STOP 9 TEXT
FIRST COMPILED DRAFT
26 MINUTES

ERTS TALK AT LEWIS RESEARCH CENTER

Welcome to Servants in Space. This presentation is made up of contributions from three NASA centers: GSFC, JSC and Lewis R.C. ~~I am~~ ____ ~~from~~ the Goddard Space Flight Center,

SPEAKER ON

For both public and scientists alike, the watchwords today are resources-energy-and environment. NASA has developed a tradition over the years as a leading innovator in communications, weather forcasting, and, of course, exploration of the planets. But it may come as a surprise to realize that the space agency in recent years has been assuming a key role in developing new approaches and techniques for exploration, inventory, and management of terrestrial natural resources, and the activities of man on the earth's surface.

Almost from the beginning of the agency, NASA experimented with photographing the earth from rockets and satellites, and with photographs taken by the astronauts. The results often were both spectacular and obviously ~~potentially~~ practical. The views obtained demonstrated the special characteristics of space imagery--tens of thousands of square miles of the surface could be shown in single scenes - giving synoptic or all-inclusive coverage of whole regions, uniformly illuminated and containing a wealth of detail.

After viewing these pictures, experts in many fields recognized the potential of earth-observing systems from orbiting platforms, for many applications which prove too difficult or expensive to do by most conventional methods. Applications are being developed today in the fields of agriculture, forestry, urban development; for geology and landuse, for monitoring air and water pollution, and for many areas in the field of oceanography. Tasks in all of these fields can be done effectively from satellites and, to a degree, have already been accomplished. Some of these will be described today.

On July 23, 1972, the first research-directed earth-observing satellite, (*) called ERTS-1 for Earth Resources Technology Satellite, was launched in a near-circular, almost polar orbit at an altitude of 570 miles. This satellite (*) carries several imaging sensors including a multispectral scanner that produces an image 115 miles on a side--covering more than 12,000 square miles at once(*). The scanner examines the earth over different wave lengths (*) -- yielding photoimages that represent the appearance of the surface as seen through green and red filters in the visible light range and through filters that ~~measure~~ pass reflected light in the near infrared. (*) After they are made, these images can be projected through a different set of filters in the laboratory to produce color images (*) -- here is the same scene in brilliant color. Since vegetation is very reflective in the IR and we use a red filter to make the IR band visible to the eye, vegetation appears red in this rendition. The satellite continues even now to take these images of the Earth on a repeating or cyclic basis. (*) The satellite reoccupies the same orbital path and images the same large area every 18 days. Depending on cloud cover, we can get up to 20 different images of each scene in a year -- this allows for seasonal coverage to monitor changes in vegetation, extent of snow cover, water supply, land development, and the like. So far, we've examined over 75% of the land surface on Earth.

For years we have been doing resources analysis and applications by a variety of techniques that are often ineffective and limited, usually slow and laborious, and certainly costly. Let me give you an example. This view of part of Central Wyoming (*) is a mosaic made from standard aerial photographs -- there are more than 12,000 individual photos in this picture -- the same area of 115 miles on a side that we get from ERTS. The scene is poorly represented. Its elements were obtained under varying lighting conditions, and although it has much detail on close examination, it is hard to get the synoptic view that interrelates the major features (*). This mosaic would cost about $200,000 to acquire today -- at that price we could do this just once, for some one season. But now look at the ERTS view (*) of the identical area (*) it is obvious how much more information is readily apparent - the lakes, mountain ranges and other features stand out in sharp contrast. ERTS images, because of their quality and uniform lighting can be pieced together to produce mosaics of entire states or even countries. Here is all of Wyoming in color (*). We are now assembling a black & white mosaic, of this quality, of the entire United States, and it may be ready to go on public display before the year is out.

(*) Now for just a few examples of what can we do practically with ERTS.

In the Wind River Mountains -- a rugged, inccessible range near the Tetons, (*) a colleague has been mapping great faults and fractures -- important features because they may concentrate mineral deposits, for 5 years, summer after summer of field work by pack mule and foot. He had, after 1000's of hours, accomplished this much (*) about 10%. One aerial flight added this new information. After he got the ERTS image, he was able (*) to complete the fractures map for the whole range in just 3 hours (including coffee break time).

These next ERTS images tell a dramatic story. We all remember the devastating effects of the great Mississippi River floods this last spring. ERTS was very successful in imaging almost the entire river basin in flood, several times during this period. Never before have we seen in such broad scope the extent of this type of major catastrophe and, from studies now underway, to continually monitor the river floodplain long after the waters recede, to learn the way the land dries out and the crops attempt to make a comeback.

Inventory of croplands during a growth cycle takes particular advantage of the repetitive coverage afforded by ERTS. Here is a view of the Sacramento Valley of northern California. A pilot study of ERTS' effectiveness in crop recognition was carried out in this small area. The next slide shows an enlargement of that section of the image. While your eye has difficulty in discerning small differences in the red tones for some of the fields, careful measurements show the differences to be real and to represent the influence of different crop types. What we do in practice is to sample a small number of fields of different crops, relate each type to its tonal or light-reflecting characteristics as seen by ERTS, and then look elsewhere in the image for fields of similar characteristics. Using this training approach, we can direct a computer to classify fields of all known types. Typical results are shown in this slide. For the number of categories selected, the computer-generated ERTS classification has proved to be about 90% accurate. From data like this, we can derive such useful information as total acreage planted in each crop type, estimates of total harvest, approximate times of anticipated crop maturity, and, in some instances, an indication of possible crop disease or weather damage. At present, the only alternative ways to get this information are to send county farm agents out to count the crops -- a huge task -- or to ask each farmer to send in monthly reports -- ~~on top of all the~~ other jobs, ~~they must do.~~

A prime topic today in our state legislature is how to develop sound land use legislation. This requires as an essential base a series of land use maps -- whose costs of initial preparation and continual updating are monumental. ERTS can do the job for a fraction of this dollar outlay. Look at the product (*) that has been generated for Connecticut-Massachusetts-Rhode Island using ERTS exclusively -- a remarkably accurate representation and one that is easily kept current. For a similar mapping job, examine these cost figures (*).

Using black and white aerial photos, color aerial photos, and ERTS images, a land use map of the identical area can be produced 20 times and 10 times cheaper from the unmanned satellite ERTS than from black and white and color photo mapping respectively.

Several of these space mosaics are being shown here today. Hopefully you will have a moment during your tour to examine our Goddard exhibits ~~where~~ we have placed some of the best from ERTS.

We will now hear from the Johnson Space Center and their efforts using the Skylab in the Earth Observation Program.

12th Edition
SKYLAB EREP PRESENTATION
LeRC

September 19 - 21, 1973

I am so and so & I will present blabity bla

2ND SPEAKER OFF
SKYLAB 1 SLIDE ON

Skylab is a 100-ton experimental space station which was launched in mid-May of this year. The first Skylab crew was also launched in May and was recovered in June. The second crew joined the Skylab on July 28 and are now in the 54th day of their mission.

1 OFF
SPEAKER
ON

At an altitude of 270 miles, Skylab is in a near-circular orbit and crosses every section of the world between 50° north and 50° south latitude, completing an orbit of the Earth every 93 minutes and repeating the same revolution every 5 days. Unlike ERTS, Skylab covers only this portion of the Earth due to vehicle, and launch constraints.

SPEAKER
OFF
2 ON

2 OFF
3 ON

The Skylab Program objectives are shown here. One of the major Skylab Program objectives is to develop and improve techniques for observing the Earth from space using remote sensing instruments, thus providing the capability to vastly improve man's ability to manage Earth resources in such fields as geology, hydrology, forestry, oceanography, and especially agriculture. The Earth applications portion constitutes only about 15% of the total time allocated for experiments.

3 OFF SPEAKER ON

(*) You have just seen some of the ERTS data, and to compare these programs, a brief summary of the Skylab and ERTS sensors is shown for you to keep in mind as we proceed.

SPEAKER OFF 4 ON

(*) The Skylab Earth Resources Experiment Package is a group of instruments composed of cameras, radar, microwave and infrared radiometers, and a multichannel scanner which can record photographic and thermal infrared information of the Earth's surface. This, by the way, is the first time microwave data has been collected from space.

4 OFF ERON 5

(*) Data from all of these sensors are being analyzed by some 150 United States and International scientists.

5 OFF SPEAKER ON

(*) I will now show you examples of this data and how it is being used. Because of time limitations, we have selected examples from <u>only</u> the Skylab cameras and the multispectral scanner.

SPEAKER

The next two slides are views of the Earth from Skylab, each covering approximately 4,000 square miles.

SPEAKER OFF 6 ON

This photograph, taken over southwestern Utah, shows an excellent view of the San Rafael Swell, a large structural feature on the Earth's surface called an anticline. This type feature, defined here by rock units of varying color, is a surface expression of subsurface conditions.

6 OFF SPEAKER ON

Scientists analyzing these types of data are applying the use of space photography to help locate oil, gas, and mineral deposits throughout the world.

SPEAKER OFF 7 ON

This photograph shows the western half of the island of Puerto Rico with its surrounding coastal waters. Such underwater regions, which appear here in various shades of blue, are being studied by ocean scientists to determine underwater topography and geology. Data of this nature combined with information obtained from other Skylab sensors as well as supporting aircraft and ground truth surveys, will ~~also~~ be used to provide information on waves, water depth, sedimentation in coastal waters, fresh water lakes, and related conditions.

7 OFF SPEAKER ON

This type of information from Skylab can contribute to our ability to locate and use more effectively our water and marine resources.

For the remainder of my presentation, I will concentrate on applications of Skylab data to agriculture. This slide shows all ~~EREP~~ SKYLAB agriculture sites.

SPEAKER OFF 8 ON

During the past year, the Johnson Space Center has been working with the Department of Agriculture to demonstrate how remote sensing techniques can be used in the identification and measurement of crop acreages in six of these areas.

8 OFF 9 ON

One of these areas is Holt County, Nebraska. In these studies, we have used both conventional photointerpretation and computer techniques. Emphasis, however, is placed on the development of computer techniques since future satellite systems will acquire vast quantities of data over the Earth's surface. Conventional analysis techniques would not allow the timely availability of the information for use by the resource manager.

9 OFF SPEAKER ON

SPEAKER OFF 10 ON.

On this color infrared photo, the Niobrara River forms the northern boundary of Holt County, Nebraska. South of the bend in the river are circular irrigated fields which have a quarter-mile irrigation system pivoting in the center and irrigating approximately 135 acres. Color infrared imagery is used to identify various crops, compute the acreage devoted to each crop, and assess crop vigor. With this kind of information, yield prediction and commodity forecasts can be made more timely and accurately.

10 OFF SPEAKER ON

SPEAKER OFF 10 BACK ON

One specific area of interest in Holt County lies within this rectangle and is also outlined on the following three slides.

10 OFF 11 ON

Another Skylab camera loaded with conventional color film took this photograph, depicting part of the same area as seen on the previous slide. However, this photo has about a three times higher resolution and shows more detail than the previous view. Note the different colors within the planted circular fields which appear to be bare soil. These are actually variations in conditions within the fields, and between fields, as a result of different planting dates, stages of growth, as well as soil type and moisture conditions related to the time of irrigation. Later, I will show you an enlargement of this area.

11 OFF
12 ON

This slide is a color infrared image of the same area, produced from the Skylab multispectral scanner tape. This instrument is unique in that data is collected in 13 channels simultaneously. Data from this sensor is more readily analyzed by a computer and the resulting product can be either a television-like picture stored on photographic film, as shown here, or a computer printout. Computer-generated multicolor images are made by superimposing different channels from the multispectral scanner. Using this technique, the scanner can produce what is termed "enchanced" images by combining various channels and using false colors to highlight particular areas of study. This view is coded to show vegetation in shades of red and bare fields in light blue.

12 OFF
13 ON

On this slide the two film strips shown on the left correspond to the small area in Holt County previously seen and outlined on this enlarged Skylab color photograph.

Using the digital magnetic tapes from the Skylab scanner, a computer can be programmed to produce a map showing the type and location of crops growing in each scene, saving a tremendous amount of time over the conventional manual photointerpretation process.

The two images on the left are the output of a computer and are generally referred to as computer-generated pattern recognition maps. The upper left strip is a detailed classification map, identifying, with various colors, different stages of crop growth and moisture content. The lower left strip shows the results obtained by classifying with the computer, all fields in this outlined area. On this slide, corn is shown in yellow, grasses in red, pasture in green, and all other classes in black. These computer-generated images relate each color to crop type and field condition. This analysis shows that there is a high correlation between individual field conditions and individual varieties of crop when the results are compared with a detailed ground check. Future applications of these computer-aided techniques will be the more accurate and rapid identification and measurement of crop acreages, thus

13 OFF SPEAKER ON

providing a major step forward in understanding the location and extent of much of the world's food.

SPEAKER OFF 14 ON

The current and prospective ERTS and Skylab Earth Resources applications you have just seen are only a portion of the studies which will result in the development of future operational Earth-orbiting systems. As the Earth Resources Lead Center for the space agency, the Johnson Space Center will continue a major effort in support of these studies.

