Electromagnetic and Aviation Systems Division—a profile

R. J. Ellis

One of RCA's major Divisions, Electromagnetic and Aviation Systems is a primary supplier of electronic warfare equipment, intelligence data systems, intrusion—ordance systems, and aviation equipment. Applying modern engineering methods (e.g., computer-aided design and microminiaturization) EASD has established a solid reputation for technical excellence, cost consciousness, and schedule performance with its commercial and military customers. This Division profile looks briefly into EASD's background, describes the product lines, and provides an insight into the engineering organization that supports these product lines. It serves as a brief introduction to the other papers in this issue, which deal with some of EASD's products and services in more detail. For a closer look at the underlying engineering philosophy, the reader should refer to the paper by R. H. Aires in thjs issue.

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received his education as a business administration major at Columbia University and as an English major at Syracuse University. He studied electronics through the Capital Radio Engineering Institute. He is presently studying law for a LLB. Mr. Ellis has had more than twenty years experience in all areas of integrated logistic support. Those areas include technical publications, provisioning, training, field support, data management, documentation control, and reproduction, and supply support. His present responsibilities include preparation and production of technical publications, proposals, brochures, presentations, reports, and all similar documentation. He also is responsible for all reproduction services including microfilm, drawing vault files, and drawing distribution. Mr. Ellis is Deputy Chairman of the Technical Publications Section of the American Ordnance Association.

IN THE FALL OF 1950, the Los Angeles Plant of the RCA Victor Division received a contract from the United States Navy to develop an Airborne Weather Radar, the AN/APS-42. This was the modest beginning of what was later to become the Electromagnetic and Aviation Systems Division, which comprises plants in Van Nuys, California (Fig. 1), West Los Angeles (Fig. 2), and in Huntsville, Alabama (Fig. 3). Sidney Sternberg, Division Vice President and General Manager, has his headquarters in Van Nuys. An integral part of this operation is the Aviation Equipment Department in West Los Angeles with Joseph R. Shirley as Division Vice President.

From 1950 to 1958 the fledgling Los Angeles Plant expanded its technological manufacturing base from the APS-42 Airborne Weather Radar to AN/APN-70 Airborne LORAN, to AN/AIC-10 Aircraft Intercommunications Equipment, and to Electronic Countermeasures Systems. In 1957 and 1958 two events resulted in the establishment of a full-fledged DEP division in Van Nuys.

In 1958, Missile and Surface Radar Division in Moorestown, N.J. was fully loaded with the BMEWS program and a new major contract for the Atlas Checkout Equipment. Since most of the early Atlas engineering development and integration work was to be done at the Vandenberg Air Force Base, California, space would be needed to accommodate engineers from M&SR. Concurrently, a company survey indicated the advisability of forming a DEP Division on the West Coast; the decision was made to build a new plant at 8500 Balboa Blvd., Van Nuys, California.

The Atlas design engineers from Moorestown moved temporarily into the Los Angeles plant while the new Van Nuys facility was being built. In September 1959 the Van Nuys plant was opened for business, under the name of West Coast Missile and Surface Radar.

The Division's employment mushroomed during the early years of its existence as the Atlas program went into production. The technological base expanded into computers, displays, and electronic warfare equipment. As the Atlas program began to phase out, the Division was successful in capturing another large contract for computerized checkout for the Saturn Launch Vehicle used in the Apollo program. Additional technical competence in displays and mass-memories was developed and several electronic warfare production contracts were won and fulfilled. A new facility was constructed in Huntsville, Alabama, to house the Saturn field engineering and logistics work.

In the latter half of the 1960's the division entered the ordnance field, manufacturing various fuzes and arming devices for the Vietnam war effort. Airlines message switching systems were also successfully delivered. Mass memories and drums were developed and manufactured for the RCA commercial market. Early in 1968, a major contract was received from the Navy for a transportable electronic warfare system, the AN/SLQ-19 Countermeasure set (Fig. 4). This was a QRC (quick-reaction contract) program with the first system to be delivered in only 13 weeks. The Division received a commendation from the Navy for schedule performance on this contract.

More recently, new products such as intrusion-sensors are being developed. Military aviation products, such as airborne integrated data systems, and several types of military drum memories are now in development and production. The Aviation Equipment Department's technology and manufacturing base has further expanded in the general aviation and the airline markets into the advanced weather radars, transponders, distance measuring equipment, and communication and navigation equipment.

The products

The equipment and systems which EASD currently designs, manufac-

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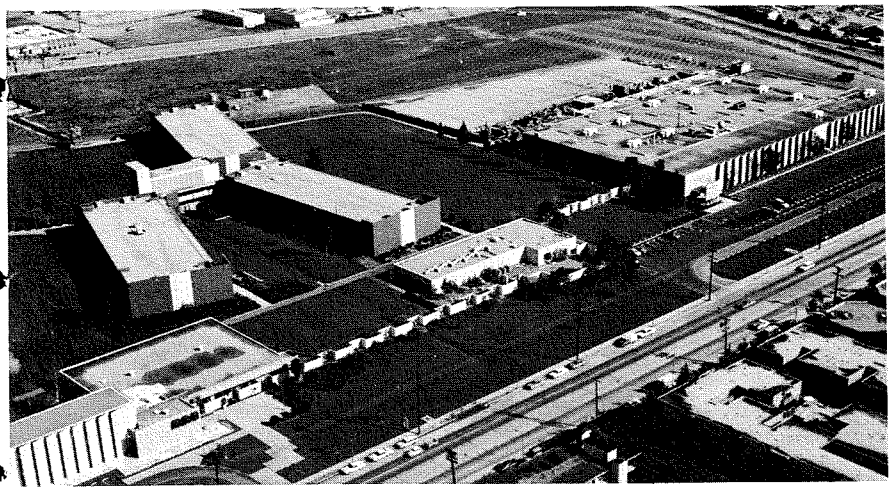

Fig. 1—Aerial view of the EASD Van Nuys facility at 8500 Balboa Blvd.

