEIVE SYNTHETIC APERTURE IMAGING RADAR DATA.

4 STATION COVERAGE

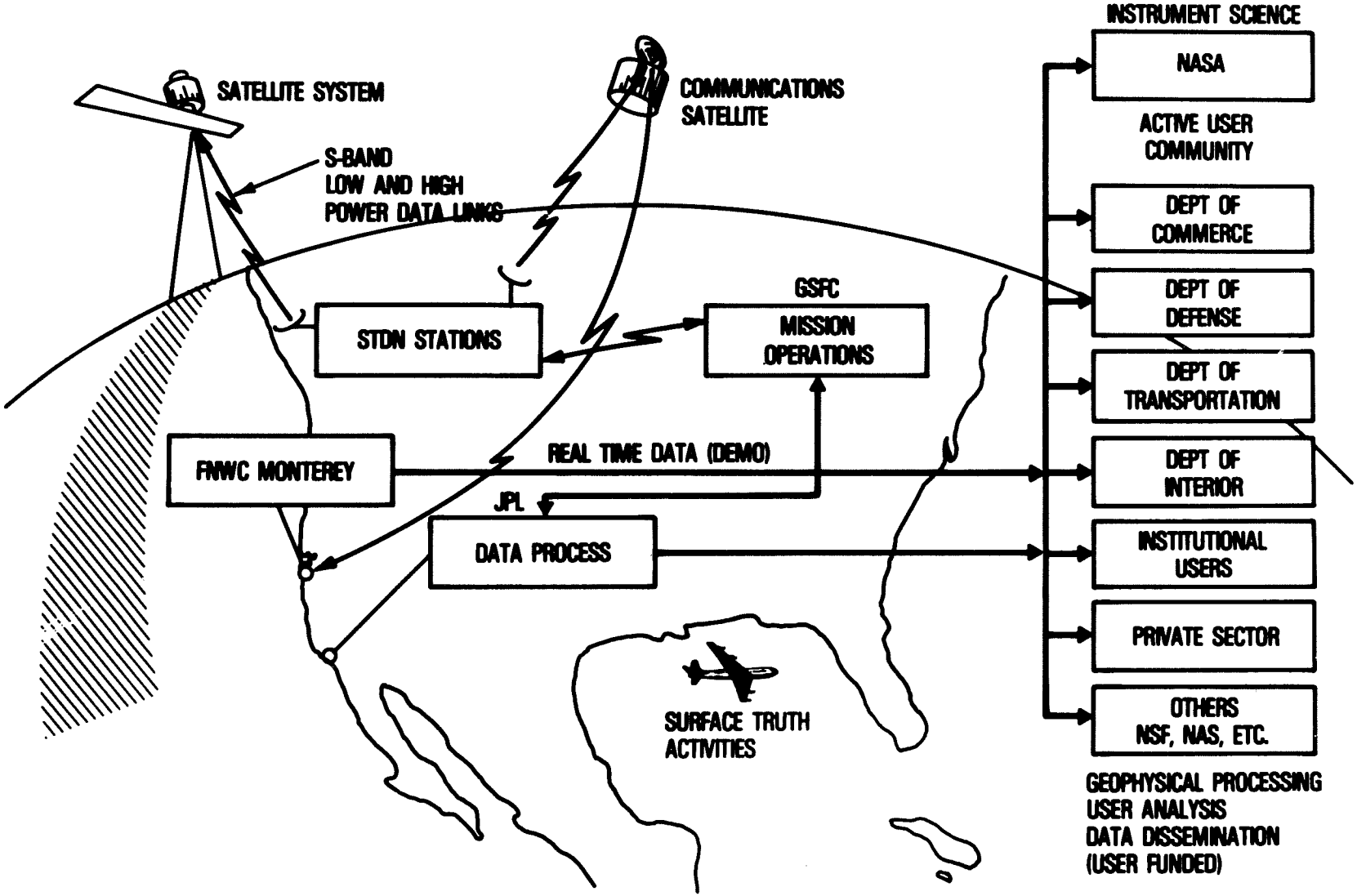


NASA HQ ES76-1004 (2)

SPECIFIC DATA ACQUISITION, PROCESSING, AND DISTRIBUTION PLANS/SYSTEMS ARE CURRENTLY BEING ESTABLISHED BY USER ORGANIZATIONS AND NASA. CONSISTENT WITH INITIAL PROGRAM FORMULATION IN 1973, NASA WILL ESTABLISH PROOF-OF-CONCEPT ENGINEERING AND GEOPHYSICAL VALIDATION OF SEASAT DATA AND USERS WILL PROVIDE THE RESOURCES REQUIRED FOR PROCESSING, ANALYSIS, DISSEMINATION AND APPLICATION OF DATA PECULIAR TO THEIR SPECIAL INTERESTS. FIGURE 5 PROVIDES A GENERALIZED VIEW OF THIS DIVISION OF RESPONSIBILITIES.

THE DATA PRODUCTS OF THE SEASAT SENSORS MUST SERVE A VARIETY OF USERS IN A VARIETY OF FORMS. WEATHER DATA IS HIGHLY PERISHABLE; TO BE OF PRACTICAL VALUE, OPERATIONALLY, THEY MUST BE PROCESSED (E.G., FORMATTED, MERGED, BLENDED, AND ANALYZED) AND APPLIED IN NEAR REAL TIME. DATA OLDER THAN 8 HOURS ARE OF LITTLE INTEREST EXCEPT FOR CLIMATE STUDIES OR MODEL DEVELOPMENT. AT THE OPPOSITE END OF THE SPECTRUM IS THE GEODESIST, WHOSE DATA ARE NEARLY TIME INVARIANT. THE GEODESIST'S APPROACH TO ANALYSIS IS OFTEN TO FIT AND REFIT DATA BY A BOOTSTRAP APPROACH, FINALLY ACHIEVING A BEST FIT MODEL OF THE OCEAN GEOID. SOME OF THE USERS WILL HAVE SIZEBLE GROUND DATA SYSTEMS AVAILABLE TO ASSIST THEM IN PROCESSING AND ANALYSIS; OTHERS WILL HAVE ONLY INEXPENSIVE TERMINALS WITH LIMITED PROCESSING CAPABILITY. SOME USERS CARE ONLY FOR SPECIFIC OUTPUTS SUCH AS WIND AND WAVE DATA FOR USE IN SHIP ROUTING; OTHERS, SUCH AS UNIVERSITY RESEARCHERS, WANT AS MUCH OF THE DATA AS AVAILABLE FOR APPLICATION TO DEVELOPMENT OF ADVANCED PREDICTION MODELS. THUS SEASAT'S END-TO-END DATA SYSTEM, CONSISTING OF NASA AND USER FACILITIES EQUIPMENT AND COMMUNICATION NETWORKS, MUST BE FLEXIBLE AND DYNAMIC ENOUGH TO MEET THE DEMANDS OF THIS BROAD SPECTRUM OF CURRENTLY IDENTIFIED AND FUTURE USER APPLICATIONS.

SEASAT-A
OCEAN DATA DISTRIBUTION PLAN



NASA HQ ES77-100 (1)
11-16-76

AS INDICATED, THIS SYSTEM COMPRISES ALL ELEMENTS FROM REMOTE SENSING OF THE OCEAN PHENOMENA THROUGH COLLECTION AND STORAGE. ELEMENTS OF THIS END-TO-END SYSTEM INCLUDE LOCATION AND SENSOR CALIBRATION, ON-BOARD THE SATELLITE OR ON THE GROUND; TRANSMISSION TO THE EARTH FOR STORAGE; CONVERSION TO GEOPHYSICAL MEANING; MERGING OF THE VARIOUS SENSOR DATA; BLENDING WITH SUPPORTING EXTERNAL DATA; DELIVERY TO THE ULTIMATE USERS FOR DATA ANALYSIS, INTERPRETATION, AND UTILIZATION: THIS PROCESS IS SHOWN IN A SIMPLIFIED FORMAT. SOME ELEMENTS OF THE PRESENT DATA SYSTEM DESCRIBED BELOW PROVIDE AN EXAMPLE OF DATA FLOW TO A PARTICULAR USER, THE NAVY'S FLEET NUMERICAL WEATHER CENTRAL.

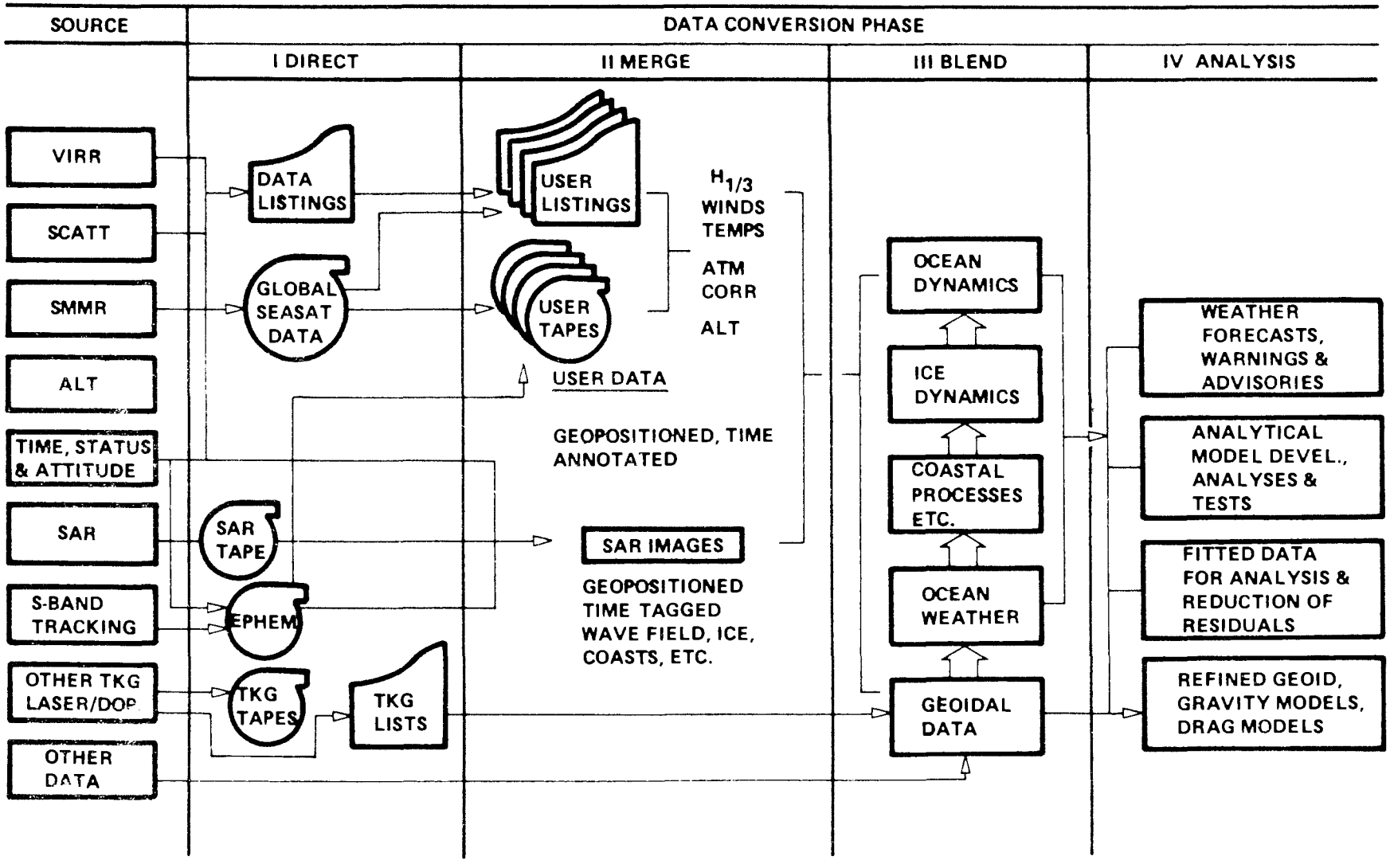
A. THE SATELLITE DATA SUBSYSTEM COMPRISES THOSE ELEMENTS ON-BOARD THE SPACECRAFT FOR COLLECTION, STORAGE, AND TRANSMISSION TO EARTH OF THE SENSOR DATA AND FOR THE COMMAND, CONTROL, AND TRACKING OF THE SATELLITE. TO FACILITATE ACCESS TO THE DATA AND TO REDUCE COSTS TO SMALL USERS, THE SATELLITE DATA SUBSYSTEM IS DESIGNED TO A BLOCK TELEMETRY FORMAT. THIS FORMAT SEPARATES DATA FROM EACH SENSOR INTO INDIVIDUAL TIME-TAGGED DATA BLOCKS. IN FUTURE SEASAT SYSTEMS IT IS EXPECTED THAT THESE DATA BLOCKS WILL ALSO BE GROUND LOCATED AND COMBINED WITH OTHER EXPERIMENT ON-BOARD ENGINEERING DATA.