14 OFF SPEAKER ON

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My name is ________________, and I will discuss briefly with you how several interesting Midwest problems are being simplified by the application of remote sensing techniques here at the Lewis Research Center. The problem of strip mining in Ohio is one that concerns all its citizens. (SLIDE) This is a color IR aerial view from 10,000 feet of strip mine areas in Noble County, with vegetation shown in red as previously described. Miners, as well as environmentalists, are aware of the problem of rehabilitating the land. (SLIDE) Here we see a close-up of the strip mine area from an altitude of 500 ft. Although such aircraft imagery provides spectacular views, for the purpose of statewide surveys, they cannot provide the single-image coverage such as this ERTS Band 5 image of all of southeastern Ohio. (SLIDE 5) Here within the circles, the strip mine areas are outlined. The bare unvegetated soil appears white in this view. The mosaic of aerial photographs of this same area would require several thousand individual photographs. Satellite images such as this will permit the State of Ohio to monitor the overall progress of strip mining in the state as required by law. State agencies have requested the Lewis Research Center to provide technical assistance in developing and applying such techniques to resource-related problems. Similarly, for example, the success of efforts to rehabilitate such areas for useful agriculture can just as easily be followed. In this development, just mapping the overall advance of strip mining as described for satellite imagery is insufficient. Many types of soil are turned up during the mining process, some of which are extremely acid and prevent growth of any vegetation for decades. The problem is really one of differentiating a number of soils. The soil types of interest in this case are shown in the next figure. (SLIDE) Can these soil types be identified remotely and at the resolution required? Your eye, as well as complex optical instrumentation, indicate that color information obtained remotely, will make such classification possible. The general soil survey, of which strip mined soil identification is a special case, could then be done remotely. Soil surveys of counties in Ohio, an example of which is shown in this slide (SLIDE) and which takes years with present methods, could be done in a few weeks or months by automatic processing of orbital imagery.

Classification is the general problem. Another specific and interesting application arises in the Middle West (SLIDE OFF). (SLIDE) The Great Lakes coastal areas have been described as the "Fourth Coastline" of the U.S. Unfortunately, this coastline is not used about four months of the year. The maximum ice cover on the Great Lakes, shown in this figure, deters shippers from using the Lakes, their ports and facilities for one-third of the year. This has been recognized for some time as an extremely inefficient use of the man-made, as well as the natural resources of the region. A combined effort involving 18 federal agencies (SLIDE) is presently attempting to assess this situation, and to determine the feasibility of extending Great Lakes shipping into the unused portion of the year, perhaps even to full 12 months-a-year shipping. An important aspect of this problem is providing all weather information concerning the distribution of the ice type and thickness on the lakes, almost daily, as determined by shipping needs. Here we (SLIDE) have an excellent ERTS satellite scanner image of the ice on most of Lake Erie and some of Lake Huron and Lake St. Clair. This view in which we have combined four adjacent ERTS images was taken from an altitude of 570 miles and covers an area of 40,000 square miles on the ground. It is an amazing picture indeed, for such an area in the Midwest is rarely without cloud cover in the winter. This was one of a very few images made of the ice from ERTS during the last winter season, since such images from ERTS are only created in the visible and near infrared portions of the spectrum. Thus, when there are clouds over Lake Erie there can be no ERTS images made of the Lake. In the longer wavelength bands, such as the microwave band used on Skylab, the clouds are transparent, however, only by a system of clever electronic processing can images be made with useful resolution. (SLIDE) In this system called Side Looking Airborne Radar, a pulse of microwave energy momentarily illuminates the ground, the antenna receives the reflection, and it is electronically processed and displayed on a cathode ray or TV tube. The image on this tube exposes a film and creates an all-weather image on the film. (START MOVIE) Flying such a system from satellite altitude has not yet been achieved, but ~~from aircraft~~ has been in use for a decade in military aircraft. Our use of such a system over Lake Erie on a cloud covered day produced the image we are now re-creating for you on the screen, in spite of the cloud cover. This image which covers a distance of about 300 miles, was made in a single 90-minute flight over Lake Erie, and the extent of the ice cover is clearly shown in the complete view. The aircraft which made this flight is on display at STOP 10, the hangar. The true color images in the upper part of the screen show how the various ice types look to the eye. Applications systems such as this are first developed and flight tested aboard aircraft. If such aircraft evaluation demonstrates operational feasibility, then studies are initiated to extend the system to satellite platforms. The upper boundary of Lake Erie is the Canadian shore. The lower boundary of the Lake is the American shore, open water areas appear as black in this image. Cities bordering the Lake are called out in green. The ice types occur in many forms. Some ice 8 feet deep is due to rafting at the shore, other ice is smooth, clear, and dark. Each type presents more or less difficulty to vessel transit and can be so designated. Imagery from such a system could be instrumental in providing charts such as this which indicates ice types and location. These can be used by shippers who would now with less difficulty and greater safety extend the shipping activities into the ice season.

MOVIE OFF 10 ON

10 OFF SPEAKER ON

These latter examples of the Lewis Research Center's Earth Observations Supporting Research and Technology Program are just a few of many being developed by NASA here and at the other 8 regional centers throughout the nation. At the same time that such systems are being developed for satellite use, the Earth observation satellites, described earlier, are being developed as data collection platforms. These are eventually to be used in the future as total earth orbiting systems for conducting earth resources inventories over extensive areas of the earth's surface. Thus, future resource managers will have available vastly improved techniques for monitoring the environment, and for efficient utilization of the remaining energy resources, and food supplies, by the inhabitants of our planet. Thank you.

SPEAKER & PRESENTATION OFF

STOP 9

GODDARD

1) SERVANTS IN SPACE

2) ERTS

3) (ERTS) MULTISPECTICAL SCANNER (MSS) CS-66868

4) FOUR G/W ERTS BANDS

5) SAHARA IN COLOR

6) MOSAIC OF CENTRAL WYOMING

7) ERTS VIEW OF CENTRAL WYOMING

8) ERTS VIEW OF ALL OF WYOMING

9) ERTS - WIND RIVER MTS

10) GEOLOGICAL MAPPING W.R.

11) " " " "

12) ST. LOUIS FLOODS

13) ERTS - SHOWS SACRAMENTO VALLEY OF N. CALIF.

14) ERTS COLOR IR COMPOSITE OF AGRICULTURAL TEST AREA
SACRAMENTO CALIF.
FRANCE 1003-18-175, 26 JULY 1972

15) CONCISE DISPLAY OF ERTS RECOGNITION MAP

16) LAND USE IN NORTHERN MEGALOPOLIS

17) COMPARISON OF COST OF LAND USE MAPPING

JOHNSON

18) SKYLAB NASA S-72-3116-S

19) SKYLAB GROUND COVERAGE NASA S-72-183-S

20) SKYLAB - AREAS OF SCIENTIFIC STUDY NASA S-72-1767-S

JOHNSON (CONT'D) #9

21) ERTS & SKYLAB EREP SENSORS REF #4

22) EREP GROUND COVERAGE NASA S-73-2842

23) SAN RAFAEL SWELL NASA S-73-2828

24) PORTO RICO NASA SL2-81-240

25) AGRICULTURE/RANGE/FORESTRY TEST SITES (NASA-S-73-097-V)

