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—(S) NATIONAL RECONNAISSANCE OFFICE
WASHINGTON, D.C.

THE NRO STAFF

2 9 MAR 1974

MEMORANDUM FOR *LT COL HOFMANN, SS-5*

SUBJECT:  NRP Weather Support

The attached background describing Air Weather Service
support to the NRP is forwarded for your information.

The paper presents an overview of the Air Force Global
Weather Central and a more detailed description of the pro-
cedures used in supporting HEXAGON and GAMBIT today.  The
final portion outlines the concept of weather support planned
for the KENNEN system in 1977.  Throughout the paper the
interrelationships of the Defense Meteorological Satellite
Program, the GWC weather support, and the NRP imaging satel-
lite systems are described.

If you have any questions or desire additional informa-
tion, please contact me.

VERNON M. MALAHY, JR.
Lt Colonel, USAF

Attachment

HEXAGON   GAMBIT   KENNEN

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15 March 1974

MEMORANDUM FOR RECORD

SUBJECT:   NRP Weather Support and Support Concept for KENNEN

Air Force Global Weather Central

    Air Force Global Weather Central (GWC) is a named Air Force unit located at Offutt Air Force Base just south of Omaha, Nebraska.  GWC is subordinate to Sixth Weather Wing located at Andrews Air Force Base, Maryland, which is direct- ly under Headquarters Air Weather Service (AWS), Scott Air Force Base, Illinois.  AWS is a service organization of Military Airlift Command (MAC) with headquarters also at Scott Air Force Base.

    GWC is a computer based facility which provides en- vironmental service to the NRP, Air Force, Army, DOD and other governmental agencies on a worldwide basis, 24 hours per day.  The basic operational concept of GWC is to build a dynamic environmental data base and then to apply this data base to produce products tailored to user mission re- quirements.

    Conventional surface (land and sea) observations, air- craft and radar reports and upper air soundings throughout the world are continuously transmitted to GWC through the Air Force Communications Service high speed Automated Weather Network (AWN).  Near space environmental parameters and observations are also received through the AWN.  GWC receives vast amounts of meteorological satellite data which are computer processed to various displays and scales for use in GWC, and for selected field units.  Both the AWN and the Defense Meteorological Satellite Program (DMSP) were established to increase GWC responsiveness and support quality to NRP requirements.

    Products produced from the automated environmental data base are manually monitored and quality controlled at GWC.

HEXAGON      GAMBIT      KENNEN

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Other specialized products are manually prepared using computer
derived forecaster aids. These data are then transmitted
either through the AWN or through one of the some 50 direct
communication channels to the GWC customers. These communica-
tions circuits include AUTODIN, weather teletype, and facsimile,
digital facsimile, data relay, and command and control computer
to computer drives. Data transmissions range from unclassified
through TOP SECRET via a variety of encryption hardware.

## NRP Weather Support, 1974

At GWC one group of meteorologists is directly under Air
Weather Service Headquarters, and this Special Projects Section
is totally dedicated to providing weather and environmental
support to the NRP. For operational purposes this section
responds directly to the NRO, and may be considered as an NRO
asset. Although this section provides data to NRP ELINT, IR
and aircraft systems, the primary task is to provide cloud fore-
casts and cloud verifications for HEXAGON and GAMBIT. The broad
concept in this support is to use the most current data and
make a short leadtime forecast for each orbital swath of the
imaging system, and to verify or assess the actual cloud cover
conditions that existed at the precise time and location the
vehicle was over the target. For efficiency, the special projects
section uses data fields produced by any GWC computer and draws
these data one-way into the BYEMAN computer area.

A unique tool in this process is the use of DoD meteoro-
logical satellites (DMSP). Two satellites are used. The first
satellite is time phased to act as a "scout" for the reconnais-
sance vehicle. At 'first light', approximately 0700 local sun
time, it scans the target areas that will be accessed by the
NRO vehicle some four to six hours later. The data received
is stored on-board and then readout, transmitted to GWC, com-
puter processed and displayed for the meteorologist. Addition-
ally, the data is stored at GWC for use in the automated cloud
analyses, the 3 dimensional nephanalysis (3-D NEPH). The
second satellite is time phased with the reconnaissance vehicle
so that it passes over the target area near the time (approx
mately local noon) the NRO vehicle is over the target. Clo

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cover data from this satellite is processed in the same manner as the scout vehicle, but is used to determine if the target areas were clear or cloudy at the time the NRO vehicle was operating, providing the NRO with a near-real-time capability to countdown target areas.