B. THE GROUND TRACKING AND DATA ACQUISITION SUBSYSTEM TRACKS THE SATELLITE, TRANSMITS STORED COMMANDS FOR SEQUENCING SATELLITE EVENTS, AND RECEIVES SENSOR AND STATUS DATA FROM THE SATELLITE FOR RETRANSMISSION TO OTHER USING SUBSYSTEMS.

C. THE MISSION OPERATIONS AND CONTROL SUBSYSTEMS RECEIVES THE TRACKING AND GLOBAL SENSOR DATA FROM THE TRACKING STATIONS, MONITORS SATELLITE AND SENSOR HEALTH, REDUCES TRACKING DATA TO PROVIDE THE SATELLITE EPHEMERIS, MERGES SATELLITE ATTITUDE DATA WITH EPHEMERIDES TO FACILITATE SENSOR FOOTPRINTS, AND DELIVERS DATA TO THE SEASAT PROJECT AND OTHER USERS. THIS SUBSYSTEM ALSO GENERATES TIMED COMMANDS FOR TRANSMISSION TO THE SATELLITE.

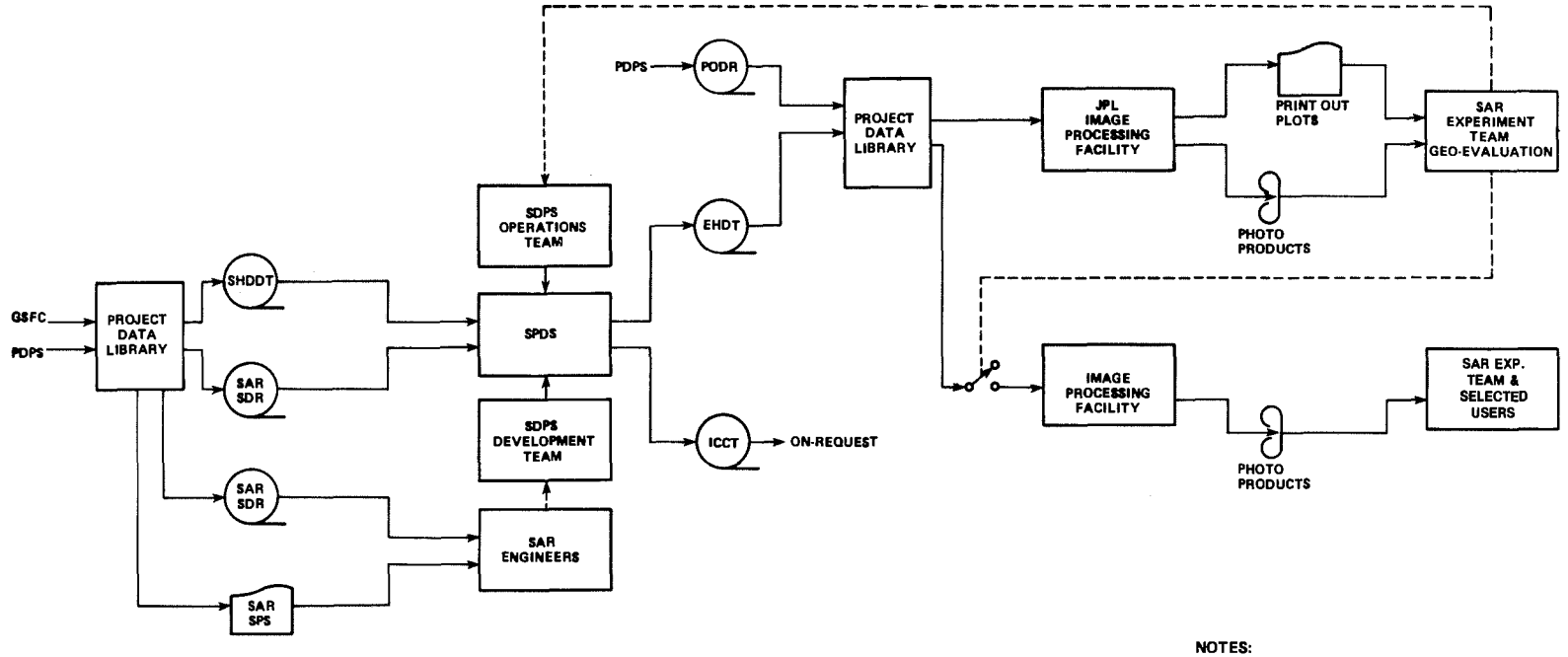
D. THE PROJECT DATA PROCESSING SUBSYSTEM HAS THE PRIMARY OBJECTIVE OF PROVIDING DATA PROCESSING SUPPORT TO THE PROOF-OF-CONCEPT MISSION FOR SENSOR SYSTEM ENGINEEE.RING AND FOR GEOPHYSICAL VALIDATION. IN THIS REGARD, IT WILL SUPPORT USER-DIRECTED EXPERIMENT TEAMS TO QUANTIZE SYSTEM PERFORMANCE CHARACTERISTICS WITH EMPHASIS ON ALGORITHM DEVELOPMENT. IN THIS WAY, WE HOPE TO ENCOURAGE AND PROVIDE TECHNOLOGY TO THE USERS IN ORDER TO PROMOTE DIRECT, INDEPENDENT, DISTRIBUTED, THEME ORIENTED DATA UTILITY BY THE USERS.

E. ONE OF THESE DIRECT, INDEPENDENT, THEME-PECULIAR USER DATA SYSTEMS IS EXEMPLIFIED BY THE NAVY FLEET NUMERICAL WEATHER CENTRAL FNWC) AT MONTEREY, CALIFORNIA. GLOBAL SENSOR AND STATUS DATA (ALL BUT THE SYNTHETIC APERATURE RADAR DATA) AS RECEIVED AT FAIRBANKS ALASKA ARE RETRANSMITTED IN NEAR REAL-TIME TO FNWC, WHERE THEY ARE PROCESSED AND REDISTRIBUTED TO THE OPERATIONAL OCEAN-USING COMMUNITY, CIVILIAN AND MILITARY, AS WEATHER MAPS AND ADVISORIES, WITH LESS THAN 8 HOURS TURNAROUND TIME. NASA AND THE DOD ARE CURRENTLY LAYING THE GROUND WORK TO EXPAND THIS REAL-TIME EXPERIMENT IN TWO MAJOR WAYS. 1. PROVIDE ALL SENSOR DATA (EXCLUDING SAR) TO FNWC BY BRINGING IN CAPE KENNEDY AND MADRID DATA COLLECTIONS TO MONTEREY. 2. REDISTRIBUTION OF FNWC REAL-TIME PRODUCTS TO SUPPORT INDUSTRY EVALUATION EXPERIMENTS AS WELL AS OTHER INTERESTED USERS.


SOURCE
DATA CONVERSION PHASE
I DIRECT
II MERGE
III BLEND
IV ANALYSIS
VIRR
SCATT
SMMR
ALT
TIME, STATUS & ATTITUDE
SAR
S-BAND TRACKING
OTHER TKG LASER/DOP
OTHER DATA
DATA LISTINGS
GLOBAL SEASAT DATA
SAR TAPE
EPHEM
TKG TAPES
TKG LISTS
USER LISTINGS
USER TAPES
USER DATA
GEOPOSITIONED, TIME ANNOTATED
SAR IMAGES
GEOPOSITIONED TIME TAGGED WAVE FIELD, ICE, COASTS, ETC.
$H_{1/3}$ WINDS TEMPS
ATM CORR
ALT
OCEAN DYNAMICS
ICE DYNAMICS
COASTAL PROCESSES ETC.
OCEAN WEATHER
GEOIDAL DATA
WEATHER FORECASTS, WARNINGS & ADVISORIES
ANALYTICAL MODEL DEVEL., ANALYSES & TESTS
FITTED DATA FOR ANALYSIS & REDUCTION OF RESIDUALS
REFINED GEOID, GRAVITY MODELS, DRAG MODELS

Data Flow

THE INITIAL SYNTHETIC APERTURE RADAR (SAR) DATA PROCESSING SUBSYSTEM SUPPORTS THE UNIQUE REQUIREMENTS OF THE IMAGING RADAR EXPERIMENT TEAM. WIDEBAND SAR DATA IS RECORDED DIGITALLY AT SPECIALLY EQUIPPED STATIONS. THE TAPES ARE DELIVERED TO THE SAR DATA-PROCESSING SYSTEM, WHERE SELECTED DATA ARE PROCESSED INTO IMAGES AND PROVIDED, ALONG WITH EPHEMERIS, ATTITUDE, AND STATUS DATA, TO THE SAR EXPERIMENT TEAM AND TO NOAA'S ENVIRONMENTAL DATA SYSTEM WHERE THE DATA CAN BE PURCHASED BY ANY USER.