26) HOLT COUNTY NEBRASKA NASA S-73-2831

27) HOLT COUNTY NEBRASKA AGRICULTURAL STUDY AREA S190A NASA S-73-2841

28) HOLT COUNTY NEBRASKA AGRICULTURAL STUDY AREA NASA S-73-2838

29) HOLT COUNTY NEBRASKA AGRICULTURAL STUDY AREA NASA S-73-2830

30) HOLT COUNTY STUDY AREA COMPUTER CLASSIFICATION MAPS NASA S-73-2839

31) SKYLAB NASA S-73-2829

LEWIS

32) COLOR IR AERIAL VIEW (3000 FT) OF STRIP MINING IN NOBLE COUNTY OHIO

33) CLOSE UP OF STRIP MINE AREA FROM 500 FT

34) ERTS BAND 5 OF SEVERAL COUNTIES IN S. E. OHIO

35) 8 SOIL TYPES

36) SOIL SURVEY MAP COLUMBIANA COUNTY OHIO

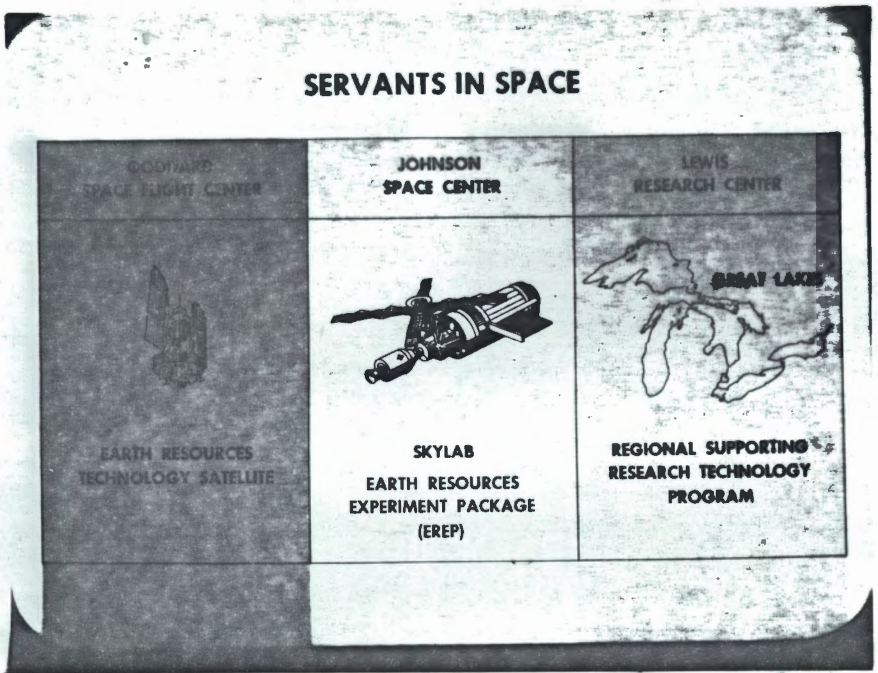
37) MAXIMUM GREAT LAKES ICE COVER

38) PARTICIPATING AGENCIES

39) ERTS ~~SATELLITE SCANNER IMAGE OF ICE OVER LAKES~~ MOSAIC OF GREAT LAKES ICE CS-67372

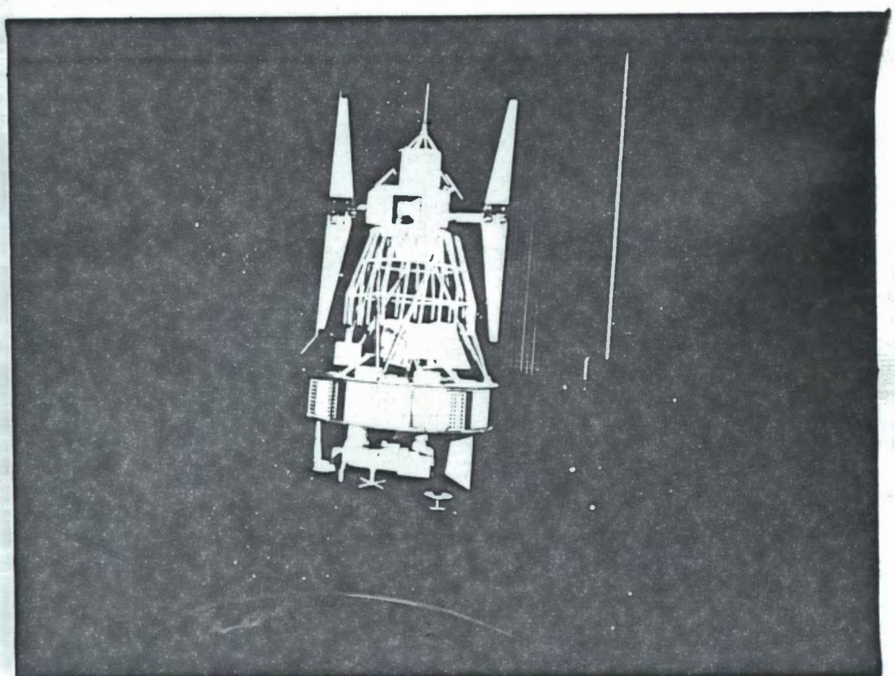
40) SIDE-LOOKING AIRBORNE RADAR SYSTEM

41) EARTH OBS PLATFORMS NASA S-73-2948



9-1

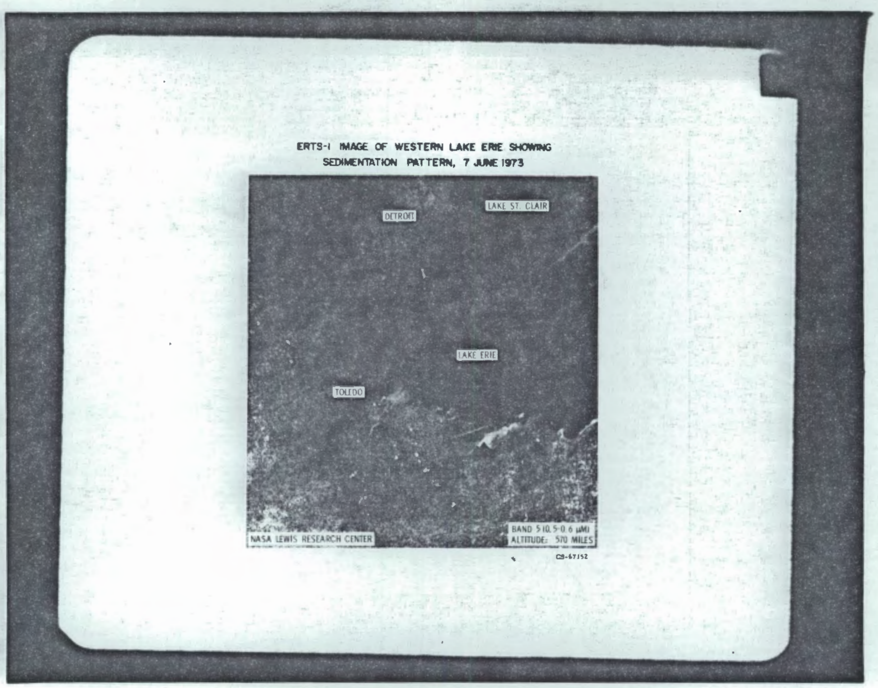
SLIDE 1



9-2

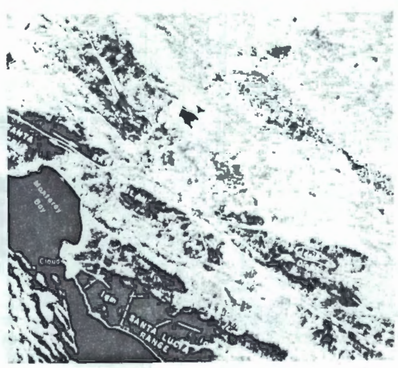
SLIDE 2 (ERTS)

EMPLOYEE'S DAY



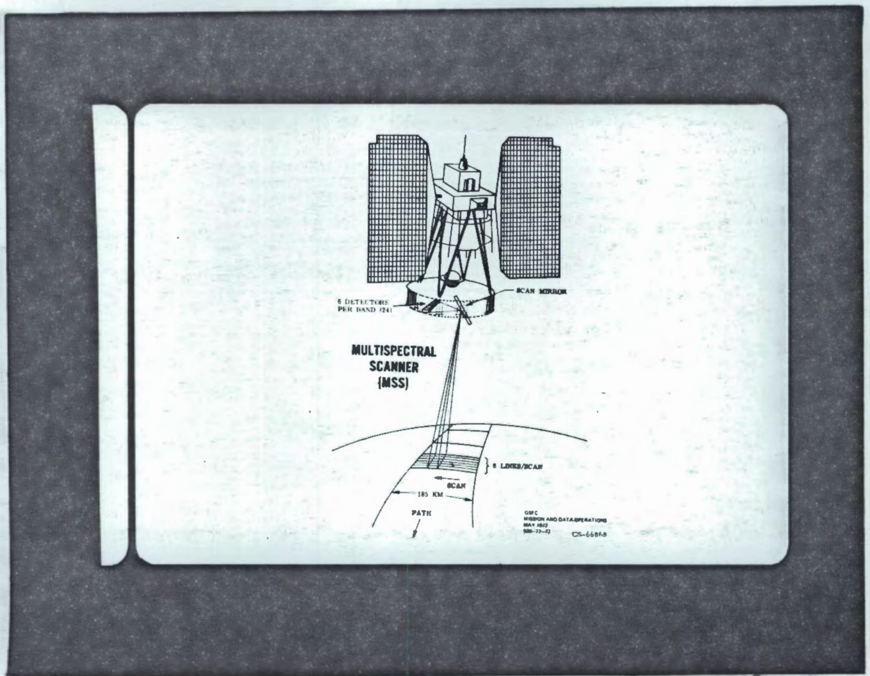
SLIDE 1-a (CS-67152)

ERTS-I IMAGE REVEALS CALIFORNIA GEOLOGICAL FEATURES



CS-66952

SLIDE 2a (CS-66952)



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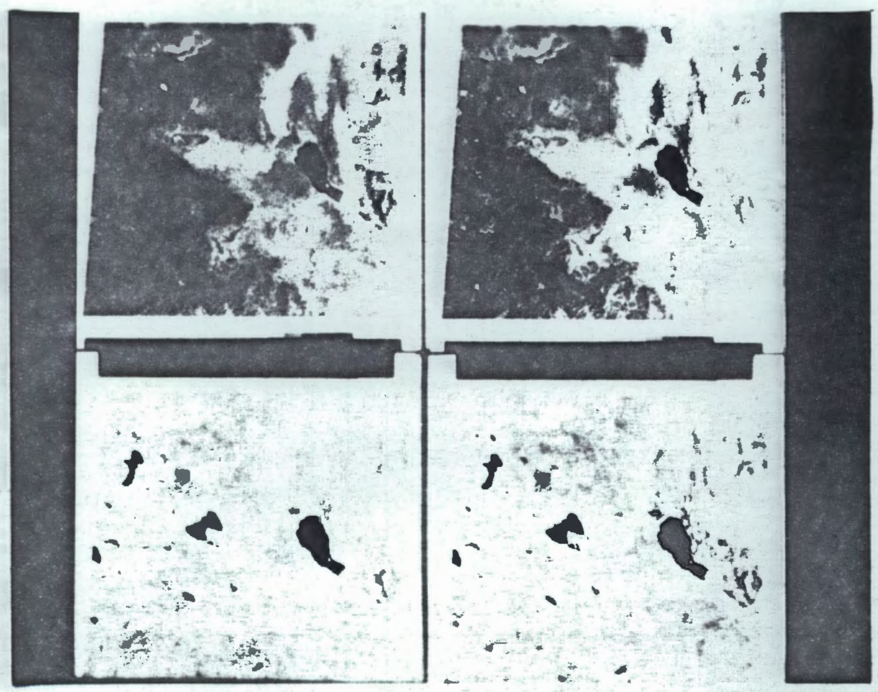
CS-66868

SLIDE 3



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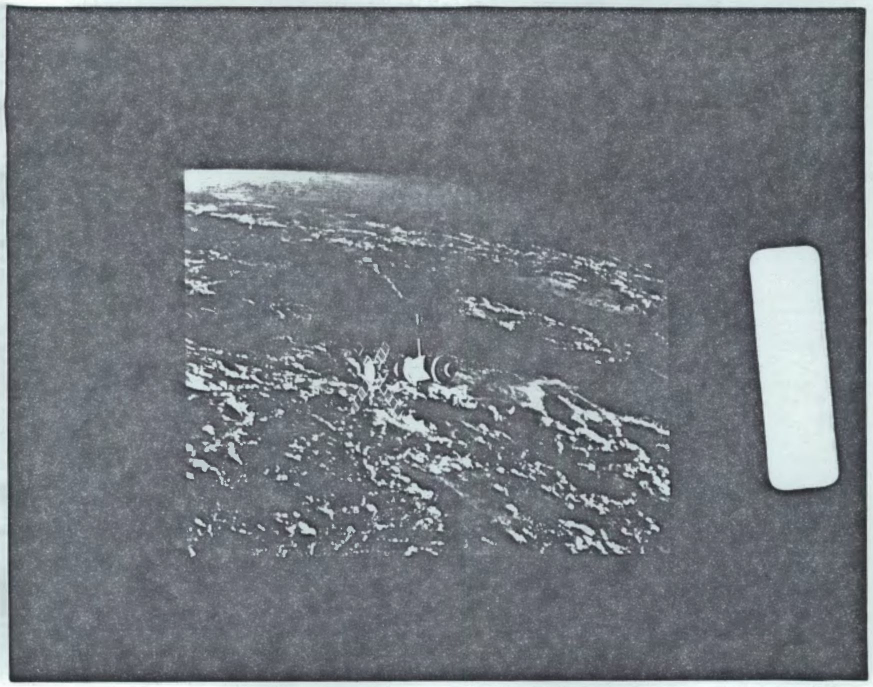
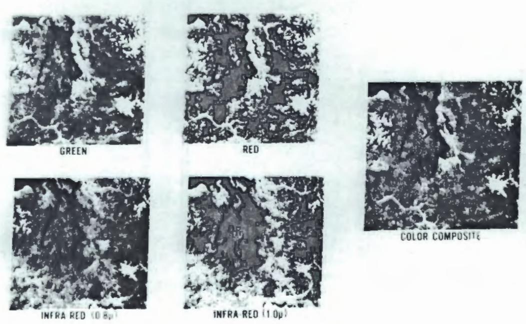
SLIDE 4

EMPLOYEE'S DAY



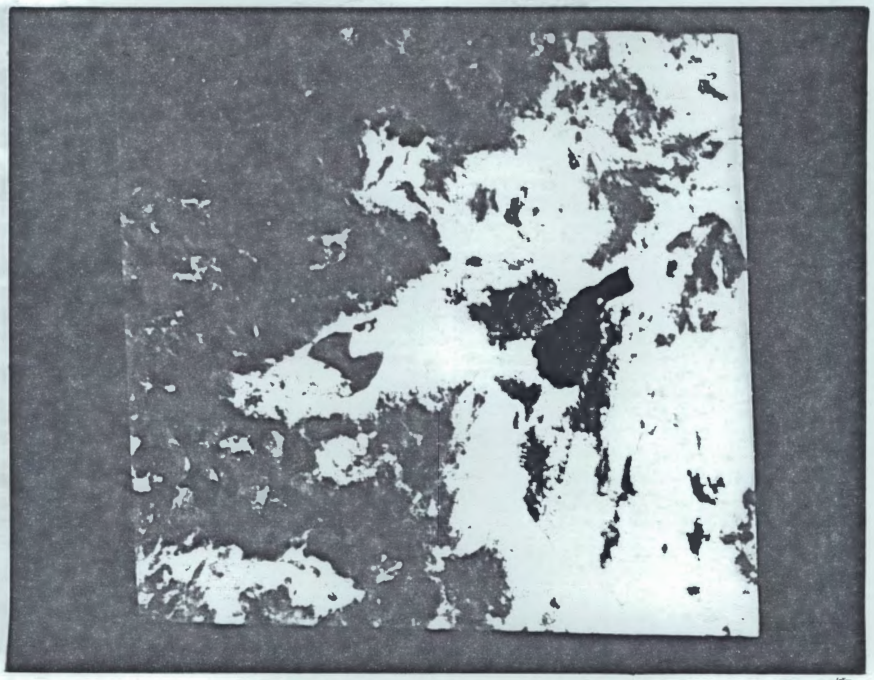
SLIDE 3a (CS-67076)

ERTS-1 PUGET SOUND (29 JULY 72)



(NASA-G-73-5942)

SLIDE 4a (CS-66953)



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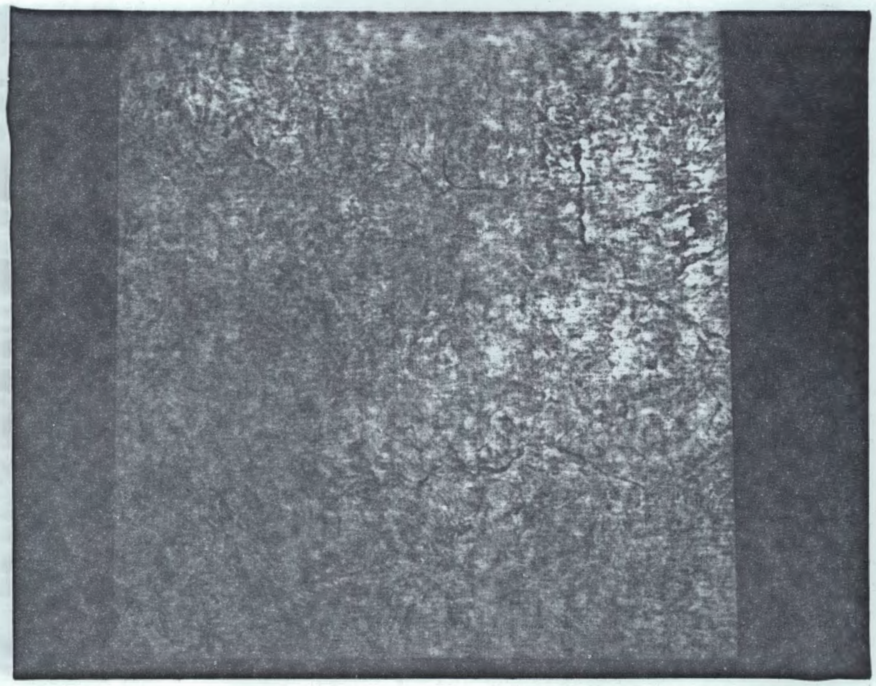
SLIDE 5



