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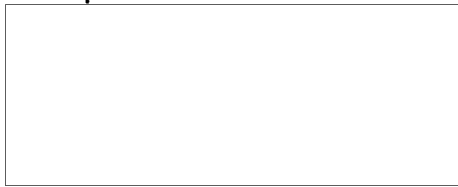
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|-----------------|----------|----------|---|
|                 |          | 28/7/70  |   |
| TO              | INITIALS | DATE     | REMARKS   |
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| DEP/DIRECTOR    | 4        | act 7/29 |   |
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| ASST TO DIR     |          |          |   |
| ASST TO DEP/DIR |          |          |   |
| CH/PPBS         | 1        |          | WALLY ✓ 9/9/70<br>Tab this report clearly. → guess we may want to bring this out often when the ERTS debate on budgets, use of RBS7's etc gets rolling.<br><br>act. |
| DEP CH/PPBS     |          | mjs 28/7 |   |
| EO/PPBS         |          | act 28/7 |   |
| Edna (File)     | 6        |          |   |
| CH/IEG          |          |          |   |
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| EO/PSG          |          |          |   |
| CH/TSSG         |          |          |   |
| DEP CH/TSSG     |          |          |   |
| EO/TSSG         |          |          |   |
| CH/SSD/TSSG     |          |          |   |
| PERSONNEL       |          |          |   |
| LOGISTICS       |          |          |   |
| TRAINING        |          |          |   |
| RECORDS MGT     |          |          |   |
| SECURITY        |          |          |   |
| FINANCE         |          |          |   |
| DIR/IAS/DDI     |          |          |   |
| CH/DIAXX-4      |          |          |   |
| CH/DIAAP-9      |          |          |   |
| CH/SPAD         |          |          |   |

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24 July 1970



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MEMORANDUM FOR THE RECORD

SUBJECT: ARGO Meeting - Room 208 - EOB, 0930-1330,  
July 22, 1970


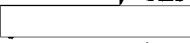
1.  chaired the meeting assisted by 

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2. The first subject was a discussion led by ESSA on the manner by which tornadoes do their damage. A film presentation was included consisting of radar flown over a tornado and ESSA satellite tornado coverage -- with a few overlays of radar over the satellite imagery. Frames 15 minutes apart were used reducing the motion film coverage of-say-8 hours, for example, to seconds. The major point appeared to be further knowledge from the reported first impression years ago that damage was caused by drawing up surface objects into the center of the tornado - to the current understanding that the damage is caused by the winds at the edge of the tornados. These winds are normally counter-clockwise with 15% clockwise. They might consist of a 100 yards wide edge of a 2-mile-wide tornado. If the tornado is "tipped" on its side enough only one edge section will be damaging. Much of this information was determined by imagery of post-tornado swaths with straight, arcs or spiral paths of material left by these wind edges.  made an interesting comment on some writings by Myron Tribus (Ass't Sec'y Commerce who has been briefed here in NPIC and who, I believe, has just been appointed by the President as Head of a special interagency group on weather modification problems - which will face the decisions on whether "to seed or not to seed" (modify) a hurricane, etc., thus possibly causing damage suits against the U.S.).  commented that Tribus has recommended great caution on attempts to modify hurricanes, tornados, thunderstorms, etc. until we are sure we know enough of what we're doing. -- The ESSA rep said we might have a home TV weather channel in a few years (something like the channel continuously running the stock market reporting) which will give us continuous pictorial reporting (providing the viewer a chance to look at the weather for his area or the immediate area north, south, east, or west into which he may be driving - for example).