NOTES:

1. GSFC – GODDARD SPACEFLIGHT CENTER.
2. PDPS – PROJECT DATA PROCESSING SUBSYSTEM.
3. SHDDT – SIGNAL HIGH DENSITY DIGITAL TAPE.
4. SDR – SUPPLEMENTARY DATA RECORD.
5. SPS – SENIOR – SENOR PERFORMANCE SUMMARY.
6. SDPS – SAR DATA PROCESSING SUBSYSTEM.
7. PODR – PRECISE ORBIT DETERMINATION RECORD.
8. ICCT – IMAGE CCT.
9. EHDT – EROS HIGH DENSITY TAPE.
10. EROS – EARTH RESOURCES OBSERVATION SYSTEM.

SAR PROCESSING DATA FLOW

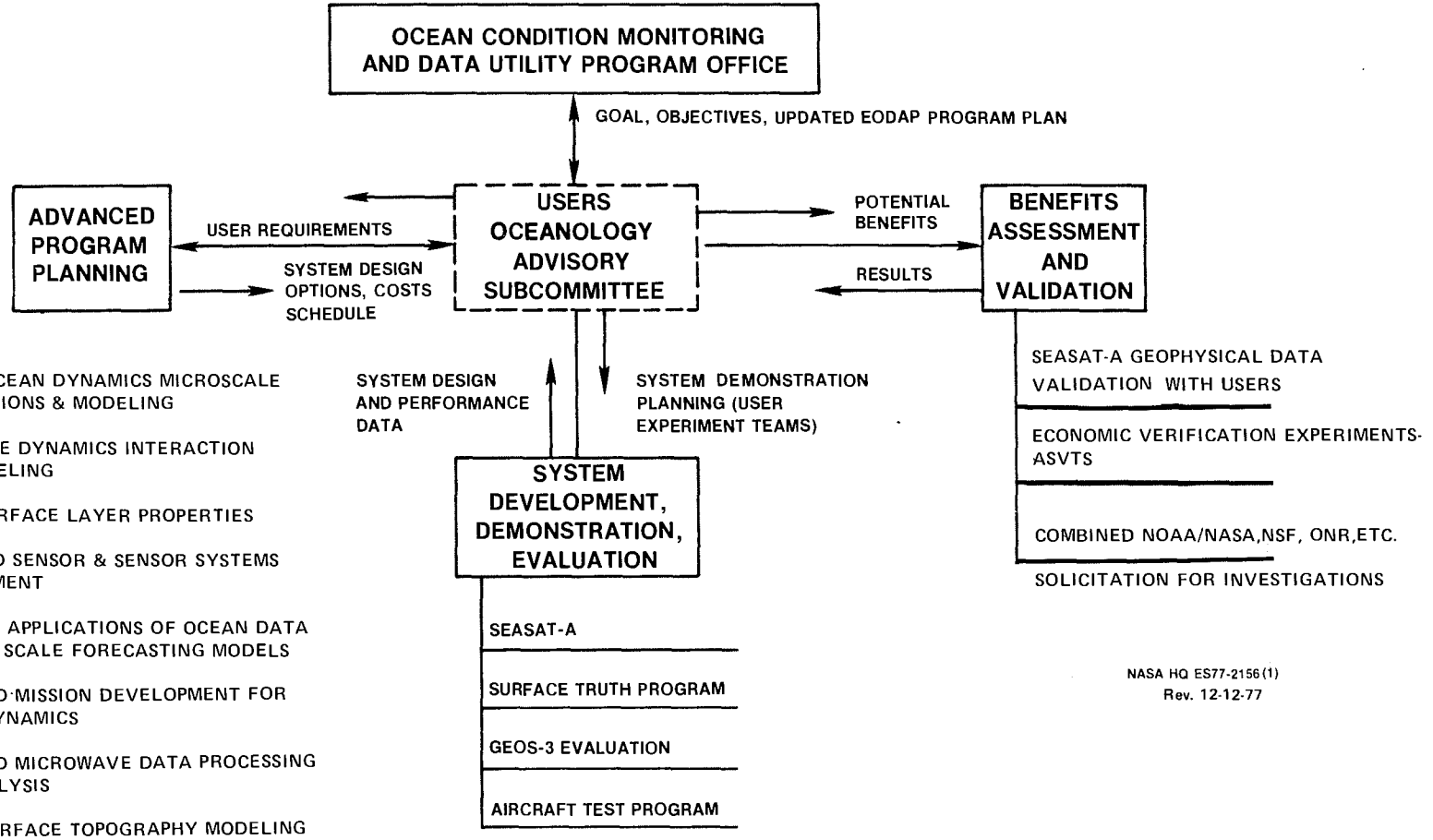
FIGURE _____

NASA HQ ES77–2419(1)
4–19–77

THE NASA OCEAN CONDITION MONITORING AND DATA UTILITY PROGRAM IS COMPRISED OF THREE MAJOR ELEMENTS. IN ADDITION TO AN ELEMENT OF SYSTEM DEVELOPMENT, DEMONSTRATION AND EVALUATION (OF WHICH SEASAT-A IS A PART), AND ADVANCED PROGRAM PLANNING . THE PROGRAM CONTAINS AN ELEMENT DEVOTED TO BENEFITS ASSESSMENT AND VALIDATION. IT IS WITHIN THIS PROGRAM ELEMENT THAT THE MAJOR ASPECTS OF THE SEASAT-A USER ACTIVITIES INVOLVING THE USE OF SEASAT-A DATA ARE INCLUDED.

TWO COMPONENTS OF USER ACTIVITY WITH SEASAT-A DATA ARE PLANNED. ONE IS A SOLICITATION OF INVESTIGATIONS, LED BY NOAA, TO INVOLVE THE NON-FEDERAL ELEMENTS OF THE OCEAN SCIENCE COMMUNITY IN A SERIES OF SCIENTIFIC INVESTIGATIONS UTILIZING SEASAT-A DATA. A SECOND COMPONENT INVOLVES THE COMMERCIAL OCEAN COMMUNITY IN A MODEST SET OF INDUSTRIAL EVALUATION EXPERIMENTS TO TEST THE COMMERCIAL UTILITY OF SEASAT-A DATA AND TO BEGIN THE TRANSFER OF OCEAN REMOTE SENSING TECHNOLOGY TO THE CIVIL SECTOR. THE NASA OCEAN CONDITION MONITORING AND DATA UTILITY PROGRAM, OF WHICH SEASAT-A IS THE MAJOR PROJECT, RELIES ON RESEARCH AND DEVELOPMENT TO DISCOVER, NURTURE AND EVENTUALLY PROVIDE SYSTEMS THAT WILL UNLOCK THE MYSTERIES OF THE WORLD'S OCEANS. THE ADVANCED PROGRAM PLANNING SUBPROGRAM AREA IS DEVOTED TO SPONSORING NASA, INDUSTRY AND ACADEMIC INSTITUTION, CO-OPERATIVE RESEARCH AND DEVELOPMENT ACTIVITIES DISCOVER, DEVELOP AND EVALUATE THE TECHNOLOGIES USEFUL TO FUTURE PROGRAMS. EIGHT SUB-DISCIPLINE AREAS COMPRISE THE CURRENT PROGRAM AS SHOWN.