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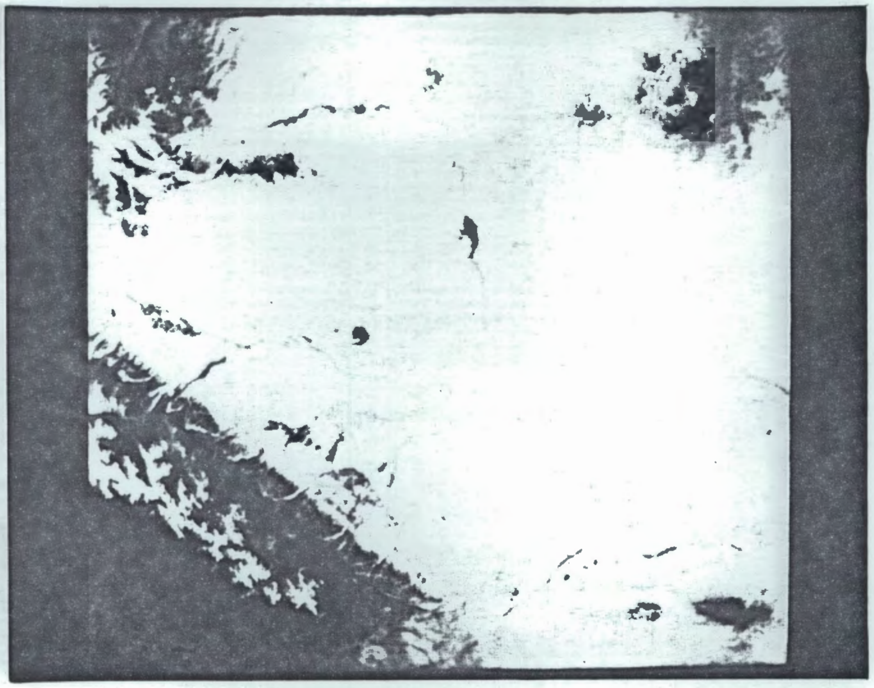
SLIDE 6



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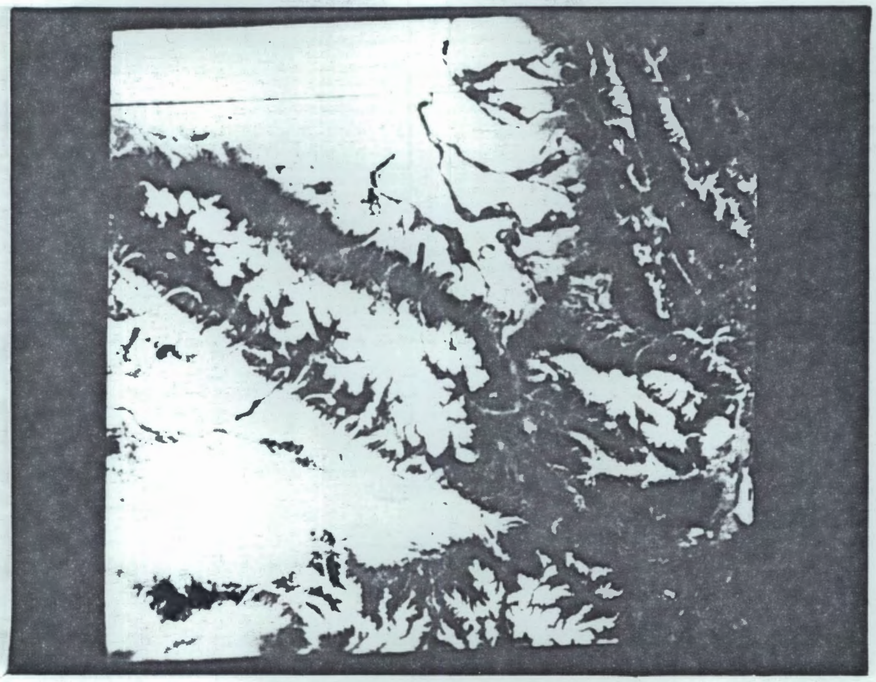
SLIDE 7

WYOMING ERTS 1

9-8

SLIDE 8



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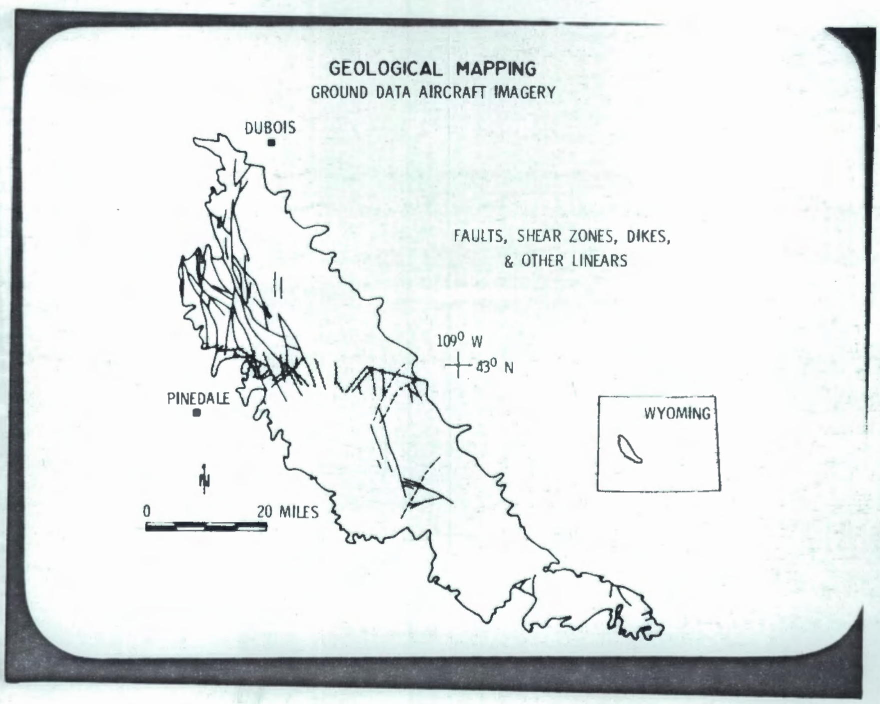
SLIDE 9



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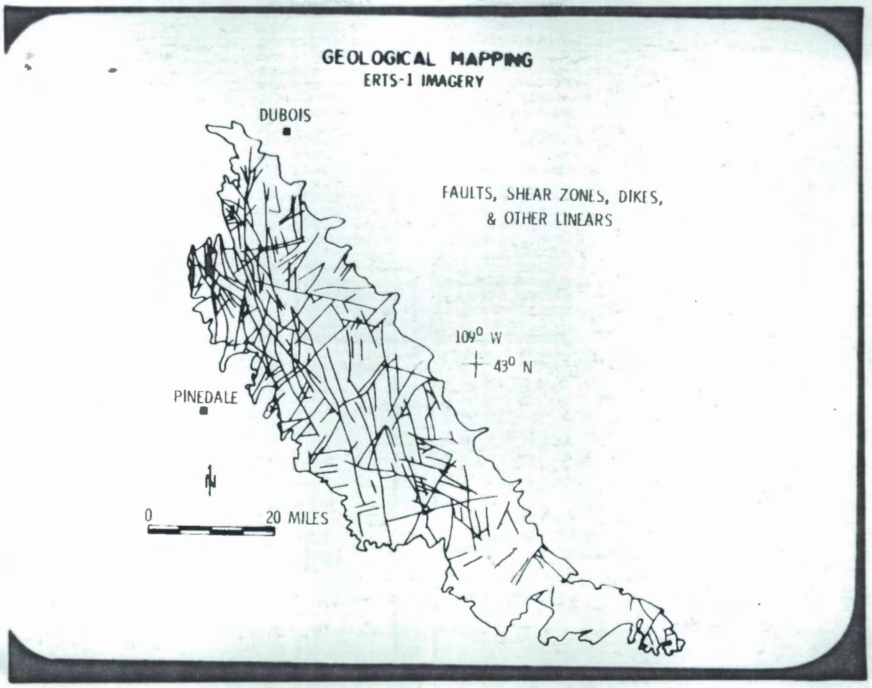
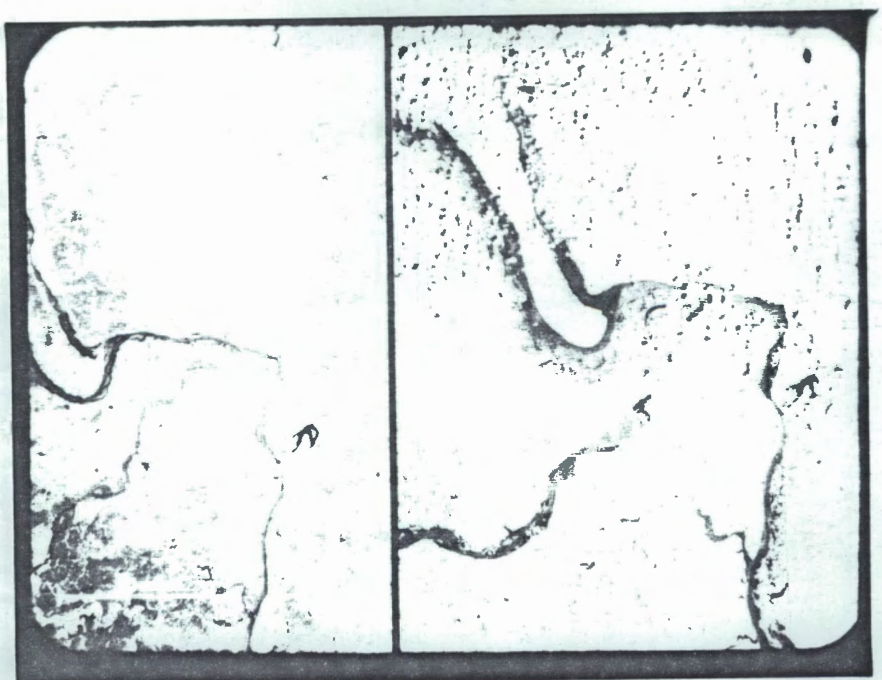
SLIDE 10 (CS-



9-11

SLIDE 11 (CS-



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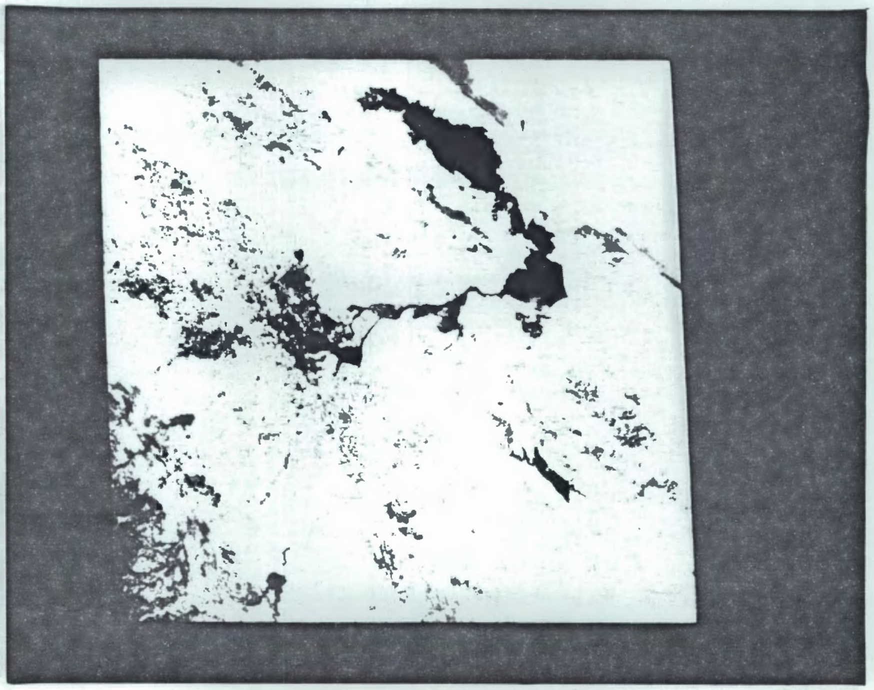
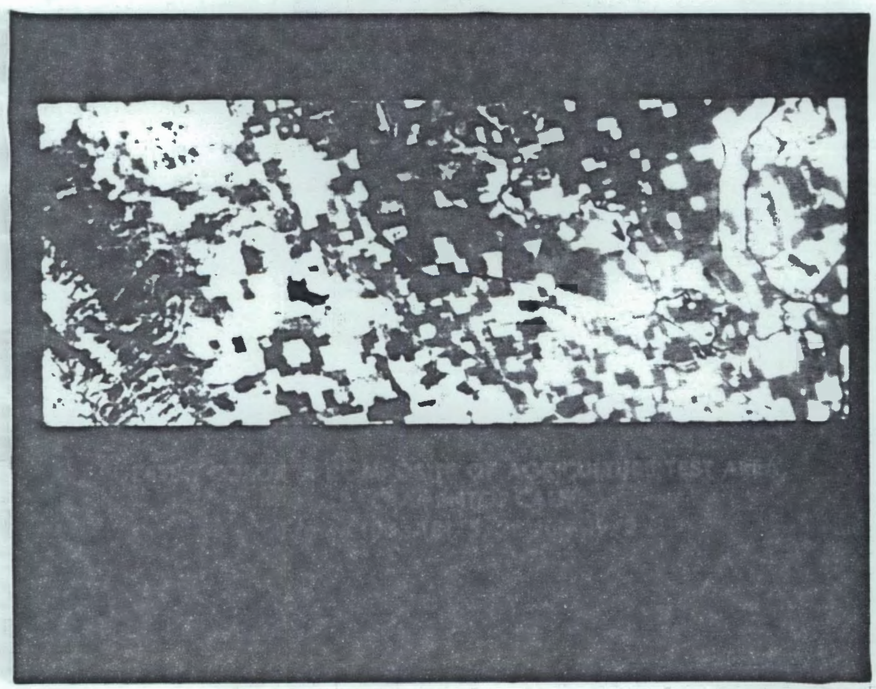
SLIDE 12