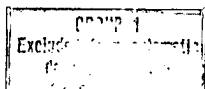
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3. , OEP, reported that the head of the Disaster Working Group , OEP) had approved the report which will be final typed next week (thanks to the return from leave of his secretary - ??). The report will be given to the Office of The Chairman, ARGO, which will distribute it to all agencies. The report is unclassified and does not refer to its TKH annex which will be distributed in parallel with the report. This distribution should occur by August 3rd. Comments, if there are any more, of the receiving agencies should be made to Chairman

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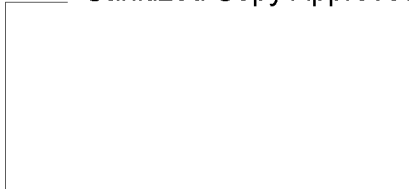
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ARGO by Aug. 13th or 14th. Final approval should occur at the September meeting of ARGO and the report forwarded to [redacted] will then transmit to the cabinet level for formal agreement. (ARGO file and past MRs contain references and comments on the disaster working group report.) -- [redacted] reported that OEP now had the budget and would begin construction of its SI/TK cleared center and its communications and information center (secure phone, wire services, presentation equipment, etc.).

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4. There was limited discussion on the RBV (return beam vidicon) following comment by [redacted] that he'd been to [redacted] recently and found there were bugs in the system. He mentioned camera shifting particularly. He and [redacted] (TOPO Div. - USGS) talked about the planned correlation between ERTS-A, [redacted] aircraft imagery. Without [redacted] (absent) from NASA, discussion seemed rather inconclusive.

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5. [redacted] presented his proposal for complete high altitude (U-2) coverage of the U.S. His proposal and recommendations are attached. Also attached is a related paper along similar lines written at NASA/Houston. [redacted] will obtain probable cost figures in a week or two. These figures will be given to user agencies for their consideration as they put in their requirements. The total requirements should be summed up in six or seven weeks for consideration at the next meeting.

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6. A brief terms of reference paper was distributed by [redacted] and returned at end of meeting. Discussion did not indicate anyone's concern. Other than some minor points, Otto Guthe and I felt it was consistent with what we believe is policy. It will be considered again later when [redacted] has a chance to put his thoughts on ARGO together, following sub-cabinet talks on that subject.

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7. [redacted] reported on his talks to date at sub-cabinet or ass't sec'y level. He covered all agencies so far except Commerce. They are: Transportation, State, Interior, NASA, State/AID, and Agriculture. He said the views on ARGO ranged from "most important" to complete indifference. He had been careful to stress that he was not selling ARGO. While not yet prepared to report, he said the degree of classification makes use difficult according to almost all user agencies. Other general views: 3 agencies said ARGO access important to them, - almost all felt it was the only device keeping attention focused on ERTS, - also most felt learning of present problems in handling classified systems gave them a start on future ERTS problems. [redacted] said he would make some recommendations on declassification to [redacted] Otto and I advised of current COMIREX reinterest in this question and the possible effect of SALT, prior experience of NSAM

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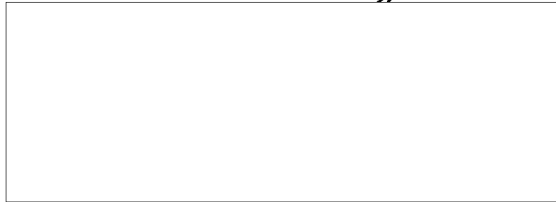


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156 committee, etc. were mentioned. [redacted] had some thoughts that when ERTS System(s) are flying ARGO might no longer be needed - perhaps a single relationship could be established. He will make available a precis of his survey in September.

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8. The Chairman's office will call members regarding time for the September meeting.



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Attachment:

As stated (UNCLASSIFIED)

Distribution:

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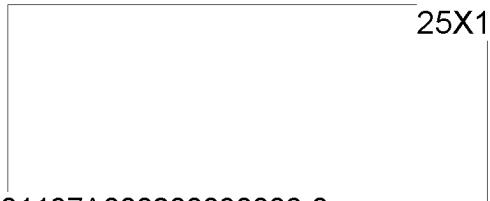
3 - NPIC/TSG/APSD [redacted] w/attach

4 - NPIC/TSG/RES/RS [redacted], w/attach

5 - NPIC/IEG (Attn: [redacted]) attach

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HIGH ALTITUDE AIRPHOTO COVERAGE  
of the United States

Background

Between 1948 and 1958 nearly complete aerial photographic coverage of the United States was obtained by the Army Map Service from flight heights of 30,000 feet and above. These photographs have been utilized repeatedly by many organizations for cartographic and noncartographic purposes. However, they no longer represent timely coverage for large areas of the country.