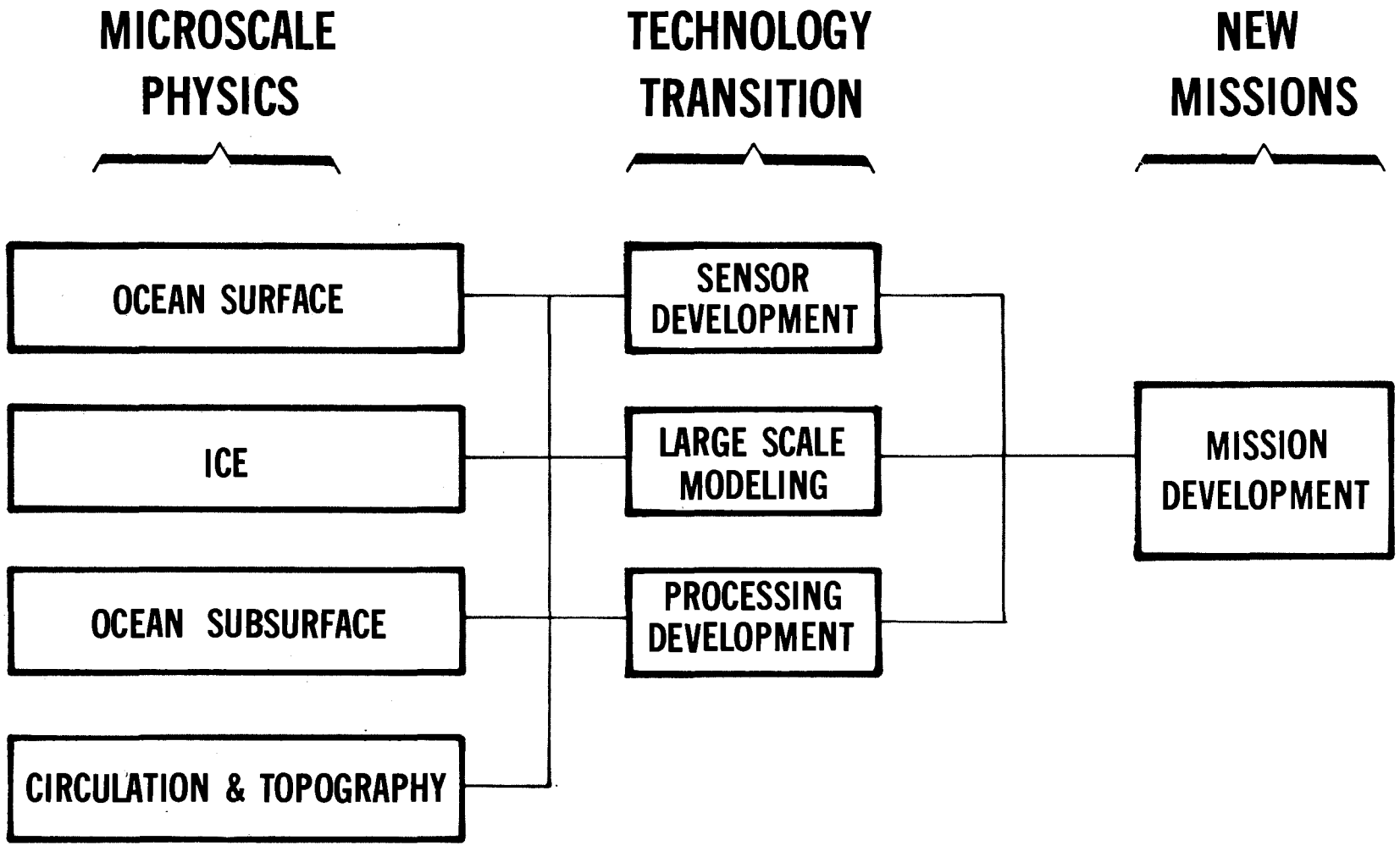
OCEAN CONDITION MONITORING AND DATA UTILITY PROGRAM



NASA HQ ES77-2156(1)
Rev. 12-12-77

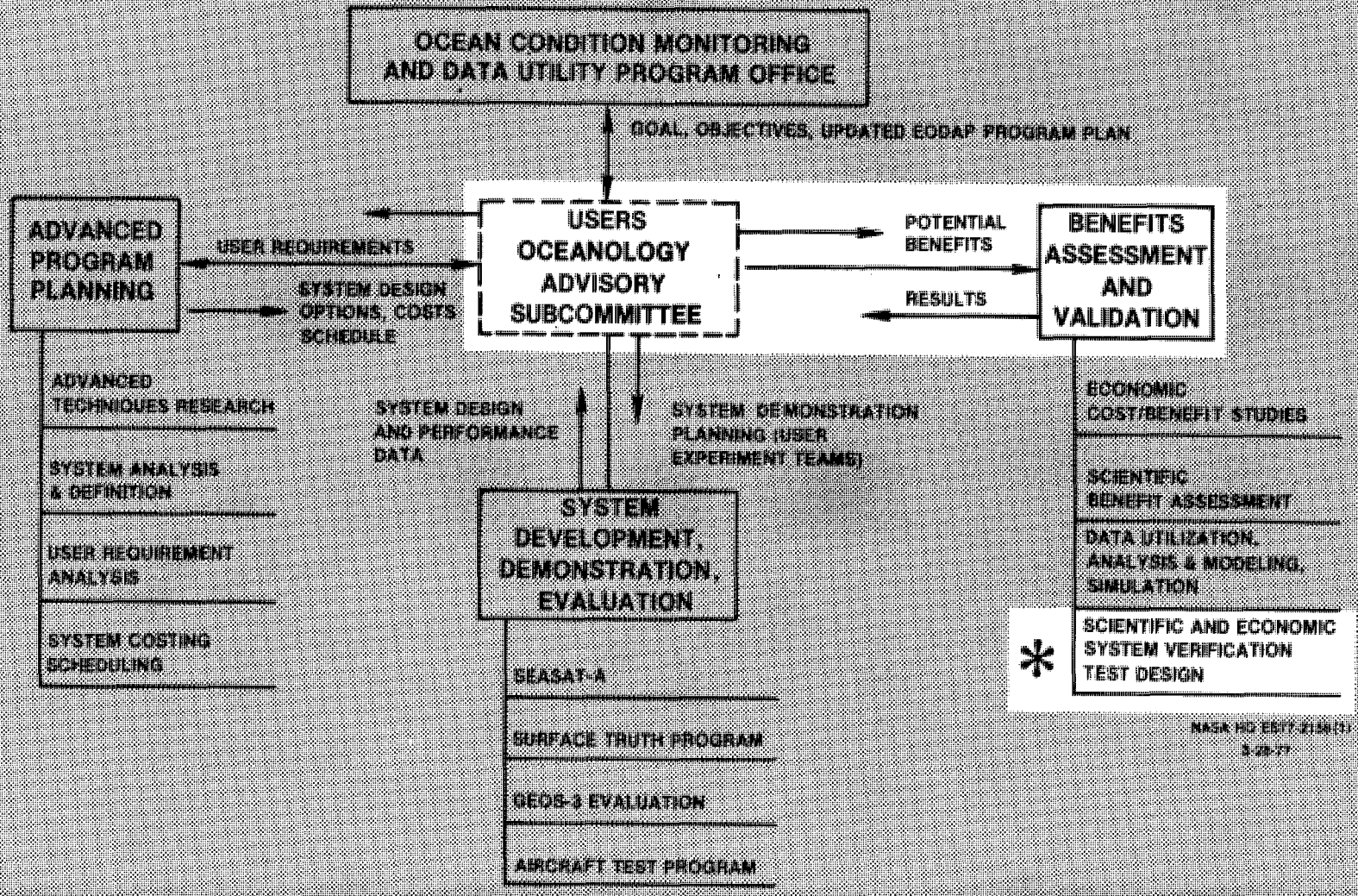
THE STRUCTURE OF THE R&D PROGRAM IS BASED ON AN ASSESSMENT OF USER NEEDS FOLLOWED BY MICROSCALE INVESTIGATIONS, INCLUDING MODELING, SIMULATIONS, AND EXPERIMENTATION, INTO REMOTE SENSING INTERACTIONS WITH THE OCEAN'S LIQUID SURFACE, ICE SURFACE, AND SURFACE LAYER (TENS OF METERS). IN ADDITION, A SPECIAL DISCIPLINE HAS BEEN DEVOTED TO CIRCULATION AND TOPOGRAPHIC INVESTIGATIONS. THE RESULTS OF ENDEAVORS IN THE AREAS PROVIDE GUIDANCE AS TO WHAT DIRECTIONS TO TAKE AND WHERE TO PUT EMPHASIS IN SENSOR DEVELOPMENTS. LARGE SCALE MODELING OF OUR ENVIRONMENT TO PROVIDE IMPROVED FORWARD FORECASTS OF ENVIRONMENTAL CONDITIONS, AND INFORMATION PROCESSING TECHNIQUES IMPROVEMENT TO ENHANCE DATA ASSIMILATION BY USERS. ALL OF THESE THINGS SHOULD CONTRIBUTE TO IMPROVED MISSIONS TO APPLY WHAT WE LEARN FOR THE BENEFIT OF SCIENTIFIC AND APPLICATIONS USERS.

R&D PROGRAM



NASA HQ ES78-649 (1)
12-21-77

OCEAN CONDITION MONITORING AND DATA UTILITY PROGRAM



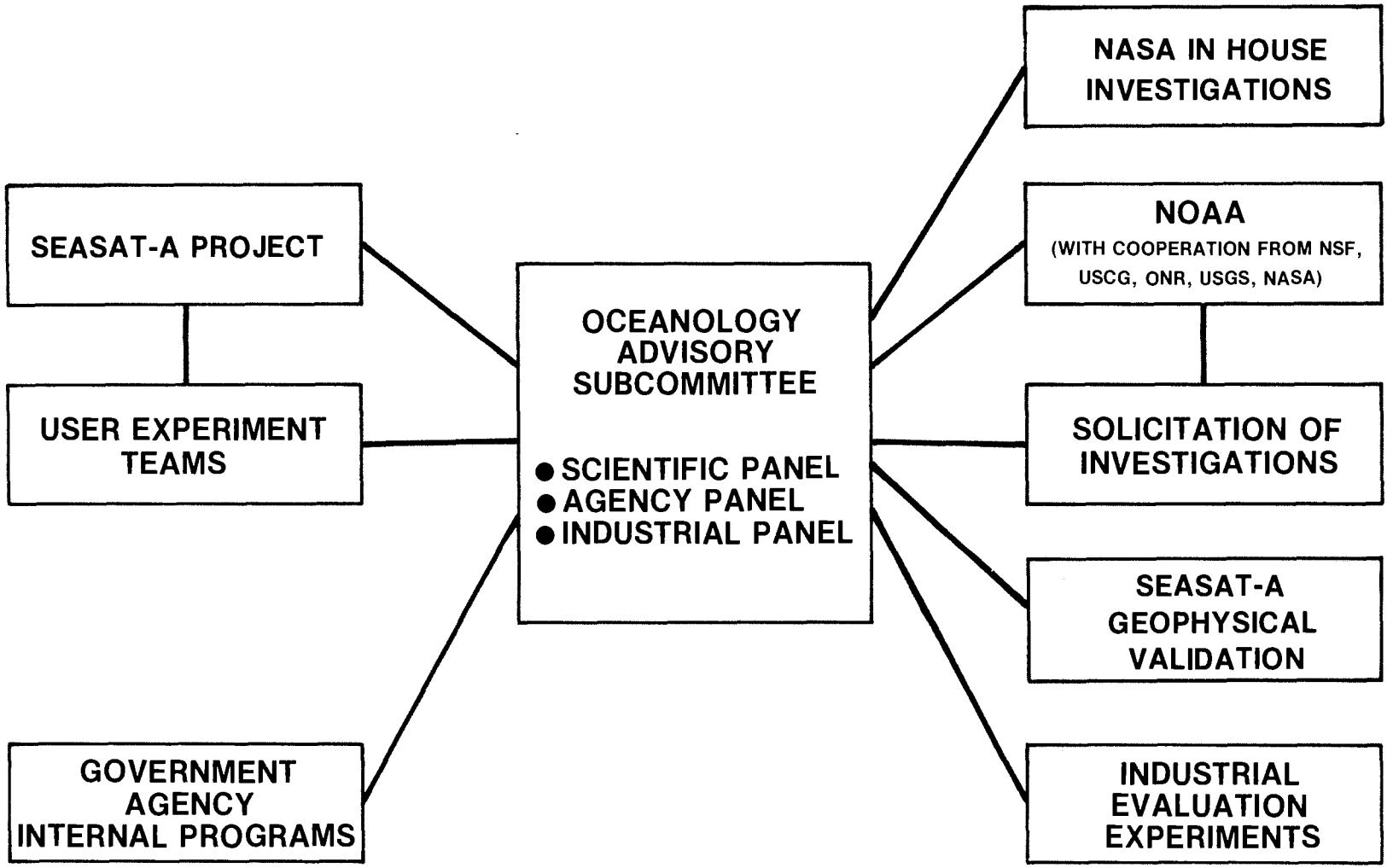
NASA HQ E87-21.56 (1)
3-28-77

USER INVOLVEMENT IN SEASAT-A EXPANDS IN SEVERAL DIMENSIONS. EACH OF THESE DIMENSIONS INTERACT STRONGLY WITH ONE ANOTHER BUT HAVE THEIR DIRECTION FOCUSED BY THE OCEANOLOGY ADVISORY SUBCOMMITTEE (OAS).