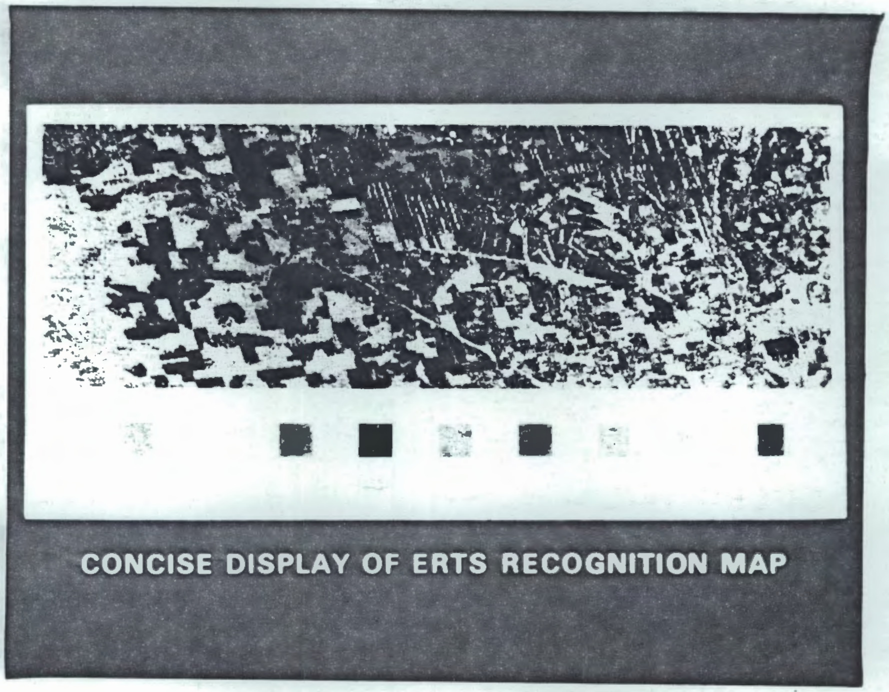
1-13 (13)

SLIDE 13



1-14

SLIDE 14



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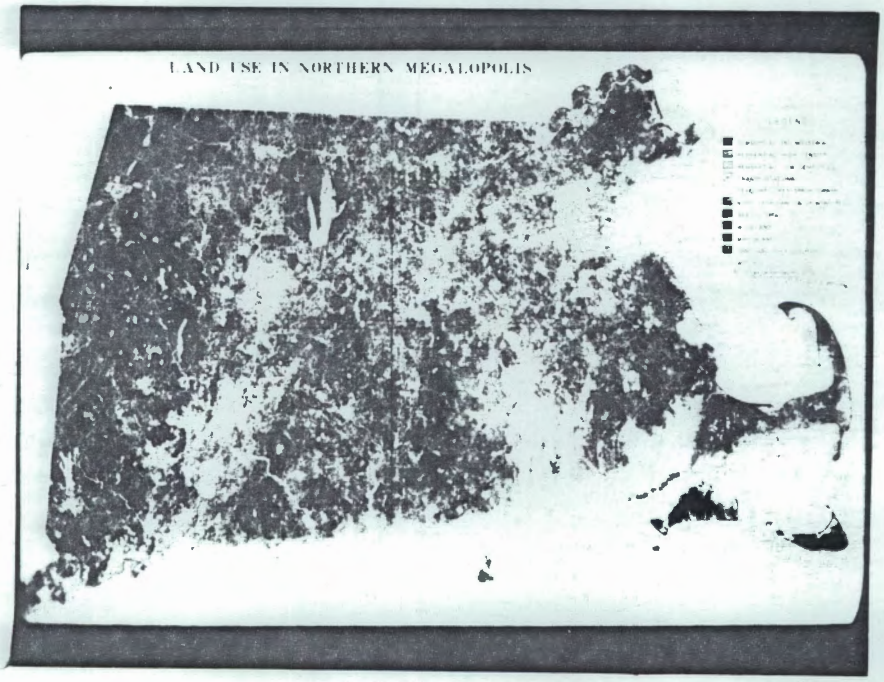
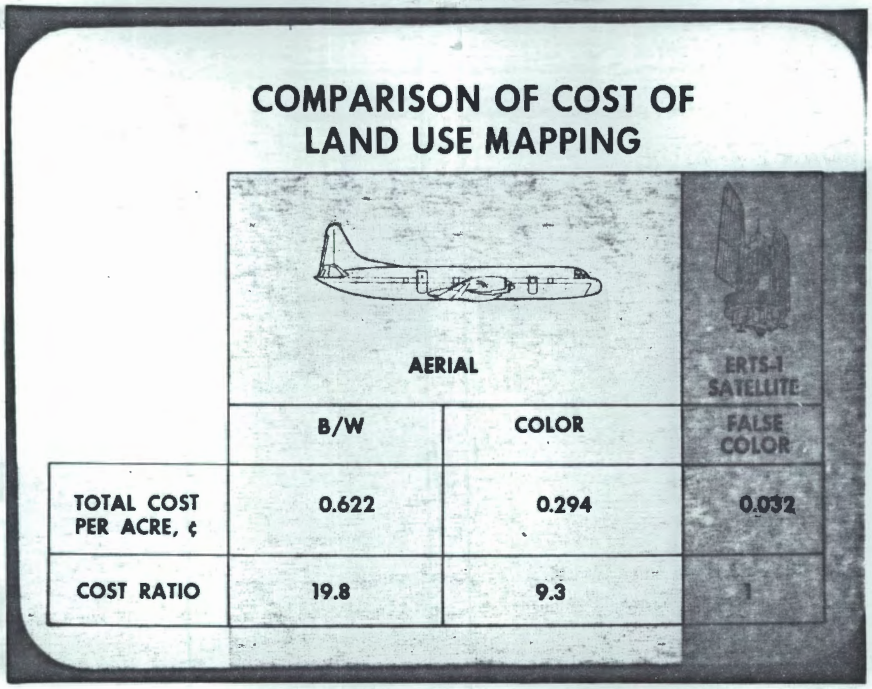
SLIDE 15



9-16

SLIDE 16

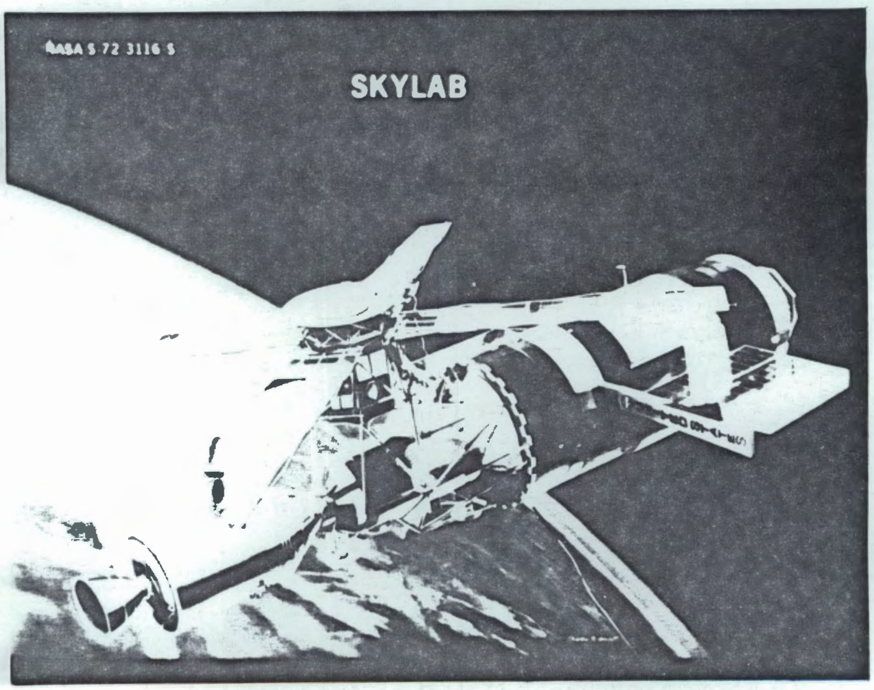


COMPARISON OF COST OF LAND USE MAPPING

	AERIAL		ERTS-1 SATELLITE
	B/W	COLOR	FALSE COLOR
TOTAL COST PER ACRE, ¢	0.622	0.294	0.032
COST RATIO	19.8	9.3	1

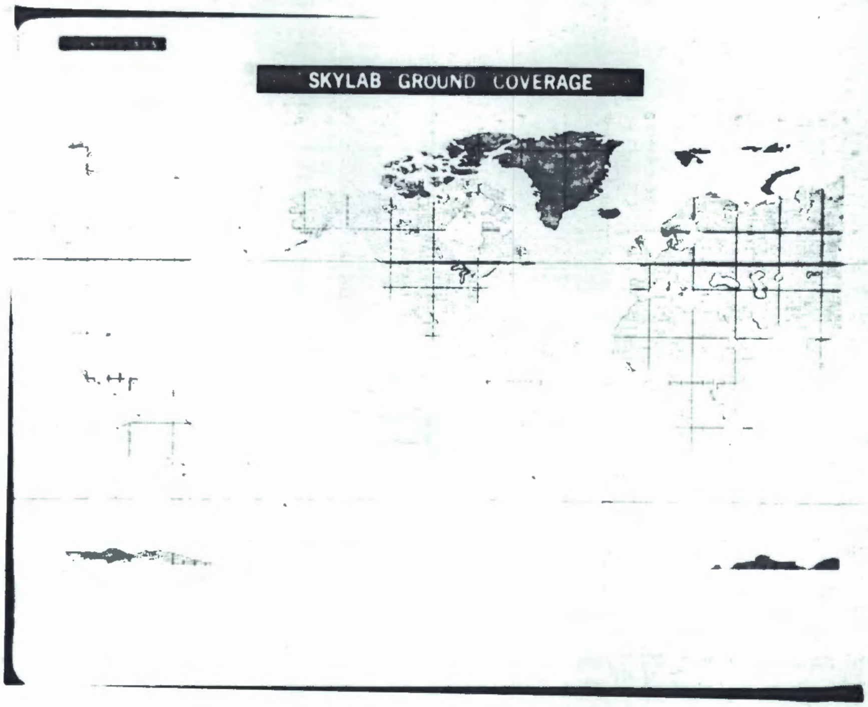
9-17

SLIDE 17 (CS-

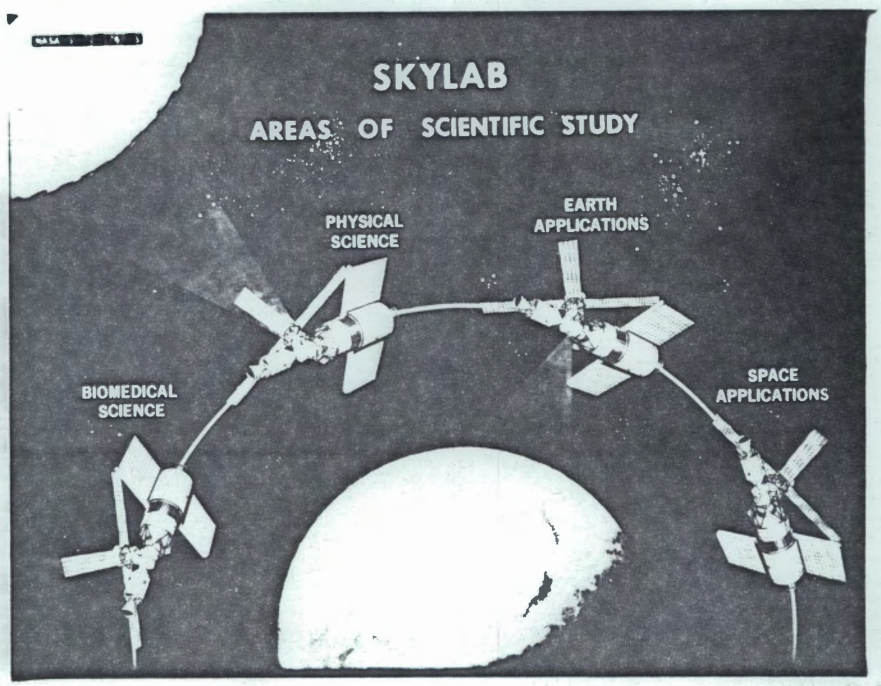


9-18

SLIDE 18 (NASA-S-72-3116-S)