Today the capability exists within the Government of obtaining photographs from altitudes of 60,000 feet and above. The performance of aerial cameras has been substantially improved, and new high resolution black and white and color responsive films can provide a far greater information content per exposure than was heretofore possible.

The first Earth Resources Technology Satellite (ERTS-A) is planned for launch in early 1972. Aerial photographs will provide spatial correlation and a large measure of "ground truth" which will simplify and expand the application of ERTS imagery for many users both within and outside the government.

Photographs taken at this time will provide a pictorial base for all users wishing to correlate their data with the 1970 census records.

It is therefore appropriate at this time to consider new high altitude coverage of the country using these new capabilities.

Department of Interior Requirements

Several bureaus of the Interior Department have indicated specific requirements or applications of high altitude photography.

o Geological Survey Topographic Division

Aerotriangulation to establish horizontal control for mapping

Image base for revising large scale topographic maps (1:24,000) in either line or orthophoto editions

Image base for both recompilation and revision of medium scale maps (1:250,000) in either line or orthophoto editions

A map supplement which, with minimal orientation data, can be distributed to the public without further processing

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Attachment to

- o EROS Program Office

Spatial correlation for ERTS imagery

Spectral and geometric calibration for ERTS imagery

Ground truth base for use with temporal ERTS coverage

Image correlation with 1970 census data

- o Bureau of Land Management

Image base for land use classification of public lands

Other bureaus in the Interior Department have expressed a general interest in the use of high altitude photography if it were available

- o Geological Survey Geologic Division

- o Bureau of Mines

- o National Park Service

- o Fish and Wildlife Service

- o Bureau of Outdoor Recreation

- o Bureau of Indian Affairs

#### Applications in Other Departments

It is anticipated that other government agencies would also make extensive use of high altitude photography

- o Census Bureau

A permanent photographic record of the country to supplement the 1970 census

- o Coast and Geodetic Survey

Aerotriangulation to establish horizontal control, and chart compilation

- o Department of Agriculture

Image base for thematic mapping and resource inventories prepared by Forest Service, Soil Conservation Service, Commodity Stabilization Service, Agriculture Stabilization and Conservation Service

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- o Corps of Engineers (civil works)
  - Image base for mapping and construction planning
- o Bureau of Public Roads
  - Coverage of interstate highway network

Suggested Configuration

Department of Interior applications would be satisfied best by having simultaneous coverage flown in high resolution black and white and color infrared. Optimum utility would be obtained by having a photograph approximately centered over each 7.5-minute (1:24,000) map quadrangle. To produce this photography the following parameters are suggested:

- o Flight configuration
  - Altitude 20.55 km (67,500 ft)
  - North South flights
- o Cartographic camera
  - Focal length 152 mm (6 inch)
  - Format 23 x 23 cm (9 x 9 inch)
  - Photo scale 1:135,000
  - Forward overlap 55%
  - Consecutive exposure spacing 13.9 km
  - Sidelap 65%
  - Flight line spacing 10.8 km
  - Coverage per frame 30.8 x 30.8 km
  - Camera type Wild, Zeiss (or equal)
  - Film type - color infrared 2443 (or equal)
- o Thematic camera \*
  - Focal length 305 mm (12 inch)
  - Format 23 x 23 cm (9 x 9 inch)
  - Photo scale 1:67,500
  - Forward overlap 10%
  - Consecutive exposure spacing 13.9 km
  - Sidelap 30%
  - Flight line spacing 10.8 km
  - Coverage per frame 15.4 x 15.4 km
  - Camera type - Zeiss (or equal)
  - Film type - black and white 3404 (or equal)

\* A 12 inch focal length, 9 x 18 inch format camera with 55% forward overlap and the 18 inch dimension in the line of flight is an acceptable alternative.



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Processing and dissemination

Processing must be accomplished in a controlled laboratory to preserve the geometry, resolution, and color quality of the photography

Original film must be available on unclassified basis for use in making copies for government agencies and general public

Availability of photography must be made known through normal indexing and publication procedures

Recommendations

- o ARGO committee members should canvas the agencies they represent to determine applications, coverage requirements, and camera, film, and flight parameters
- o The ARGO committee should prepare a definitive set of specifications incorporating as many requirements as possible
- o The ARGO committee should exercise the means at its command to implement the recommended high altitude photography program
- o Specific priorities for coverage should be established, but the target objective should be to obtain near complete coverage of the United States by 1972.