THE OAS AS A BODY PROVIDES OVERSIGHT TO THE SEASAT-A PROJECT AND IT'S ATTENDENT SENSOR EXPERIMENT TEAM ACTIVITIES. THE OAS SCIENTIFIC PANEL, AS ONE PART OF ITS ACTIVITIES, SERVES IN AN ADVISORY CAPACITY TO NOAA AND ITS EFFORTS TOWARDS IMPLEMENTING A SOLICITATION (AND SELECTION) OF INVESTIGATIONS (SCIENTIFIC). THE INDUSTRIAL EVALUATION EXPERIMENT ACTIVITY HAS A STRONG INTERACTION WITH THE OAS INDUSTRIAL PANEL WHICH SERVES AS BOTH A USER CONSTITUENCY GROUP AND A STEERING COMMITTEE/OVERSIGHT GROUP IN THE FORMULATION AND SELECTION OF CANDIDATE EXPERIMENTS. THE AGENCY PANEL, COMPRISED OF USERS FROM THE FEDERAL STRUCTURE, COORDINATES THE REQUIREMENTS OF THIS CONSTITUENCY AND ADVISES NASA REGARDING THE MULTIPLICITY OF OCEAN ACTIVITIES WITHIN THE U.S. GOVERNMENT.

SEASAT-A

SEVERAL DIMENSIONS OF USER INVOLVEMENT



NASA HQ ES77-2157 (1)
Rev. 12-19-77

NASA HAS SELECTED A SET OF EXPERIMENT TEAMS, ONE FOR EACH SENSOR ON SEASAT-A. THESE SCIENTIFIC TEAMS ARE RESPONSIBLE FOR THE GEOPHYSICAL PERFORMANCE VALIDATION OF THE SENSORS.

IN ORDER TO BROADEN THE INVOLVEMENT OF THE OCEAN SCIENCE COMMUNITY IN THE USE OF SEASAT-A DATA, THE NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION WILL, IN COOPERATION WITH OTHER GOVERNMENT AGENCIES, SOLICIT, SELECT AND FUND SCIENTIFIC INVESTIGATIONS WHICH UTILIZE DATA DERIVED BY SEASAT-A.

SEASAT-A

SOLICITATION OF INVESTIGATIONS

PURPOSE:

- TO PROVIDE SUPPORT TO THE OCEAN SCIENCE COMMUNITY FOR RESEARCH ACTIVITIES UTILIZING SEASAT-A DATA

- TO BEGIN TO VALIDATE THE SCIENTIFIC CONTRIBUTION ESTIMATES EXPECTED FROM SEASAT-A.

THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION WILL LEAD THE SOLICITATION OF INVESTIGATIONS ACTIVITY. THIS WILL INCLUDE THE ADMINISTRATION OF FUNDS FROM BOTH NOAA AND NASA TO BE USED TO SUPPORT THE SELECTED INVESTIGATIONS. OTHER COOPERATING AGENCIES FUNDS WILL BE ADMINISTERED BY EACH AGENCY.

INVESTIGATIONS WILL BE LIMITED TO THE NON-FEDERAL SEGMENT OF THE OCEAN SCIENCE COMMUNITY. THESE RESTRICTIONS WILL ALSO APPLY TO RESEARCHERS IN THE SEVERAL FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS.

SCIENTISTS WITHIN GOVERNMENT AGENCIES MAY OBTAIN RESOURCES FROM THEIR RESPECTIVE AGENCIES.

SEASAT-A

SOLICITATION OF INVESTIGATIONS

APPROACH

- NOAA WILL COORDINATE A COMBINED USER AGENCY SOLICITATION
- NOAA WILL ISSUE THE FORMAL SOLICITATION, RECEIVE AND EVALUATE PROPOSALS, AND WILL FUND NOAA AND NASA SUPPORTED INVESTIGATIONS
- RESPONSES SOUGHT FROM DOMESTIC, NON GOVERNMENT USERS
- AGENCY SCIENTISTS WILL BE SUPPORTED INTERNALLY BY THEIR RESPECTIVE AGENCIES
- SOLICITATION GUIDELINES, REVIEW CRITERION AND REVIEW TEAMS PRESCRIBED BY THE OCEANOLOGY ADVISORY SUBCOMMITTEE

THE NOAA SOLICITATION OF INVESTIGATIONS IS A COORDINATED EFFORT IN COOPERATION WITH FIVE (5) OTHER GOVERNMENT AGENCIES INVOLVED IN OCEANIC AND MARINE ACTIVITIES. AN INTER-AGENCY COORDINATING COMMITTEE HAS BEEN WORKING SINCE SEPTEMBER, 1976, TO DEFINE THE ROLES AND PROCESSES NECESSARY TO CARRY-OUT THIS COORDINATED SOLICITATION.

NOT ALL COOPERATING AGENCIES CAN PROVIDE DIRECT FUNDING IN SUPPORT OF INVESTIGATIONS. SOME AGENCIES WILL SUPPORT INVESTIGATIONS THROUGH THE CONTRIBUTION OF OTHER RESOURCES SUCH AS TIME ON OCEANOGRAPHIC RESEARCH SHIPS OR CUTTERS, AIRCRAFT TO FLY INSTRUMENTATION FOR OBSERVATIONAL PURPOSES, DATA BUOYS TO OBTAIN SURFACE TRUTH DATA, ETC.

SEASAT-A

SOLICITATION OF INVESTIGATIONS

COOPERATING AGENCIES

AGENCY PARTICIPANTS	RESOURCE CONTRIBUTIONS
• NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION	FUNDING SUPPORT
• NATIONAL SCIENCE FOUNDATION	FUNDING SUPPORT
• U.S. COAST GUARD	SHIP SUPPORT, BUOYS, AIRCRAFT FLIGHTS
• OFFICE OF NAVAL RESEARCH	FUNDING SUPPORT
• U.S. GEOLOGICAL SURVEY	SHIP SUPPORT
• NATIONAL AERONAUTICS & SPACE ADMINISTRATION	FUNDING SUPPORT

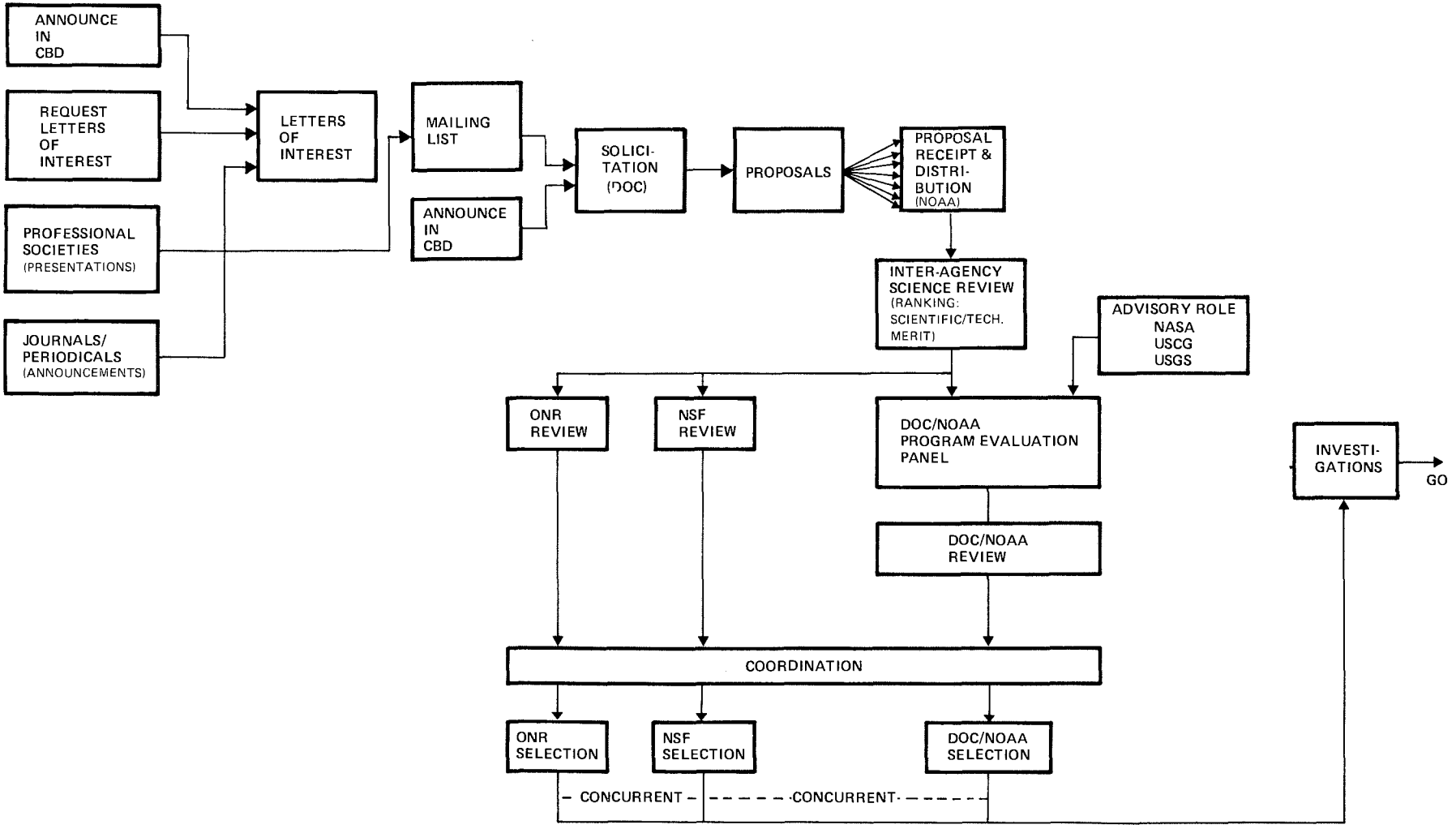
POSSIBLE MECHANIZATION OF SEASAT-A INVESTIGATIONS

DESCRIPTION

- CONCEPT PROVIDES FOR A NOAA SOLICITATION.
- NASA WILL TRANSFER FUNDS TO NOAA IN SUPPORT OF SELECTED INVESTIGATIONS.
- A PRE-SOLICITATION ACTIVITY WILL INCLUDE A REQUEST FOR A LETTER OF INTEREST FROM THE SCIENTIFIC COMMUNITY. WILL BE AUGMENTED BY PRESENTATIONS AT SCIENTIFIC MEETINGS AND ANNOUNCEMENTS IN SCIENTIFIC JOURNALS PLUS AN ANNOUNCEMENT IN THE COMMERCE BUSINESS DAILY (CBD).
- REQUESTS FOR LETTERS OF INTEREST WILL BE MAILED TO INDIVIDUALS ON MAILING LISTS FROM ALL AGENCIES PARTICIPATING IN THE COORDINATING COMMITTEE ACTIVITIES.
- INDIVIDUALS PROVIDING A LETTER OF INTEREST WILL BE INCLUDED IN THE FORMAL SOLICITATION. THE FORMAL SOLICITATION WILL BE SYNOPSIZED IN THE CBD.
- PROPOSALS WILL BE RECEIVED AND DISTRIBUTED BY NOAA FOR REVIEW/EVALUATION.
- ALL PROPOSALS WILL UNDER-GO AN INTER-AGENCY REVIEW TO BE RANKED IN TERMS OF THEIR SCIENTIFIC AND TECHNICAL MERIT. PARTICIPANTS IN THIS REVIEW ARE TBD BUT WILL INCLUDE REPRESENTATIVES FROM EACH AGENCY INVOLVED IN THE COORDINATING COMMITTEE ACTIVITIES (i.e., NOAA, NASA, NSF, ONR, NRL, USCG, USGS).
- NOAA WILL PROVIDE A PROGRAMMATIC REVIEW OF ALL PROPOSALS WITH NASA, USGS SERVING IN ADVISORY CAPACITIES. THE NSF AND ONR WILL PERFORM THEIR RESPECTIVE PROGRAMMATIC REVIEWS. THE PROGRAMMATIC REVIEW PROCESS WILL BE COORDINATED WITH ALL COOPERATING AGENCIES.
- A NOAA SELECTION OFFICIAL WILL CONDUCT A PRELIMINARY REVIEW AND PERFORM A TENTATIVE RANKING OF PROPOSALS.
- THE SELECTION ANNOUNCEMENT FROM EACH COOPERATING AGENCY WILL OCCUR CONCURRENTLY.