SLIDE 19 (NASA-S-72-183-S)



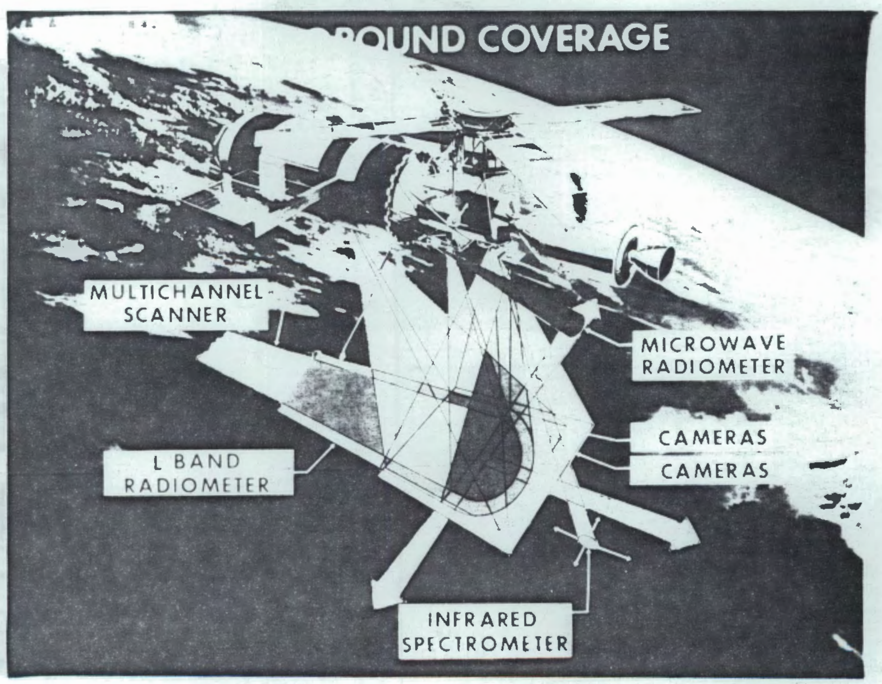
SLIDE 20 (NASA-S-72-1767-S)

ERTS AND SKYLAB EREP SENSORS

ERTS	EREP
• [illegible]	• [illegible]
• [illegible]	• [illegible]
	• [illegible]
	• [illegible]
	• [illegible]
	• [illegible]

9-21

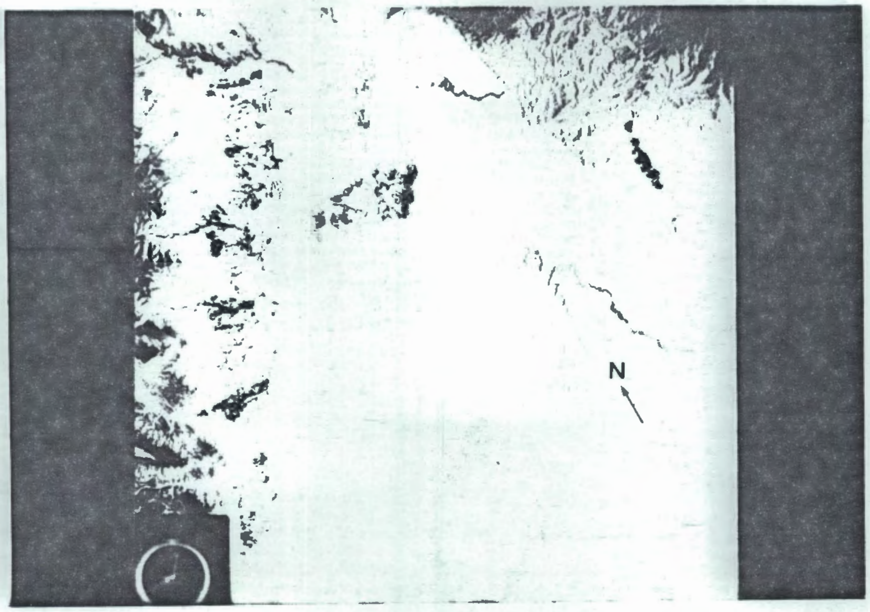
SLIDE 21



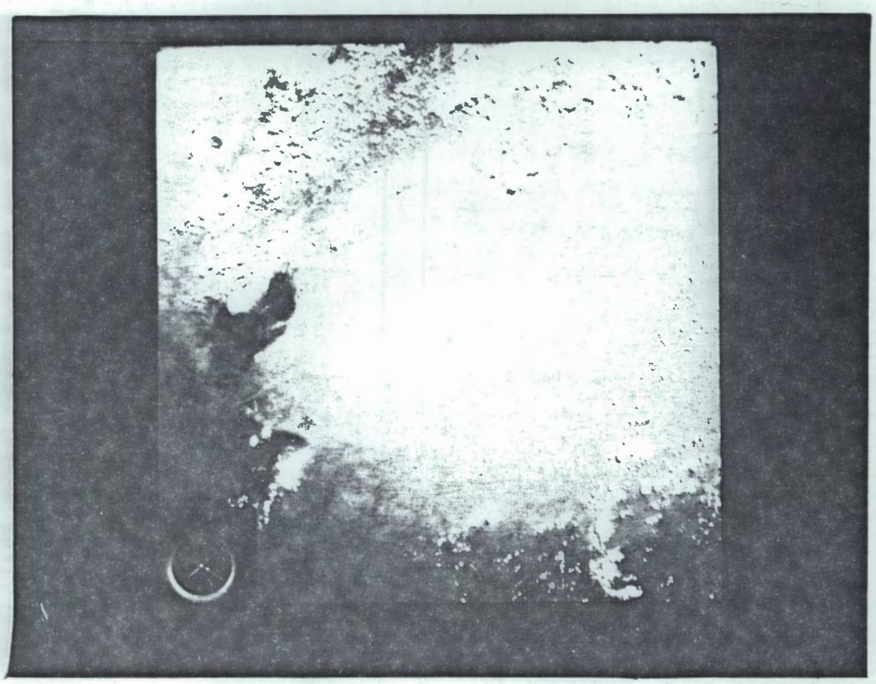
9-22

SLIDE 22 (NASA-S-73-2842)

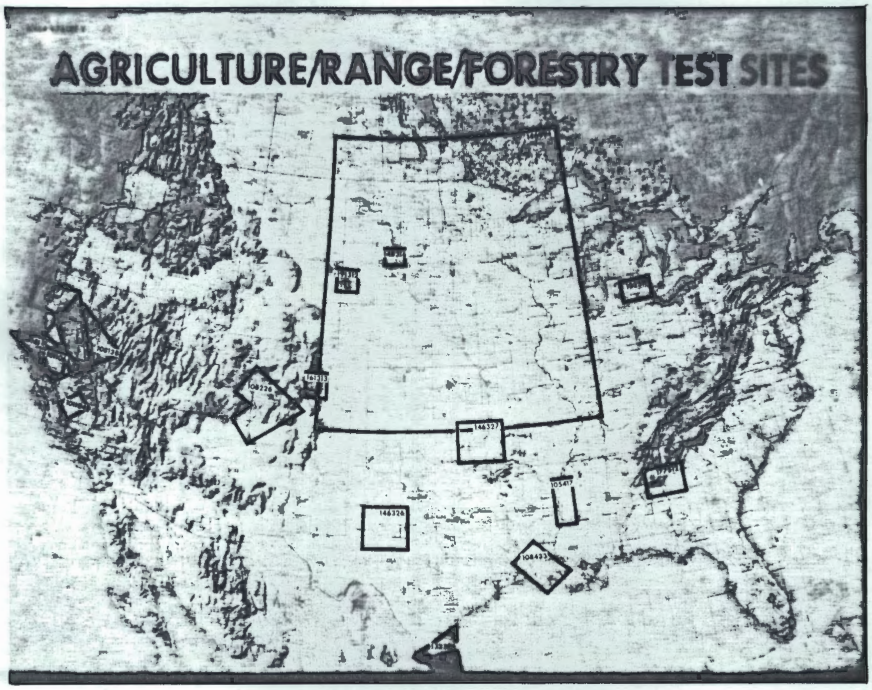
SAN RAFAEL SWELL



SLIDE 23 (NASA-S-73-2828)



SLIDE 24 (NASA-SL2-81-240)

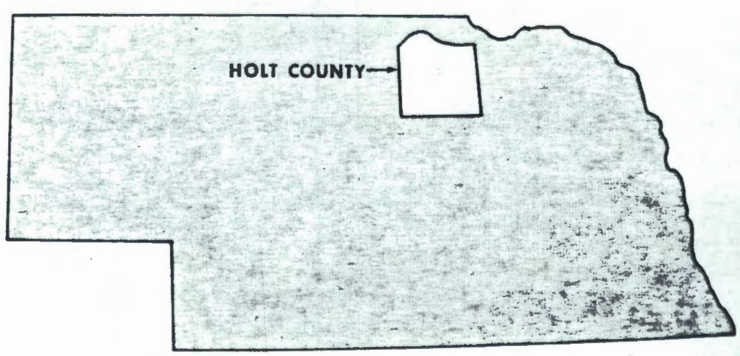


? 25

SLIDE 25 (NASA-S-73-097-V)

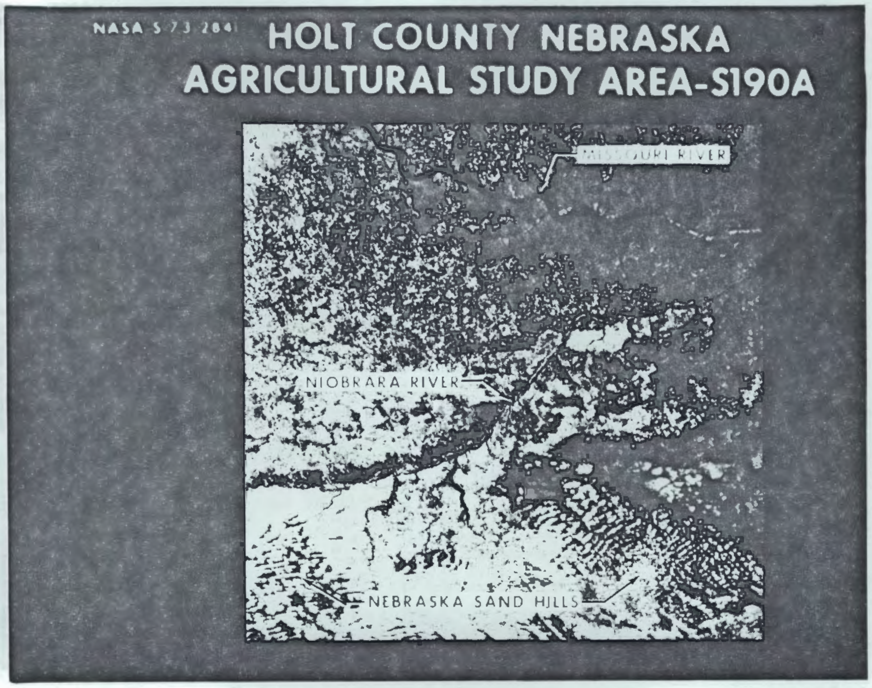
NASA S 73 2831

HOLT COUNTY NEBRASKA



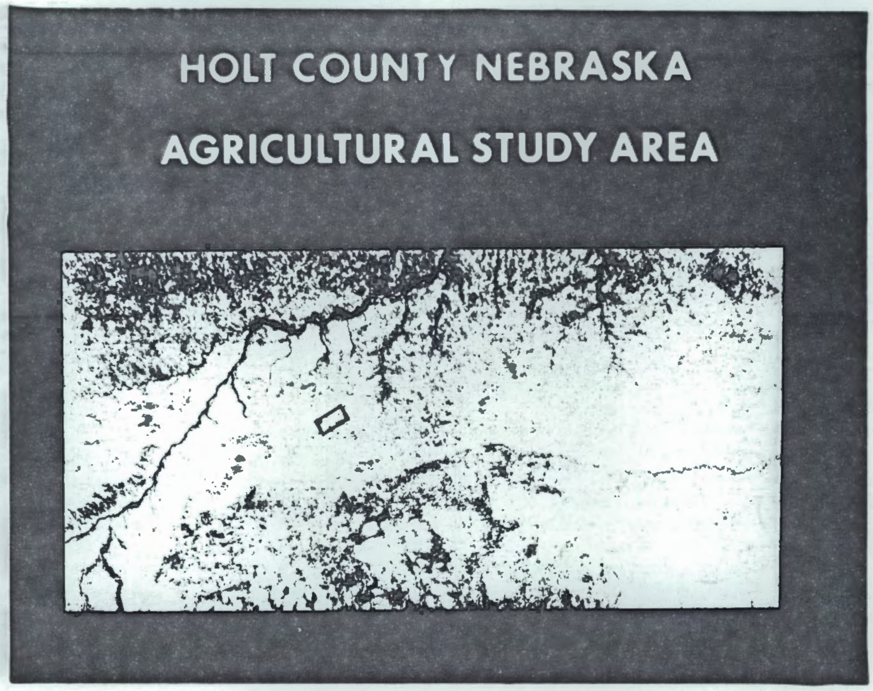
9-26

SLIDE 26 (NASA-S-73-2831)