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MEMORANDUM

Date: January 26, 1970

To: TF3/Chief, Aircraft Project Office

In reply refer to:  
TF3/ML9-70

From: TF3 [redacted]

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Subject: Mapping the United States with the RB57F

Recently, I read a comment by [redacted] USGS, that it would take 1,500,000 pictures and ten years to map the United States. This statement was made in support of Earth Resources satellites. Although satellites certainly have a tremendous advantage in photographic coverage, lifetime, field-of-view, etc., the RB57F does provide a tremendous synoptic view of the earth at altitudes above 60,000 ft. and at a fraction of the cost. If you consider the time element, I would almost venture to say that we could probably even deliver the "goods" before the satellite.

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I think if more people in the User Agencies were made aware of our high altitude capabilities, we could do more for the scientific community in the field of earth resources both national and international.

Perhaps you might desire to make more of them aware of the RB57F Program and its capabilities by making this proposal available to them.

How to map the 48 contiguous United States (Alaska and Hawaii too, if desired)

With the present team of some 20 Air Force, three NASA and four Contractors already "combat tested" in the Earth Resources Aircraft Program map the 48 States in a systematic, methodical manner with the RB57F. Consider the inputs of all the User Agencies and NASA Scientists in selecting cameras, films and filters, seasonal problems, terrain, etc.

Use the already proven concept of block coverage from the five existing RB57F supporting Air Bases: Kirtland AFB, New Mexico, McClellan AFB, California, McCoy AFB, Florida, Wurtsmith AFB, Michigan and Ellington AFB, Texas. Deploy to any given base until most of the "blocks" within the 1000 nautical miles of that base are covered. Consideration would be given to such weather factors as "no snow on the ground," "cloud coverage less than 3/10ths" etc. For example: deploy to Wurtsmith AFB, Michigan during the summer in order to map the North and East when there is no snow on the ground and deploy to McCoy AFB, Florida, during the winter to map the South and Southwestern parts of the U.S.

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Most of our five bases are at the extremities of the U.S. so that we really have a 1000 nautical mile radius for about a half circle or an area of some 1,500,000 nautical miles<sup>2</sup>, which is considerable. It is even very likely that we would not have to deploy to all five bases due to this layout. We have reached the Imperial Valley, Phoenix, Purdue, Tennessee Valley and others from Ellington AFB, Texas. This illustrates the tremendous flexibility of the RB57F. I would estimate that 25-50% of the U.S. could be mapped out of Houston, Texas. This of course, would greatly reduce the total cost. The cost estimate assumes that 20% of the U.S. is mapped from each base, which is conservative.

Since the RB57F became operational in July 1969, to the present, we have mapped about 9% of the U.S. at the leisure pace indicated below:

| <u>Mission</u> | <u>Date</u>  | <u>Flights</u> |
|----------------|--------------|----------------|
| 100            | 7/14-21/69   | 3              |
| 101            | 7/30-8/15-69 | 9              |
| 103            | 8/25-9/17/69 | 8              |
| 106            | 9/29-10/2/69 | 3              |
| 110            | 8/19/69      | 1              |
| 112            | 19/7-16/69   | 5              |
| 116            | 12/3-7/69    | 3              |
| 118            | 1/6-1/15-70  | 4              |

Total to date -- 36

At this pace (6 flights/month) we would have mapped an area equal to that of the 48 States in 400 flights. This is because we are not managing our flights to cover maximum size blocks but to fly selected test sites with some block coverage in the area. Consider, for example, the difference between Mission 106 where we flew four test sites for about 19,000 nm<sup>2</sup> and Mission 112 where we mapped about 80% of the State of Florida. Had we attempted maximum area of coverage, we could have mapped 432,000 nm<sup>2</sup> or 19% of the U.S. in this same time.