POSSIBLE MECHANIZATION OF SEASAT-A INVESTIGATIONS

(DOC/NOAA PROCUREMENT)



NASA HQ ES77-784(1)
2-2-77

SEASAT-A

SOLICITATION OF INVESTIGATIONS

AREAS OF RESEARCH INTEREST

- COASTAL ZONE AND LAKES
- OPEN OCEAN
- GEODESY
- POLAR REGIONS
- HYDROLOGY

SEVERAL AREAS OF RESEARCH ARE TO BE EMPHASIZED IN THE INVESTIGATIONS. FIVE KEY AREAS ARE NOTED BELOW ALONG WITH A LISTING OF RELEVANT SUB-AREAS:

- COASTAL ZONE & LAKES
  - SHALLOW WATER WAVES
  - INTERNAL WAVES
  - CONTINENTAL SHELF/NEARSHORE CIRCULATION PROCESSES
  -
  - STORM SURGE AND SETUP
  - NEAR SHORE WINDS
  - SHOALS
  - OIL
  - LAKE ICE
- OPEN OCEAN
  - WIND FIELDS, STRESS FIELDS AND WAVE SPECTRA
  - SURFACE WINDS
  - WIND STRESS
  - SURFACE TEMPERATURE
  - STEADY AND TRANSIENT OPEN-OCEAN CURRENTS
  - ATMOSPHERIC LIQUID WATER AND WATER VAPOR
- GEODESY
  - GEOID
  - PRECISE EPHEMERIS
- POLAR
  - ICE DYNAMICS
  - ICE MAPPING
  - SEA ICE STATISTICS
- HYDROLOGY
  - SNOW AREA EXTENT
  - SNOW DEPTH AND PHYSICAL PROPERTIES
  - FLOOD INUNDATION MAPPING
  - SOIL MOISTURE

THE SCHEDULE OF ACTIVITIES FOR THE SOLICITATION AND SELECTION OF INVESTIGATIONS IS BEING PACED BY THE LAUNCH DATE FOR SEASAT-A, NOW SET FOR MAY 1978. IT IS THE INTENT TO HAVE ALL INVESTIGATIONS SELECTED PRIOR TO THE LAUNCH DATE. WHILE THE BULK OF THE FUNDING WILL PROBABLY NOT BE MADE AVAILABLE PRIOR TO LAUNCH, IT MAY BE NECESSARY TO PROVIDE LIMITED LEVELS OF SUPPORT IN ORDER TO HAVE MANPOWER: APPARATUS, SHIPS, ETC., IN PLACE SHORTLY AFTER LAUNCH.

SEASAT-A

SOLICITATION OF INVESTIGATIONS

KEY MILESTONES

EVENT	DATE
• ISSUE REQUEST FOR LETTERS OF INTEREST	JUNE, 1977
• ISSUE INVITATION TO PROPOSE INVESTIGATIONS	DECEMBER, 1977
• RECEIVE PROPOSALS	FEBRUARY, 1978
• SELECTION OF INVESTIGATIONS	MAY, 1978

SEASAT-A
INDUSTRY EVALUATION EXPERIMENTS

THE SEASAT ECONOMIC ASSESSMENT, COMPLETED IN 1975, IDENTIFIED SUBSTANTIAL POTENTIAL BENEFITS FROM THE USE OF OPERATIONAL SEASAT DATA IN AREAS THAT ARE EXTENSIONS OF CURRENT OPERATIONS, SUCH AS MARINE TRANSPORTATION,AND OFFSHORE OIL AND NATURAL GAS EXPLORATION AND DEVELOPMENT. IN ADDITION, IT WAS CONCLUDED THAT VERY LARGE POTENTIAL BENEFITS FROM THE USE OF SEASAT DATA COULD BE POSSIBLE IN AN AREA OF OPERATIONS THAT IS NOW IN THE PLANNING OR CONCEPTUAL STAGE, NAMELY, THE TRANSPORTATION OF OIL, NATURAL GAS AND OTHER RESOURCES BY SURFACE SHIP IN THE ARCTIC REGIONS. A FURTHER AREA OF LARGE POTENTIAL BENEFITS THAT WAS IDENTIFIED STEMS FROM THE USE OF SEASAT DATA IN SUPPORT OF OCEAN FISHING OPERATIONS. FOR THE PURPOSE OF THE ECONOMIC ASSESSMENT, THE OPERATIONAL SEASAT SYSTEM WAS CONSIDERED TO BEGIN IN 1985. THE ECONOMIC BENEFITS SHOWN IN THE TABLE BEGIN IN 1985 AND ARE ACCRUED IN THE PERIOD FROM 1985 THROUGH 2000. THE RANGE OF BENEFITS ESTIMATED RELFECTS PRESENT UNCERTAINTIES IN THE FUTURE DEVELOPMENTS OF THE AREAS STUDIED, AS WELL AS UNCERTAINTIES IN THE EXPECTED PERFORMANCE OF THE OPERATIONAL SEASAT SYSTEM. ALL BENEFITS ARE STATED IN 1975 DOLLARS AT A 10 PERCENT RATE OF DISCOUNT, REFERENCED TO 1975.

THE BENEFIT ESTIMATES MADE IN THE SEASAT ECONOMIC ASSESSMENT ARE LARGELY BASED UPON EMPIRICAL EVIDENCE,AND BEST ESTIMATES OF THE EXPECTED IMPACT OF OPERATIONAL SEASAT DATA ON OPERATIONS IN THE AREAS OF MARITIME ACTIVITY WHICH WERE CONSIDERED IN THE ASSESSMENT. THE LAUNCH OF SEASAT-A IN 1978 WILL PROVIDE THE FIRST OPPORTUNITY TO OBTAIN EXPERIMENTAL EVIDENCE OF THE EFFECTS OF SEASAT DATA ON THE ECONOMIC PERFORMANCE OF SELECTED AREAS OF MARITIME ACTIVITY.

SEASAT-A

INDUSTRY EVALUATION EXPERIMENTS

SEASAT MAJOR BENEFIT AREAS

AREA	PRESENT VALUE OF THE BENEFIT ($ MILLIONS, 1975)
ARCTIC OPERATIONS	96 - 288
COSTAL ZONES	3 - 81
MARINE TRANSPORTATION	215 - 525
OCEAN FISHING	274 -1432
OFFSHORE OIL AND NATURAL GAS	214 - 344

*Benefits Attributable To An Operational SEASAT System, 1985-2000, At 10 Percent Discount Rate, Referenced to 1975.

THROUGH THE USE OF SEASAT-A DATA IN A SERIES OF CAREFULLY DESIGNED EXPERIMENTS, IT SHOULD BE POSSIBLE TO OBTAIN INFORMATION WHICH WILL BE USEFUL IN GUIDING THE DESIGN OF FUTURE OCEANOGRAPHIC SATELLITE SYSTEMS TO EMPHASIZE THOSE CHARACTERISTICS THAT ARE OF ECONOMIC IMPORTANCE TO CIVILIAN SECTOR AND COMMERCIAL USERS. A SECONDARY PURPOSE OF THESE EXPERIMENTS WILL BE TO BEGIN THE PROCESS OF THE TRANSFER OF THE TECHNOLOGY OF THE SEASAT SYSTEM FROM NASA TO THE EXPECTED USERS OF AN OPERATIONAL SEASAT SYSTEM.

SEASAT-A
INDUSTRY EVALUATION EXPERIMENTS

PURPOSE:

- TO PROVIDE DATA TO AID IN DEFINING OPERATIONAL CHARACTERISTICS OF FUTURE, SEASAT SYSTEMS.
- TO BEGIN THE TECHNOLOGY TRANSFER PROCESS TO SELECTED USERS.
- TO OBTAIN EXPERIMENTAL DATA TO HELP VALIDATE ECONOMIC BENEFIT ESTIMATES.

THE CONCEPT EMBODIED BY THE INDUSTRIAL EVALUATION EXPERIMENTS IS QUITE STRAIGHTFORWARD. SEASAT-A DATA WILL BE TRANSFERED TO THE NAVY FLEET NUMERICAL WEATHER CENTRAL (MONTEREY, CA.) FOR REAL TIME PROCESSING. NASA WILL SUPPORT SOME ADDITIONAL PROCESSING OF THESE FNWC PRODUCTS TO MEET EXPERIMENT PARTICIPANTS NEEDS. NASA WILL PROVIDE THE RESOURCES NECESSARY TO DELIVERY THESE PRODUCTS TO THE USERS "DOORSTEP". THE ASSIMILATION AND OPERATIONAL USE OF THE DATA PRODUCTS WILL BE THE PARTICIPANTS RESOURCES. NASA SUPPORT DURING THE EARLY PHASES OF DATA ASSIMILATION IS EXPECTED. THE EXPERIMENT PARTICIPANTS WILL OBTAIN SOME MEASURE OF THE UTILITY THAT THE USE OF SEASAT-A DATA PRODUCTS HAVE ON THEIR COMMERCE - THESE RESULTS WOULD BE PUBLISHED AND RELEASED BY THE EXPERIMENT PARTICIPANTS.