The following is a brief scenario of forecast preparation by the Special Projects Section in support of HEXAGON or GAMBIT Block II today:

      a.  Meteorological satellite data is received, processed, displayed and stored.

      b.  The 3-D NEPH is produced using the most current meteorological satellite data, and conventional data which is constantly being updated in the automated environmental data base as data is received from the AWN.

      c.  Using the completed 3-D NEPH for the region of interest, and drawing processed data fields from the unclassified data base, an automated cloud prognosis is produced. The valid time of this cloud prognosis is for the time of the particular orbital rev of the imaging system.

      d.  An automated applications program then extracts only those cloud forecast data that precisely fit the requirements of the imaging system. This data is formatted into decision elements consistent with the command generation software of the imaging system, is displayed in various formats for the meteorologist, and is put on cards for transmission through the NRO communication link.

      e.  The meteorologist manually performs a quality control check to ascertain not only that data format is correct, but also to check and modify the actual automated cloud forecast if necessary. (It should be noted that this man-machine mix has produced consistently superior results when compared to the automated product, however, the volume of data produced is beyond the scope of a totally manual prepared forecast.

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     f.  The final cloud forecast, in the form of the probability of successful acquisition of a desired area or target by decision element, is then transmitted for inclusion in the HEXAGON or GAMBIT command generation software decision logic.

     g.  The entire process is repeated for the next subsequent rev.

Due to orbital times, the perishability of weather data (i.e., new data continually updating older data) and the near realtime round-the-clock requirements of the NRO, several of these generalized steps may be occurring simultaneously for various revs of the imaging system.  The entire process is geared to the concept of shortening the time between the meteorological satellite viewing the broad target region to the time that HEXAGON or GAMBIT is operating over the specific targets in the region.

## Concept of Weather Support for KENNEN, 1977

In terms of cloud-free imagery return, KENNEN has the potential to equal or exceed the mission effectiveness of todays current HEXAGON and GAMBIT systems through the use of timely and accurate weather support.
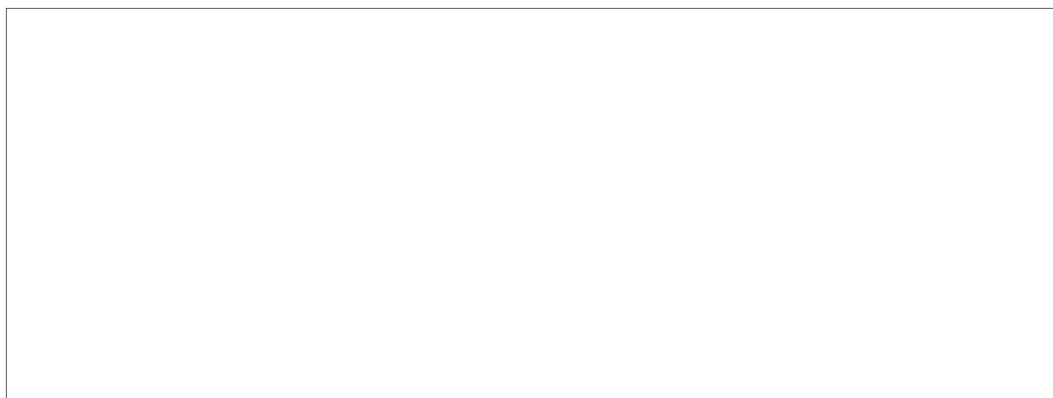
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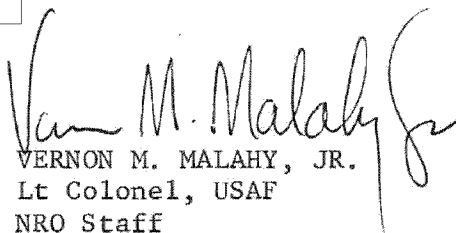
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HEXAGON or GAMBIT on orbit simultaneously the data base must be updated constantly, and many of the above procedures will be occurring simultaneously for various revs of the reconnaissance systems. In order to meet the 1977 total requirements, the special projects computers will be upgraded and AWS is in the final stage of securing approval for the hardware upgrade through ACD with NRO support.

If you have any questions please contact Lt Colonel Vern Malahy, SAFSS-4, extension

VERNON M. MALAHY, JR.
Lt Colonel, USAF
NRO Staff

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