A maximum area of block coverage is 100 nm by 120 nm or 11 flight lines. This represents the best size area for mapping with 10 nm flight centers to obtain 60% front overlap by 30% side overlap on the RC-8 cameras and accepting whatever overlap results on the KA50 and Hasselblads depending on lens sizes flown. This would provide 12,000 nm<sup>2</sup> each flight on about 1/2% of the U.S. each flight. The end results can be seen in the next chart.

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Given: Map the 48 contiguous United States

- With:
- 2 RC-8 Wild-Heerbrugg Metric Cameras - Color and Color IR
  - 1 KA50 Chicago Aerial Wide Angle Camera - B&W
  - 6 Hasselblads-Multispectral

- How:
- Block Coverage Concept - NASA/Air Force RB57F
  - 100 nm by 120 nm Block Areas (12,000 nm<sup>2</sup>)
  - 60,000 ft. MSL
  - 11 Flight Lines Per Block - 10 nm apart
  - Clear Areas Only (.3 cloud coverage or less)
  - 5 AF Base Staging Concept
  - Deployments based on season and weather
  - 190 flights - 9 flights per month - 21 months

- Product:
- 1605 pictures per block area - color, color IR and Multispectral and B&W
  - 440 RC-8, 165 KA50, 1000 Hasselblads per flight
  - 305,000 pictures total

- Cost:
- (over entire 21-month period - 27 people on team) Note 1
- 190 flights of 6 hours at \$906/hr (see note 2)
  - 10-C141 support airlifts for deployments
  - Per diem for 16 GI's and 4 AF Officers
  - Per diem for 3 NASA and 4 Contractors
  - 1710 Rolls of Film and Processing
  - Airfare for NASA and Contractors (see note 3)
  - Data Tapes - 38D (2 each flight)
  - Spare parts for instrument pallet
  - Contingency money
- (note 4) -- Total

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Note 1 - Salaries not included since already accounted for.

Note 2 - The \$906/hr for the aircraft includes the use of 16 airmen and 4 officers for the entire period.

This price also includes repairs on the aircrafts.

Note 3 - All Air Force Personnel will travel in C141 airlift.

Note 4 - Total cost is about \$1/nm<sup>2</sup>

### Summary

In my opinion, most people think of aerial photography in terms of aircraft used five or ten years ago. Furthermore, most people never heard of the RB57F and if they did, do not know of its capabilities. I believe we should make all the User Agencies more aware of what we can do and for how little in the way of manpower and expenditures. For a little more, we could fly the RS-7 Infrared Scanner and possibly replace the Radiometer Spectrometer

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with more cameras; perhaps some new high altitude cameras being built for the Air Force. (Reference: High Altitude Panoramic Airborne Camera being developed by [redacted])

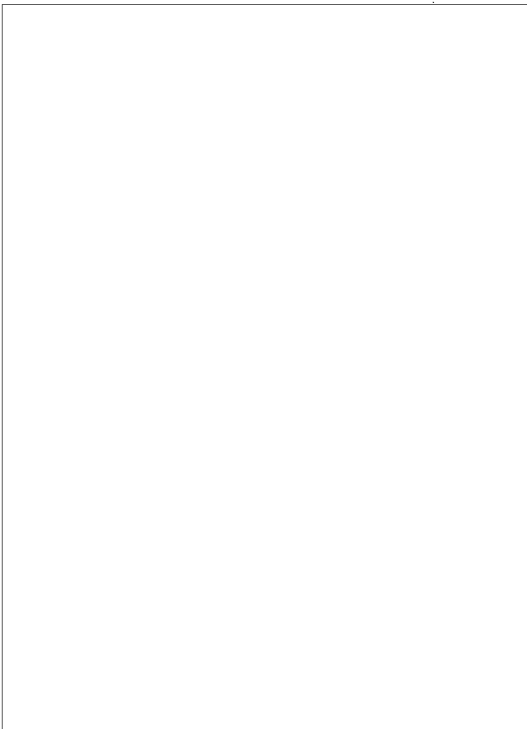
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With regard to our present Earth Resources missions, it is possible we could include the requirements of the Principal Investigators for Earth Resources sites with the overall requirement to map the U.S. Certainly, enough trade offs and compromises could be made in order to satisfy most of the requirements. We could possibly fly two or three of the nine cameras with the same film/filter combinations and vary the remaining cameras for varied scientific reasons.