SEASAT-A
INDUSTRY EVALUATION EXPERIMENTS
EXPERIMENT CONCEPT

- NASA TO PROVIDE SEASAT-A DATA PRODUCTS IN USER REQUIRED FORMAT
- INDUSTRY USER PARTICIPANTS TO PROVIDE RESOURCES TO ASSIMILATE DATA PRODUCTS AND UTILIZE THEM IN EXPERIMENT ACTIVITIES.
- INDUSTRY USER PARTICIPANTS TO MEASURE UTILITY OF SEASAT-A DATA PRODUCTS IN USERS COMMERCE.
- INDUSTRY USER PARTICIPANTS TO RELEASE RESULTS OF EXPERIMENT ACTIVITY.

THE INDUSTRIAL USERS HAVE BEEN A MAJOR INGREDIENT OF THE SEASAT-A PROGRAM. KEY TO THE ESTABLISHMENT OF THE PROGRAM WAS THE FACT THAT THE MAJOR BENEFITS ESTIMATED TO ACCRUE FROM AN OPERATIONAL SEASAT-SYSTEM ARE TO BE DERIVED FROM THE COMMERCIAL OCEAN COMMUNITY. THESE BENEFITS, ALONG WITH THE NECESSARY TRANSFER OF TECHNOLOGY MUST BE TESTED DURING THE SEASAT-A MISSION. HOWEVER, IN THIS EARLY FIRST PHASE NASA HAS A RESPONSIBILITY TO PROVIDE SUPPORT, IN A COST-SHARING ARRANGEMENT, TO THE COMMERCIAL SECTOR, IN ORDER TO DEMONSTRATE THE COMMERCIAL VIABILITY OF THE SEASAT-A CONCEPT.

SEASAT-A
INDUSTRY EVALUATION EXPERIMENTS
IMPORTANCE OF INDUSTRIAL USER PROGRAM

- INDUSTRIAL USERS HAVE HAD AN INVOLVEMENT IN SEASAT-A USER GROUP BACK TO 1972.
- THE MAJORITY OF THE DOLLAR BENEFITS FOR SEASAT WERE COMMERCIAL.
- THE INDUSTRIAL USER PROGRAM NEEDS NASA SUPPORT TO DEMONSTRATE VIABILITY.

THE INDUSTRIAL USERS OF SEASAT-A DATA ARE, IN FACT, DEMONSTRABLY DIFFERENT THAN EITHER THE ACADEMIC, INSTITUTIONAL OR GOVERNMENT AGENCY USERS.

FIRST VENTURES REQUIRE A COMMERCIAL USER TO COMMIT REAL PEOPLE AND REAL DOLLARS. THESE RESOURCES CAN SUFFER SIGNIFICANTLY IN THE EVENT THESE FIRST VENTURES ARE LESS THAN SUCCESSFUL. USE OF SEASAT-A DATA, FOR MOST COMMERCIAL USERS IS A FIRST VENTURE. THIS DIFFERENCE MUST BE RECOGNIZED AND ACCOMMODATED IN THE USER PROGRAM.

SEASAT-A
INDUSTRY EVALUATE EXPERIMENTS
CONTRAST BETWEEN INDUSTRIAL AND SCIENTIFIC/AGENCY USERS

- SCIENTIFIC USERS WILL CONDUCT EXPERIMENTS MOSTLY IN NON-REAL TIME
- AGENCY SPONSORED USER PROGRAMS MAY NOT PROVIDE FULL SUPPORT FOR INDUSTRIAL SERVICES
- INDUSTRIAL USERS ARE DIFFERENT:
  - COMPANY COMMITMENT OF RESOURCES AND PEOPLE IS INVOLVED
  - UNSUCCESSFUL EFFORT BY INDUSTRY INVOLVES PENALTIES NOT SUFFERED BY SCIENTIFIC OR AGENCY GROUPS
- <u>REAL</u> INDUSTRIAL USERS ARE REQUESTING NASA ASSISTANCE

ALL INDUSTRIAL EVALUATION EXPERIMENTS SELECTED FOR SUPPORT AND IMPLEMENTATION WILL SATISFY THE FIVE (5) CRITERIA NOTED ON THE FACING PAGE. BOTH THE COMMERCIAL USER AND NASA WILL FAIL TO OBTAIN MAXIMUM BENEFITS FROM THE EXPERIMENTAL ACTIVITY SHOULD AN EXPERIMENT FAIL TO MEET ANY ONE OF THESE CRITERIA.

SEASAT-A

INDUSTRY EVALUATION EXPERIMENTS
CRITERIA FOR A SUCCESSFUL EVALUATION
EXPERIMENT

- COMMITMENT FROM PRIVATE INDUSTRY
- SEASAT-A DATA WILL SATISFY REQUIREMENTS OF EXPERIMENT
- MEASURABLE RESULTS CAN BE OBTAINED DURING SEASAT-A LIFETIME
- EXPERIMENT RESULTS CAN BE DISTRIBUTED
- INDUSTRY EXPERIMENTS WILL HAVE SPECIFIED BEGINNING AND END POINT IN TERMS OF NASA INVOLVEMENT

A KEY ELEMENT IN THE INDUSTRIAL EVALUATION EXPERIMENT CONCEPT IS THE FACT THAT, AS PILOT DEMONSTRATIONS THEY HAVE A DEFINITE END POINT. ASSUMING EXPERIMENTAL SUCCESS, HOWEVER, THE COMMERCIAL UTILIZATION OF THE SEASAT DATA IS EXPECTED TO CONTINUE - BUT UNDER THE AUSPICES OF OPERATIONAL GOVERNMENT AGENCIES. THESE GOVERNMENT AGENCIES, NOAA AND OTHERS, WILL SUPPLY THE DATA NEEDS OF THE USERS WHO, IN TURN, WILL EITHER BEAR, OR SHARE THE COSTS OF OBTAINING AND USING THE DATA PRODUCTS.

SEASAT-A

INDUSTRY EVALUATION EXPERIMENTS

CHARACTERISTICS OF NASA INVOLVEMENT

- A DEMONSTRATION OF FEASIBILITY
- A PILOT PROJECT WITH A DEFINITE END
- DECREASING SUPPORT LEVELS FROM NASA WITH INCREASING SUPPORT FROM INDUSTRY AFTER AUGUST 1978
- NASA SUPPORTS FLOW OF DATA TO INDUSTRIAL EXPERIMENT USERS
- USERS SUPPORT COSTS AT THEIR SITES

A RATHER BROAD REPRESENTATION FROM THE COMMERCIAL OCEAN COMMUNITY IS CURRENTLY INVOLVED IN THE PLANNING PHASES OF THE INDUSTRIAL EVALUATION EXPERIMENTS. EACH SELECTED COMMERCIAL USER WILL PARTICIPATE ON A RESOURCE-SHARE BASIS IN THE EXPERIMENTS. THE RESOURCE CONTRIBUTIONS OF THE PARTICIPANTS WILL OF COURSE, VARY DEPENDING UPON THE NATURE OF THE USERS COMMERCE AS WELL AS THE SIZE OF THE ORGANIZATION. POTENTIAL INVESTMENTS OF CANDIDATE PARTICIPANTS ARE ILLUSTRATED ON THE FACING PAGE.

SEASAT-A
INDUSTRY EVALUATION EXPERIMENTS
POTENTIAL INVESTMENTS
OF SEVERAL
COMMERCIAL USERS

• SUN SHIPBUILDING & DRYDOCK, INC.	VESSEL TIME IN GULF OF ALASKA, COMPUTATION AND DATA ANALYSIS
• CONOCO	OCEAN INSTRUMENTATION COMPUTATION & DATA ANALYSIS
• TENNESSEE GAS & PIPELINE	OCEAN INSTRUMENTATION COMPUTATION & DATA ANALYSIS
• NO. PACIFIC FISHING VESSEL OWNERS ASSOC.	VESSEL TIME, OPERATIONAL ANALYSIS
• INTER-AMERICAN TROPICAL TUNA COMMISSION	VESSEL TIME, OCEAN INSTRUMENTATION, DATA ANALYSIS
• OCEAN DATA SYSTEMS, INC.	COMPUTATION, DATA DISTRIBUTION
• INTERNATIONAL ICE PATROL	AIRCRAFT & SHIP SUPPORT, DATA ANALYSIS
• UNITED FISHERMANS MARKETING ASSOC.	VESSEL TIME, OPERATIONAL ANALYSIS
• OCEAN ROUTES INCORPORATED	COMPUTATION, DATA DISTRIBUTION

THE INDUSTRIAL EVALUATION EXPERIMENTS ARE WELL INTO THE PLANNING PHASE. PRELIMINARY SELECTION OF EXPERIMENTS FOR DESIGN AND IMPLEMENTATION IS EXPECTED TO OCCUR AROUND JUNE, 1977.

TO AID IN THE PLANNING, NASA REPRESENTATIVES INTERFACE DIRECTLY WITH EACH CANDIDATE PARTICIPANT IN ORDER TO DEVELOP EXPERIMENT PLANS WHICH REFLECT THE REALITIES OF THE SEASAT-A PERFORMANCE AS WELL AS THE GROUND PROCESSING CAPABILITIES.

