

1/16/73

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Research Accomplishment

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1. Background: The POPPY ELINT satellite system has been collecting radar intelligence data from the Soviet Union and other countries for over 12 years. Through most of the history of the program, as well as all other satellite collection systems, this information has been of a strategic long-term value in assessing new radar capabilities, weapon system deployments, etc. The operational value of this data has been recognized by this Branch for a number of years. During the last quarter the research and development efforts succeeded in providing a processing system which meets the Navy's strictest satellite oriented time requirements (1 hr.) for processing and reporting to operational commands.

2. The specific system which provided this capability is the POPPY Automatic Processing System (PAPS) which was shipped to on schedule in September 1972 and without any major problems became operational in the past quarter. The history of this system was that it was conceived and presented by the principal investigator in a paper to the POPPY Program Director on April 22, 1970. By that time the POPPY system had demonstrated the capability for detecting and locating shipboard radars. Considerable controversy existed as to the approach which should be followed in making the system operational. The other concepts were presented by NSA and NSG. The initial Navy submission was that of NSG's. It was rejected and NRL's formal concept of 12 August 1970 was submitted and approved on 13 October 1970 by Dr. McLucas.

(b)(1)
(b)(3)

3. The POPPY system collects radar signals from approximately 10 million sq mi of air, land, and ocean areas with many combinations of broad frequency bands from 153 MHz to 35 GHz. The mixture of

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free world and Sino-Soviet Bloc commercial, experimental, and military radars are all merged and transponded to the ground unprocessed in an analog form. The problem for the processing system is sorting through this very diverse data which may exceed 2 million events in a single pass and reconstruct the hostile radars, in terms of their specific electronic parameters and the site of origin. This is achieved through a complex series of data filtering, auto/cross correlating, statistical testing, data fitting, and evaluation routines. For each radar family the control values, limits, fitting techniques, etc., are different and must be changed.

The system must have extensive bookkeeping and data management capabilities to allow forward and backward manipulation of the data as well as manual overrides for detailed examinations and unusual data conditions.

4. Specifically, PAPS is the integration of a carefully selected, medium size computer (SEL-86) with a series of complex specialized programs and data bases. These process the POPPY data automatically under the Automatic Sequence Driver (ASD) which is a special software executive system. The features of the system are listed below.

- a. High speed, modularized processing system.
- b. Automatic processing from SEDSCAF target designation entry through emitter locations.
- c. Automatic data assessment.
- d. Automatic reconfiguration and recycling.
- e. Flexible data bases for storage and recall of supporting information, e.g., processing sequences, assessment criteria, ephemeris, etc.
- f. Manual override and detailed processing information throughout the automatic processing sequences, with no loss of data, bookkeeping, etc.
- g. Automatic allocation and deallocation of all data and program storage areas.

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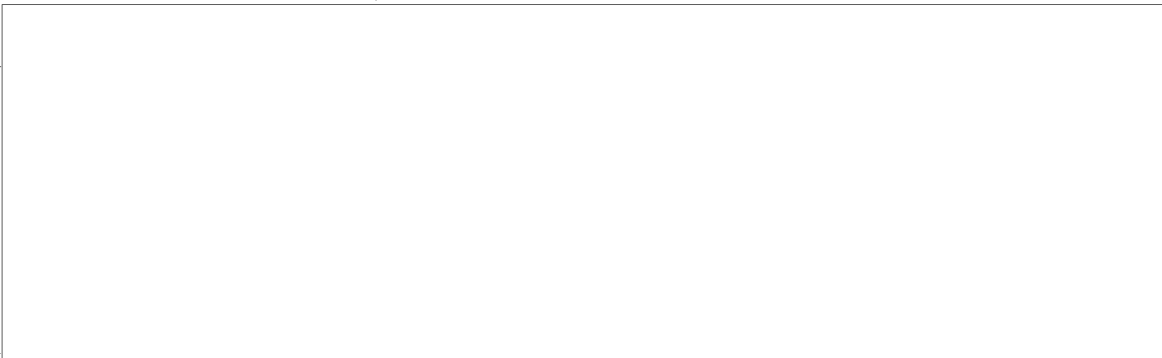
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- h. Free formatted operator entries, common messages on status, errors, etc.
- i. Extensive system bookkeeping capability including module sequences, signal summaries, time of day, current storage allocations, etc.

The processing signals list can be changed or modified at any time by field personnel using software maintenance routines to reflect the changing requirements or for special signals. All the features of the system as well as manual aids are available to the operator to use as he might desire in manual data processing.

PAPS currently is automatically processing the following Soviet radar signals.



(b)(1)
(b)(3)

These signals are processed using 41 separate pulse repetition ranges.

Using PAPS, [] is reporting (via operational communication links to [] within [] of the time of intercept on the radars carried on the major combatants. This ocean surveillance processing has been using less than 30% of the total computer power.

The success of this system in exceeding the goals of the proposal as well as meeting Navy Mode IV operational requirements, as with all complex research and development tasks, is the result of many people's efforts. As the Navy and the nation further exploit this significant new operational dimension of satellite systems, the full power and versatility of PAPS will be further documented.

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