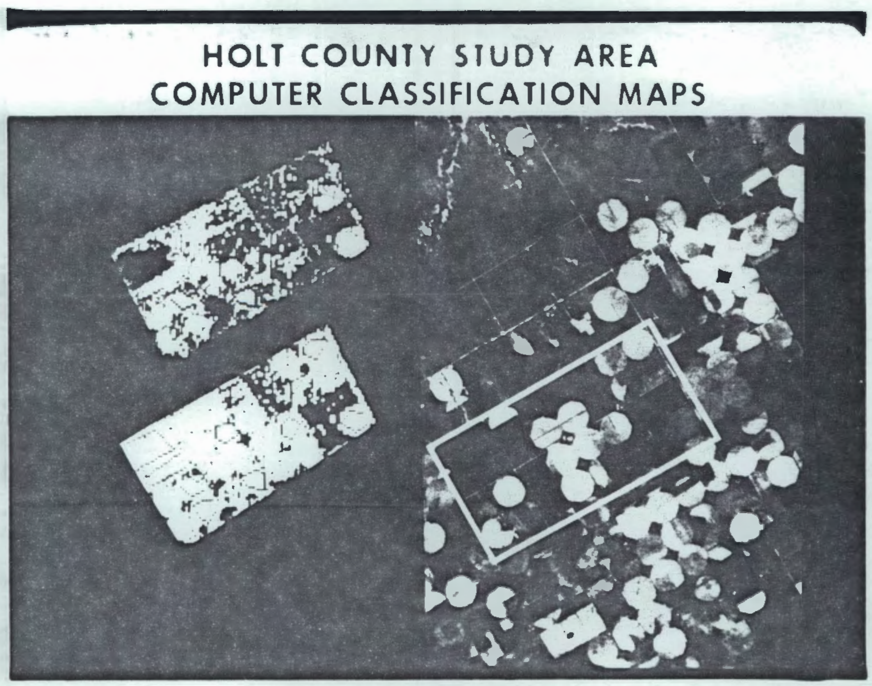
SLIDE 27 (NASA-S-73-2841)

SLIDE 28 (NASA-S-73-2838)



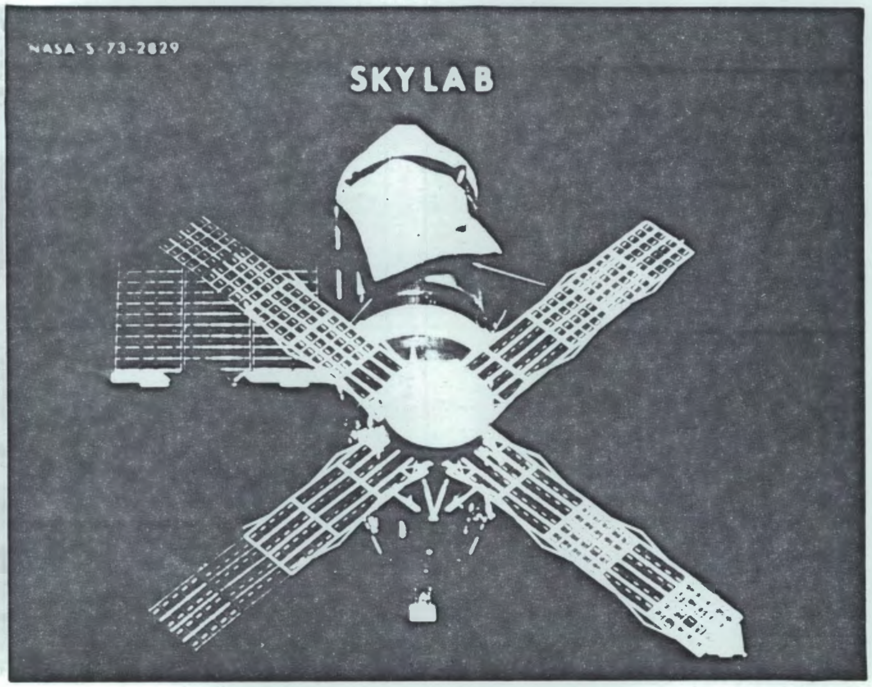
9-29

SLIDE 29 (NASA-S-73-2830)



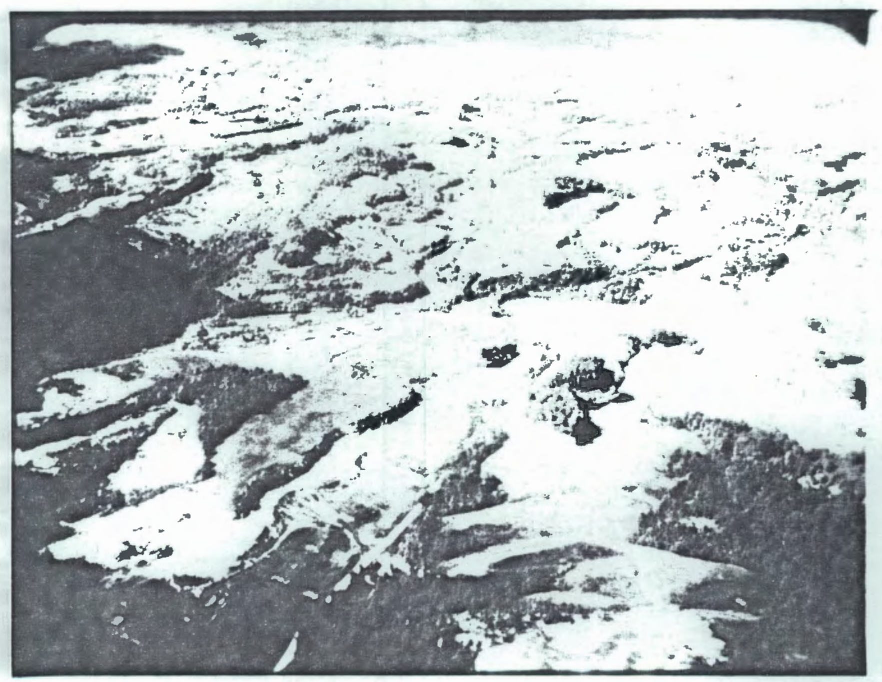
9-30

SLIDE 30 (NASA-S-73-2839)



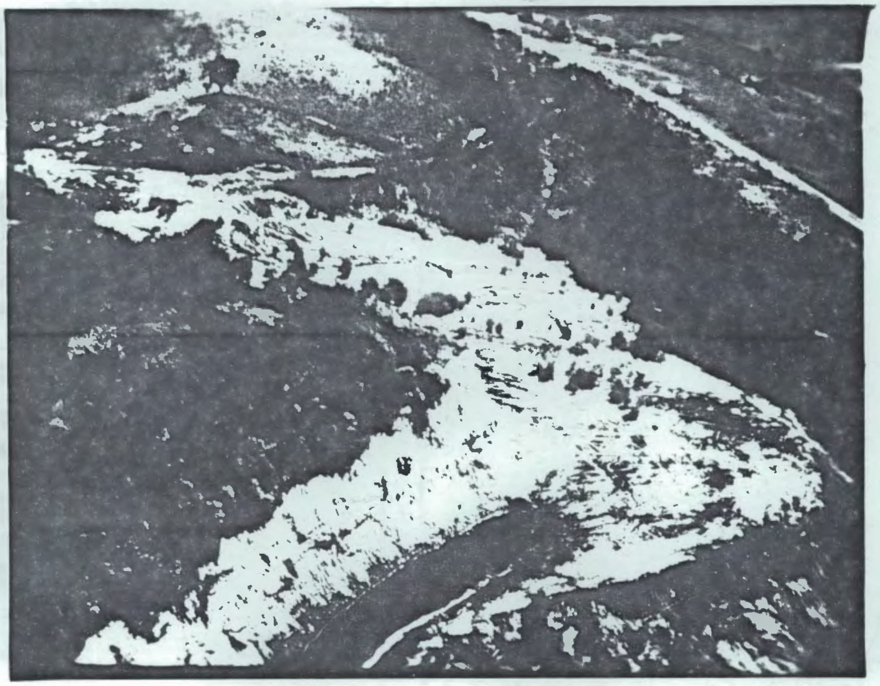
9-31

SLIDE 31 (NASA-S-73-2829)