SEASAT-A

INDUSTRY EVALUATION EXPERIMENTS

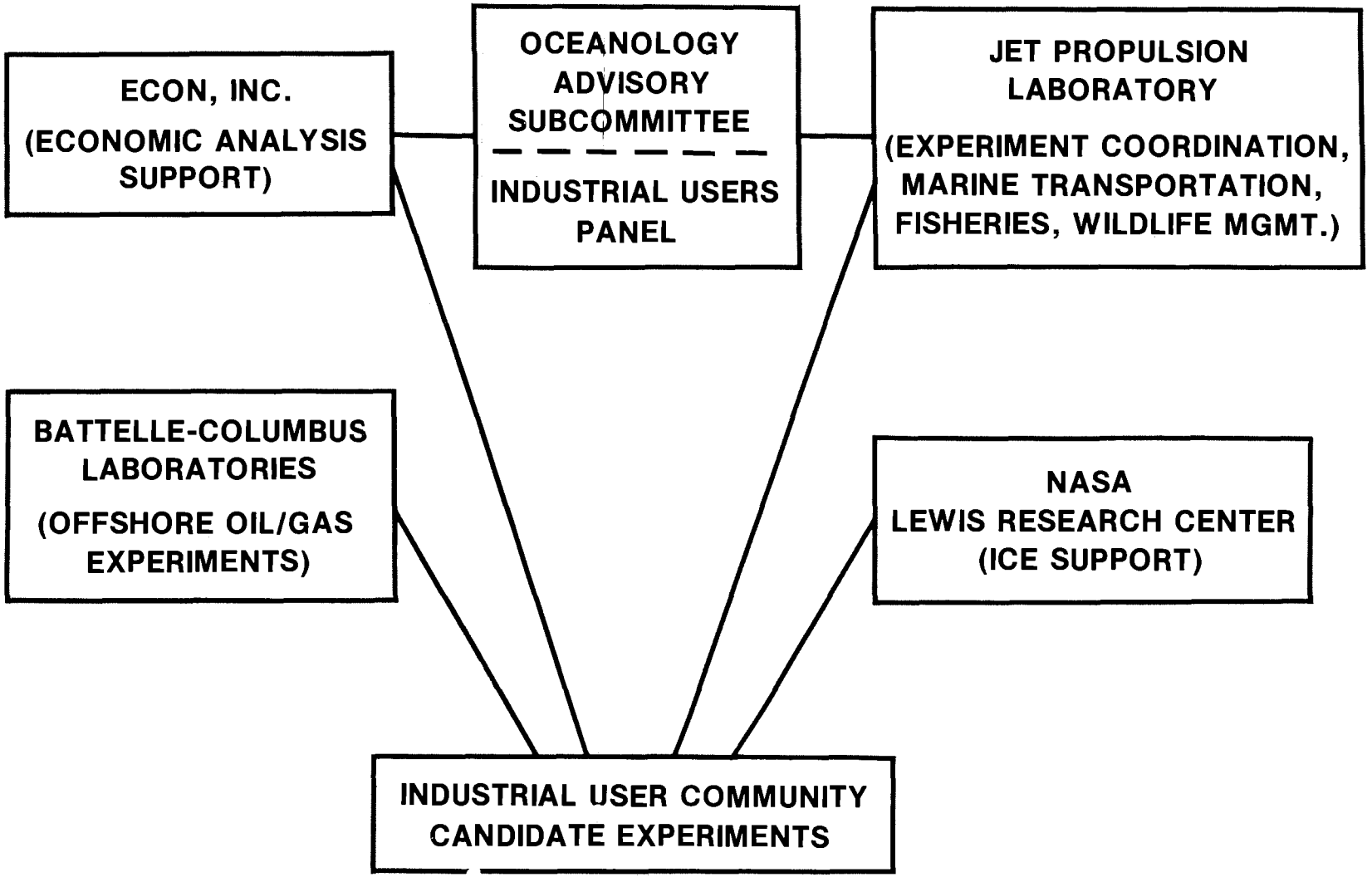
PRELIMINARY EXPERIMENT DESIGN

- POTENTIAL EXPERIMENT AREAS
  - OFFSHORE OIL AND GAS
  - MARINE TRANSPORTATION
  - ARCTIC ICE
  - CANADIAN COOPERATION
- EACH EXPERIMENT HAS INDUSTRY INVOLVEMENT & SEASAT LIAISON PERSONNEL ARE ASSIGNED
- EXPERIMENT PLANNING IS PROCEEDING; SOME COMPANIES INVOLVED ARE:
  - SUN SHIPBUILDING & DRYDOCK, INC.
  - CONOCO
  - TENNESSEE GAS & PIPELINE
  - BROWN & ROOT, INC.
  - OCEAN DATA SYSTEMS, INC.
  - OCEANROUTES, INC.
  - INTER-AMERICAN TROPICAL TUNA COMMISSION
  - INTERNATIONAL ICE PATROL
  - NO. PACIFIC FISHING VESSEL OWNERS ASSOC.
  - UNITED FISHERMANS MARKETING ASSOC.
  - OSU SEA GRANT MARINE ADVISORY PROGRAM

IN ORDER TO TAKE ADVANTAGE OF THE UNIQUE SKILLS AND CAPABILITIES AS WELL AS TO MAINTAIN FOCUSED DIRECTION, THE PLANNING AND FUTURE IMPLEMENTATION OF THE INDUSTRIAL EVALUATION EXPERIMENTS ARE PROCEEDING UNDER A SET OF WELL DEFINED INTERFACES AND RELATIONSHIPS.

PROVIDING FOCUS AND DIRECTION IS THE INDUSTRIAL USERS PANEL OF THE OCEANOLOGY ADVISORY SUBCOMMITTEE. ALL CANDIDATE EXPERIMENT PARTICIPANTS ARE ACTIVE MEMBERS OF THIS PANEL. REVIEW AND RECOMMENDATIONS FOR EXPERIMENT SELECTION WILL BE PROVIDED BY THIS PANEL.

SEASAT-A
INDUSTRY EVALUATION EXPERIMENTS
INTERFACES AND RELATIONSHIPS



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A DEVELOPMENT AND IMPLEMENTATION SCHEDULE FOR THE INDUSTRIAL EVALUATION EXPERIMENTS HAS BEEN GENERATED - EFFORTS TO DATE ARE FOLLOWING THIS SCHEDULE.

SEVERAL FACTORS HAVE DRIVEN THE SCHEDULE OF EVENTS. TWO KEY DRIVING ELEMENTS ARE THE LAUNCH DATE OF SEASAT-A, MAY 1978, AND THE POST-LAUNCH PERIOD REQUIRED TO PERFORM THE GEOPHYSICAL VALIDATION OF SEASAT-A SENSORS. PRODUCTS FROM SEASAT-A DATA ARE NOT EXPECTED TO BE SUFFICIENTLY MATURE FOR MOST INDUSTRIAL EXPERIMENTAL PURPOSES UNTIL APPROXIMATELY 6 MONTHS TO 1 YEAR AFTER LAUNCH. THIS PERIOD WILL PERMIT THE GEOPHYSICAL VALIDATION OF EACH SENSOR. AS SUCH, MOST INDUSTRIAL EVALUATION EXPERIMENTS WILL BE PLANNED TO BEGIN (FOLLOWING A THOROUGH TEST PERIOD) AROUND NOVEMBER, 1978. EXPERIMENTS WITH SEASONAL DEPENDENCY MAY COMMENCE EARLIER CONSISTENT WITH THE STATE OF VALIDATION FOR THE SENSORS INVOLVED IN THE PARTICULAR EXPERIMENT DATA PRODUCTS.

SEASAT-A

INDUSTRY EVALUATION EXPERIMENTS

KEY MILESTONES

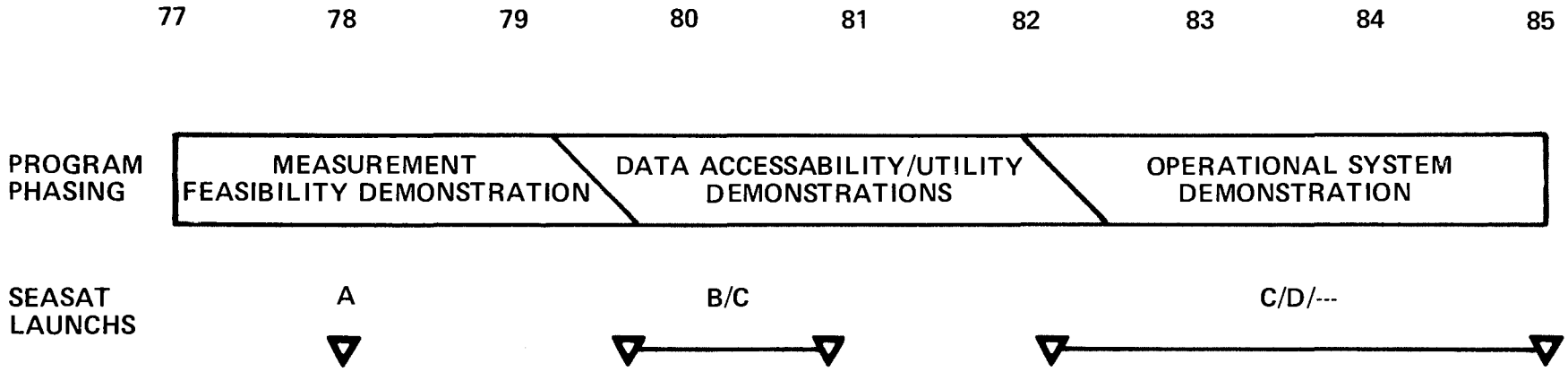
EVENTS	DATE
• DEFINE A SET OF EXPERIMENTS AS APPROVED BY INDUSTRIAL USERS PANEL	FEBRUARY - APRIL 1977
• TECHNICAL EVALUATION BY PROJECT AND EXPERIMENT TEAMS	MAY 1977
• NASA SELECTION OF EXPERIMENTS - ASSIGN LEVEL OF SUPPORT	JUNE 1977
• COMMENCE EXPERIMENT IMPLEMENTATION	JULY 1977
• BEGIN EXPERIMENT TEST OPERATIONS	JUNE 1978
• COMMENCE EXPERIMENTAL ACTIVITIES	NOVEMBER 1978
• NOAA OR OTHERS BEGIN TO ASSUME PROGRAM RESPONSIBILITY-PROVIDE USER DATA NEEDS	NOVEMBER 1979

SEASAT-A IS CONSIDERED TO BE THE FIRST IN A SERIES OF OCEAN MONITORING SATELLITES DESIGNED TO TEST THE APPLICATION OF REMOTELY SENSED OCEAN CONDITION DATA TO MARINE RESEARCH, OPERATIONAL PROGRAMS AND COMMERCE. SEASAT-A IS ALSO CONSIDERED TO BE THE FORERUNNER OF AN OPERATIONAL SYSTEM - A POSSIBLE NEW GENERATION OF OPERATIONAL POLAR ORBITING ENVIRONMENTAL SATELLITE SYSTEMS.

AN EVOLUTIONARY PROCESS IS ENVISIONED - LEADING TO THE OPERATIONAL SYSTEM. SEASAT-A WILL PROVIDE FOR A DEMONSTRATION OF THE MEASUREMENT FEASIBILITY. DEFICIENCIES IN MEASUREMENT ABILITY AND DATA PROCESSING ARE LIKELY AND USER EXPERIENCE WITH SEASAT-A WILL CAUSE MODIFICATIONS TO BE DESIRABLE IN THE PERFORMANCE OF THE NEXT GENERATION OF SATELLITES. IT WILL BE NECESSARY TO EVALUATE THESE CHANGES AND TO DEMONSTRATE BOTH THE ABILITY TO ACCESS DATA IN AN OPERATIONAL REGIME AND THE QUANTIATIVE UTILITY OF THE DATA TO OCEAN SERVICES & COMMERCE PRIOR TO IMPLEMENTING AN OPERATIONAL SYSTEM.

THE SEQUENCE & EVENTS SHOWN ON THE FACING PAGE ILLUSTRATES THE EVOLUTIONARY PROCESS FOR THE SEASAT PROGRAM AND DEPICTS THE EVENTS IN A TIME FRAME CONSISTENT WITH THE PLANS OF THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION - THE PRINCIPAL CIVIL OCEAN OPERATING AGENCY IN THE FEDERAL GOVERNMENT.

POSTULATE SEASAT PROGRAM



* SPECIFIC DATES A FUNCTION OF USER SUPPORT AND FUNDING CONSTRAINTS

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