[redacted]

~~SECRET~~

I. During 1963, a number of NASA contractors, on MORL studies, examined - at NASA's request - optical reconnaissance systems. Example: Boeing study ~~(SECRET)~~ considered the earth reconnaissance mission and possible military application.

II. In FY 65, a MORL work statement for Douglas listed such objectives as R&D in surveillance and reconnaissance, command and control, anti-ballistic missile and anti-satellite technology: A January 1965 report by Douglas stated that "two categories of experiments have been tentatively selected for inclusion on board the MORL which support the reconnaissance and surveillance required for the National Defense effort. These are microwave radiometry and radar. Approximately eight specific experiments for these two categories have been identified."

III. In March, 1965 NASA listed for the Navy some 28 technical items in the NASA program as being of current or prospective interest to the Navy. The first eight are categorized as "visual, photographic, and electronic surveillance of ocean areas." The items listed include detection, observation, tracking, the use of geodetic satellites, and "various uses of large telescopes and antennas."

This chronology prepared by Maj Yost : 13 Aug 65

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~~TOP SECRET~~

IV. NASA has established two programs for optical reconnaissance of the moon, in consultation with the NRO.

- Unmanned mapping and return of data by television. Obsolete military equipment was provided NASA. NRO experts consult.
- Manned lunar photographic mission using the APOLLO vehicle. Uses adaptation of an NRO camera. Work done by NRO.

V. For the APOLLO E. S., NASA proposes 15 earth orbital missions. On five of these, earth mapping or other "remote sensing" of earth's surface by image forming devices were identified as primary experiments. Devices include radar, optical cameras, and IR cameras. Mapping by microwave emission from natural sources (microwave radiometry) and detection of electromagnetic signals also included as objectives.

VI. NASA program efforts on the APOLLO E. S.

Radar:- NASA has asked the Army to declassify its SECRET APQ-97 radar developed by Westinghouse.

- GIMRADA uses this radar as a base for designing an advanced radar mapping-surveillance system.

- The APQ-97 is the most advanced side looking radar developed to date.
- Publication of details on the APQ-97 would divulge current state-of-the-art in this area.
- Characteristics:

  Band - Ka
  Antenna - 14 ft
  Synthetic aperature
  Interferometer technique
  Pulse width - 3.10 -8 second

Mapping & Geodesy:

- NASA has made several requests to Army, Navy and Air Force for specific performance and specifications of existing or planned mapping and reconnaissance camera and radar systems.
- GIMRADA has supplied to NASA "unclassified" performance data on a multi-purpose research camera system.
- NASA has provided GIMRADA funds for placement of contracts with specific DOD contractors, experienced in this area. Example: Autometric Company for a "parametric study of photographic systems for the APOLLO Extension series." (One report turned in)

- Experience factors applied by select DOD contractors are based on highly sensitive background data.

✓ High Resolution Photographic Camera Systems:

- Air Force (WPAFB) has supplied data to NASA on a variety of camera systems or potential camera systems.
- NASA has contacted directly several DOD contractors in this area. Example: NASA has placed at least two contracts with ITEK on parametric performance of panoramic cameras. Specific emphasis was placed on camera system available in time period (1968) for first APOLLO E. S. earth orbital launching. (Study reports on three configurations completed.)

✓ General:

- NASA has circularized a "Dear Colleague" letter on detailed sensing of the lunar surface.
- The letter solicits from "a potential user of the photographic and other records that could be obtained from such (lunar orbital) flights " any comments and suggestions relative to such records and maps and the reasons why such material should be obtained.

- The check list of NASA's interests (attached to the circular) covered both photography and other spectral responses (radar, IR, and passive microwave).

VII. Interagency task statements on APOLLO E. S.

NASA - U. S. Army Corps of Engineers

- Outgrowth of work being done by GIMRADA.

NASA-USDA

- Pure reconnaissance
- No data to support specific statement of USDA requirements (resolution, coverage, spectral range, etc.).
- With one exception, all data needed can be obtained from aircraft experiments. Exception: Determining value of small scale maps covering wide areas.
- Maps could be made by KH-4.

NASA-U. S. Navy Oceanographic Office

- Outgrowth of Navy interest in use of remote sensors for synoptic and repetitive oceanographic studies.
- Similar to USDA task.
- Requirement for reconnaissance quality photographs is unclear.

NASA - U. S. Geological Survey

- Outgrowth of infrared sensing and test site studies by USGS for NASA.
- Similar to USDA.

VIII. NASA has issued (28 May 1965) an RFQ on a "Preliminary Design Study for an Optical Technology APOLLO E. S." Outlines 14 experiments which include:

- Effects on large diffraction limited telescope and suspense system.
- Laser tracking from satellite to ground beacon.
- Two-way Laser communications, with closed loop tracking of antennas.
- Atmospheric effects on Laser transmission

IX. ACDA (Scoville) letter to NASA refers to JPL Arms Control Group and proposes "NIMBUS" satellites with better cameras.

X. U. S. Army Corps of Engineers (General Cassidy) letter to NASA expresses interest in APOLLO E. S. and refers to continuing contact between Engineers and NASA.

XI. NASA MSC has proposed a "Symposium on Space Optics."