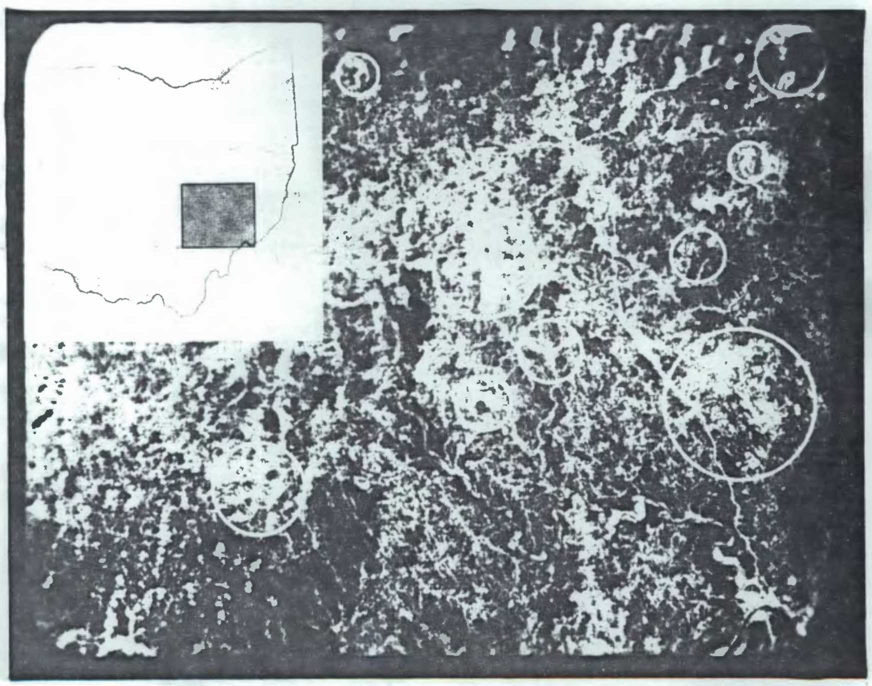


9-32

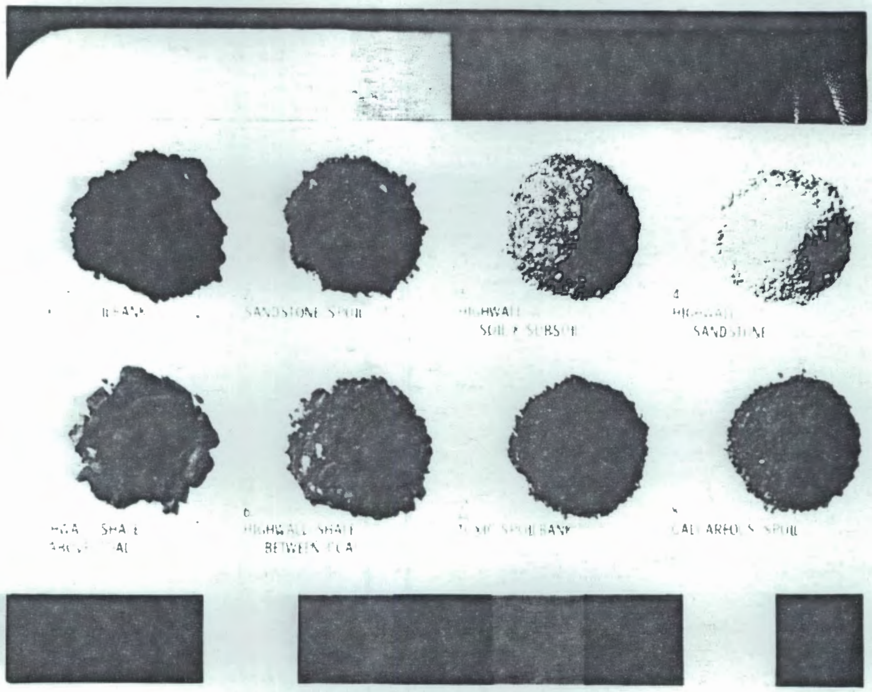
SLIDE 32 (CS-



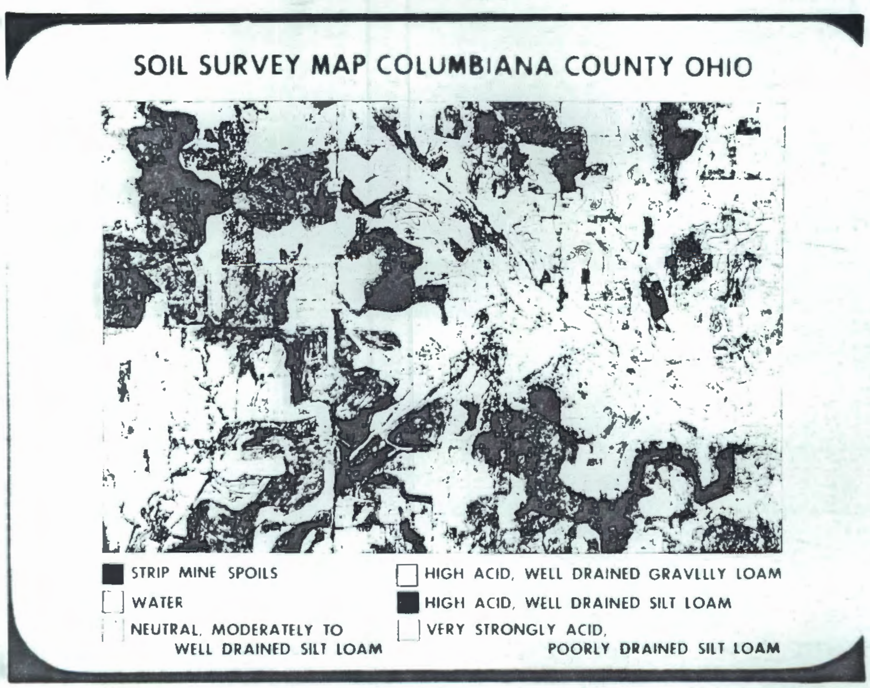
SLIDE 33 (CS-



SLIDE 34 (CS-



SLIDE 35



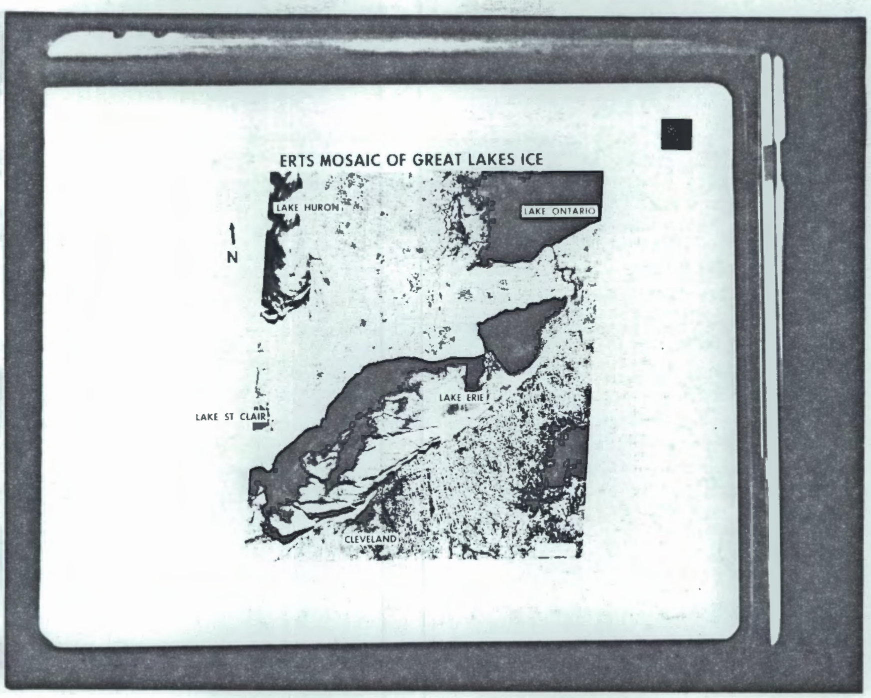
SLIDE 36

9-37

SLIDE 37

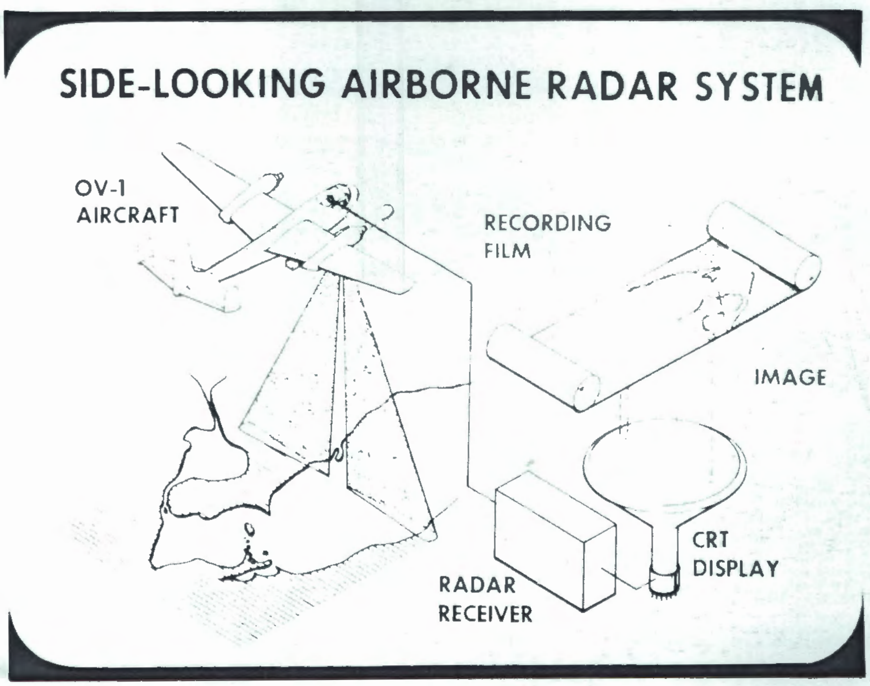
9-38

SLIDE 38



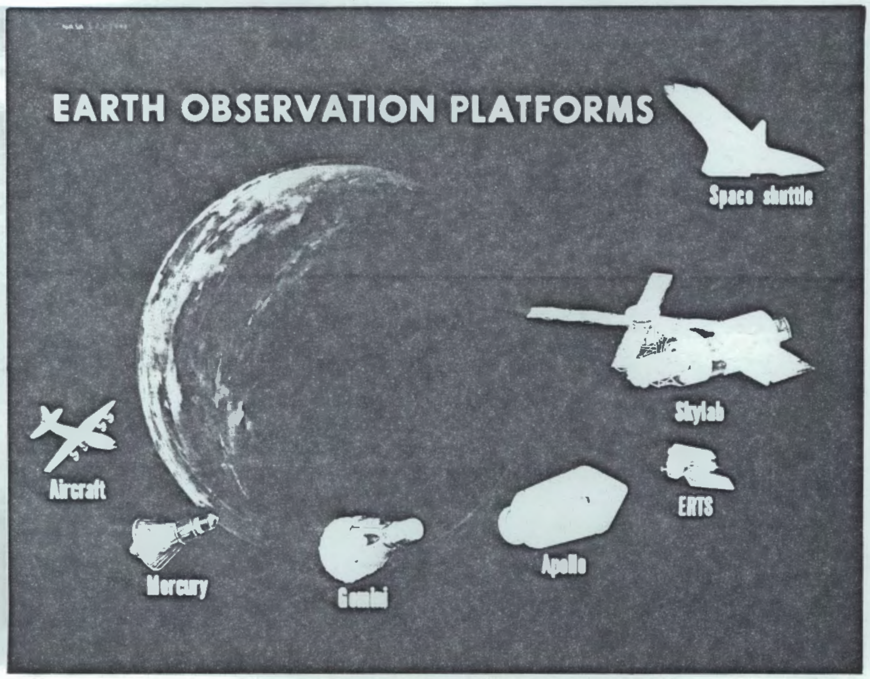
9-39

SLIDE 39 (CS-67372)



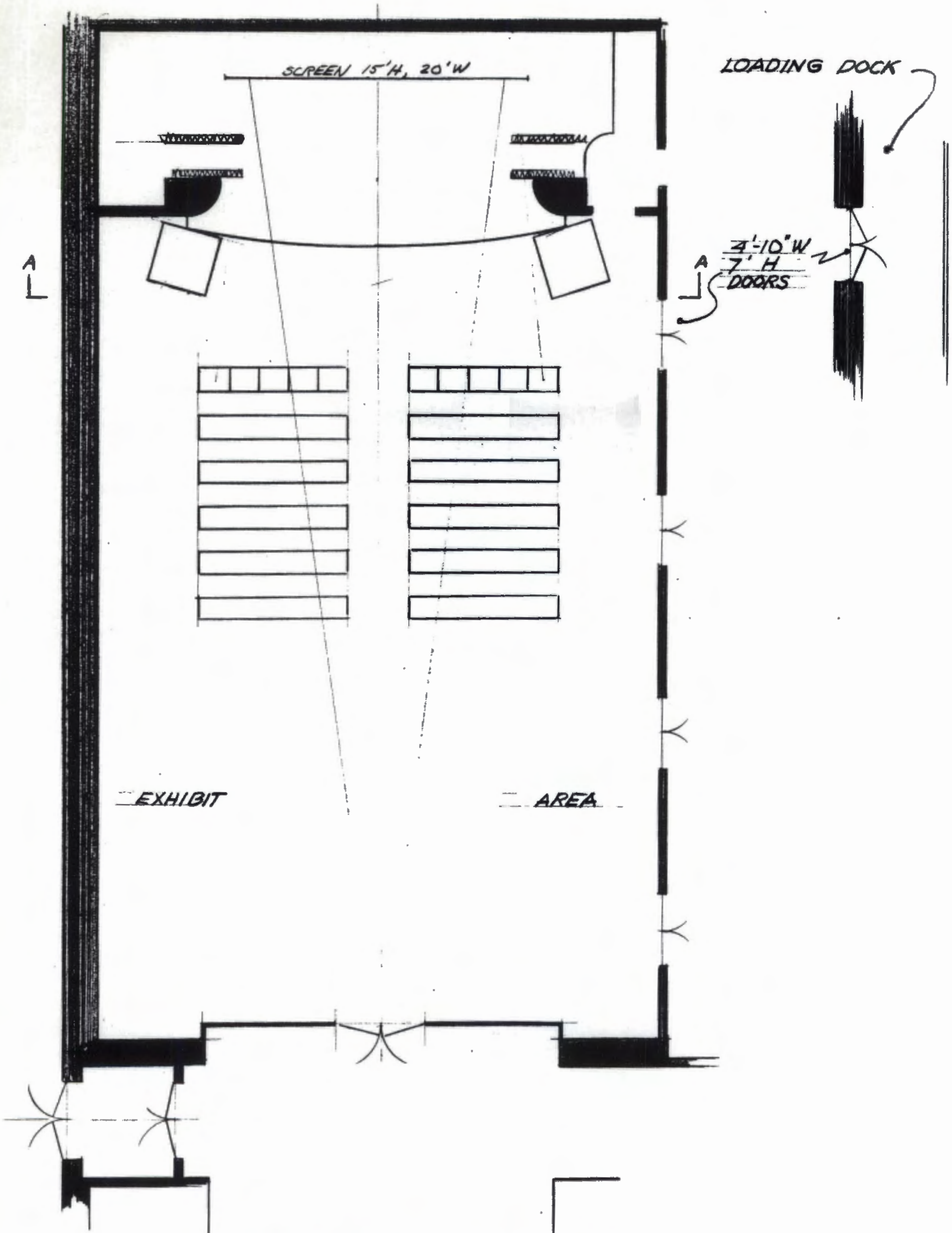
9-40

SLIDE 40 (CS-

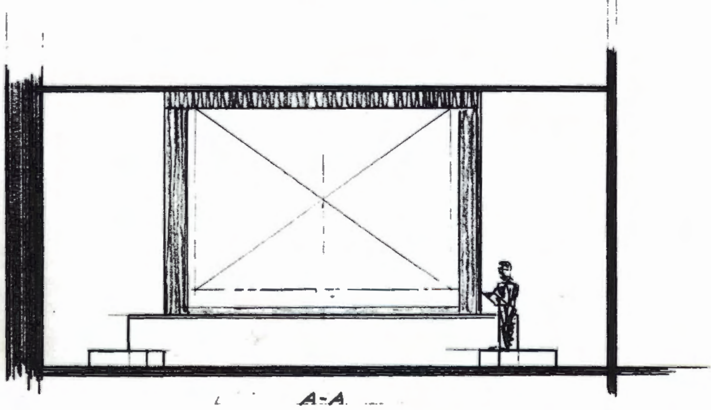


1-41

SLIDE 41 (NASA-S-73-2948)



STOP #9 SERVANTS IN SPACE
AD. BUILDING AUDITORIUM
1/8" = 1' R.S. 6-8-73



A-A

NASA
C-73-1526

ADMINISTRATION BUILDING & ADMIN. SERV. BLDG.

NASA
C-73-3387

NASA
C-73-3383

NASA
C-73-3384