Plan the missions based on an average flight time and camera load of six hours of which three and one-half hours is data time. This works out to blocks of coverage 100 nm by 120 nm which is the size of many blocks we have already flown.

In summary, map the United States today, tomorrow the world. (In conjunction with international agreements, of course!)

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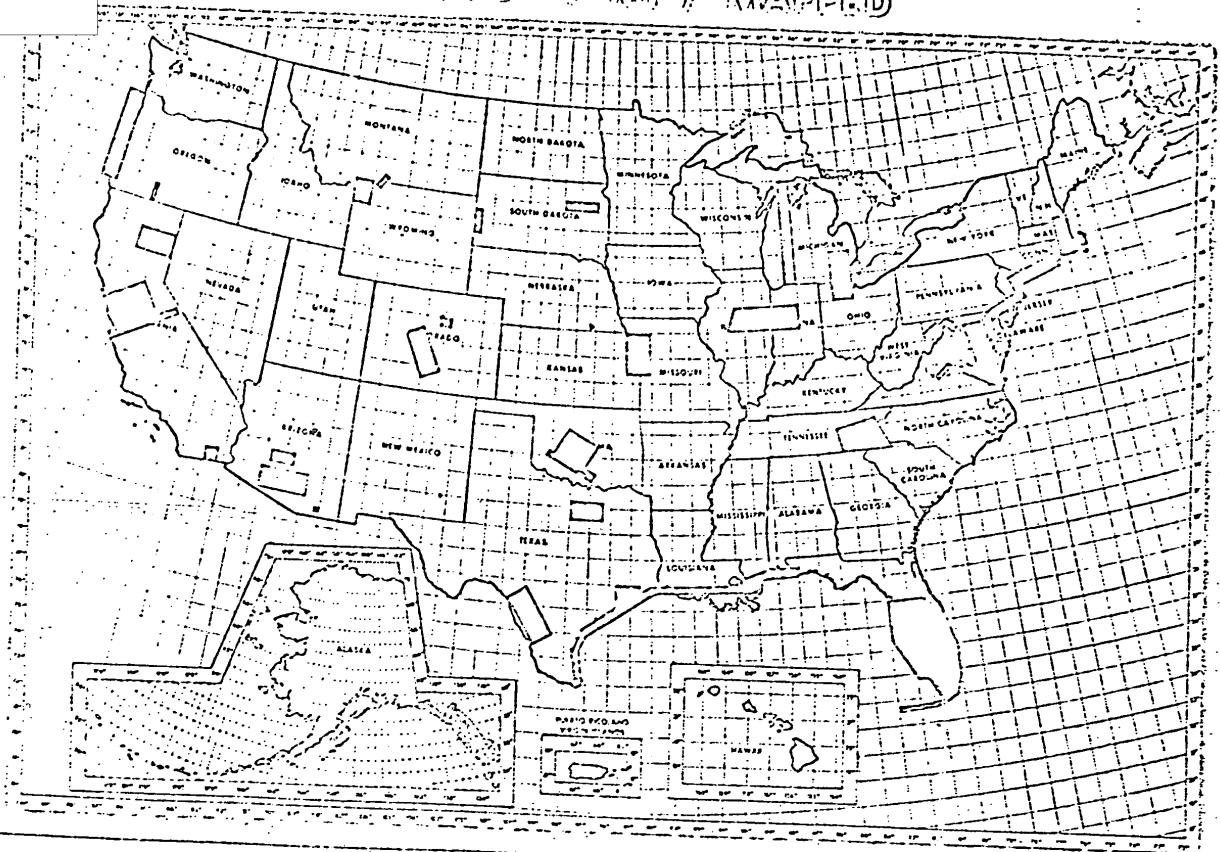
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Attachment

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RB57F COVERAGE  
JUNE 1969 THRU JANUARY 1970  
(238,150 N MI<sup>2</sup>) MAPPED

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