Fig. 2—Aviation Equipment Department, West Los Angeles.

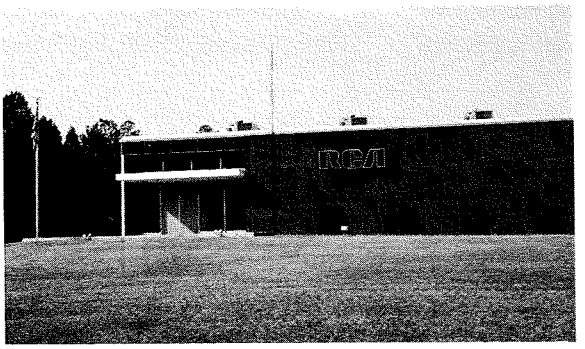

Fig. 3—EASD, Huntsville, Alabama.

Fig. 4—Mr. Sternberg (at left) briefing Mr. Sarnoff and Mr. Watts on the AN/SLQ-19 Countermeasures Set. Program Manager Jackson is at the right.

tures, and markets are divided into five major product lines:

1) Electronic warfare systems,
2) Intelligence data systems,
3) Military aviation products,
4) Intrusion—ordnance systems, and
5) Aviation equipment.

Electronic warfare systems

The major strength of the Division in recent years has been electronic warfare (EW); Fig. 5 illustrates, in summary form, the nature of the equipment and technology that supports the EW product line. The function of most of EASD's electronic warfare equipment is to detect and locate the threat, and then immediately to analyze, display, and record vital information for the command and control decision. EASD has been a major EW supplier to the Navy with primary emphasis upon electronic countermeasures to confuse and/or deceive the threat. Typical EASD electronic warfare equipments for the Navy are: deception repeaters, jammers, traveling-wave-tube oscillators, high-power amplifiers, and automatic control equipment. Complete threat reactive systems were delivered to the Navy on a quick-reaction basis in the form of the SLQ-19 Countermeasure System. A new multiple-target electronic warfare system for installations, such as tanks or jeeps, is under development now for the Army (Fig. 5). Airborne decoys for ship protection are also being developed under contracts to the military. EASD has also designed and proposed the ship electronic warfare system for the new DD963 destroyers soon to be built.

Intelligence data systems

The intelligence data systems (IDS) product line is directed toward the man-machine relationship in the computer and peripheral equipment field. EASD has been a prime supplier of computer peripherals to the Computer Systems Division. Recent efforts have been to expand this capability to serve the military. Major equipments are alphanumeric displays; random-access mass memories (Fig. 6); drum memories (Fig. 7); and central processors. Several complete computer systems have been developed including a switching system for airline use and a communications and checkout system for the Saturn launch vehicles. Under a present system contract, EASD is developing operational support equipment for the Mariner Mars '71 program (Fig. 8). In the last two years, EASD has brought into development and production a new drum memory system. Drum memories are under contract for the Army (Tacfire) and the Navy (NADC). The largest single program potential is in the S-3A ASW aircraft now under contract to Sanders Corp. Airborne displays have been delivered to the Air Force and are being evaluated.

Military aviation products and systems

Military aviation products and systems (MAPS) is a relatively new product line at EASD. The knowledge, experience, and products of the Aviation Equipment Department, added to the EASD capability for systems design and integration, provide the basis for combining transportation/housekeeping avionic equipment into integrated avionics systems. To date, distance measuring equipment has been delivered to the Army, and signal adapters that are part of an airborne

Fig. 5—Multiple-target electronic warfare system.

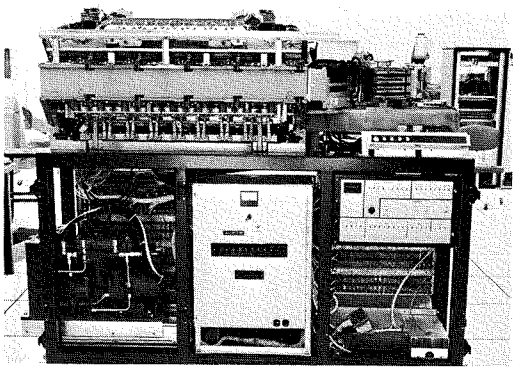
Fig. 6—70/568 random-access mass memory.

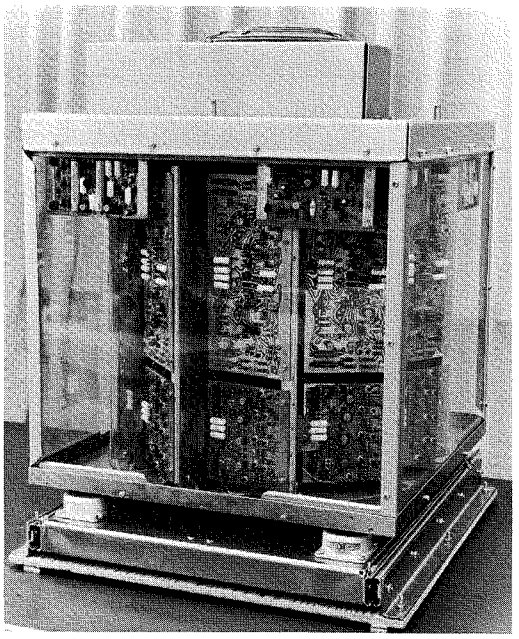
Fig. 7—Spectra 70/567 drum memory.

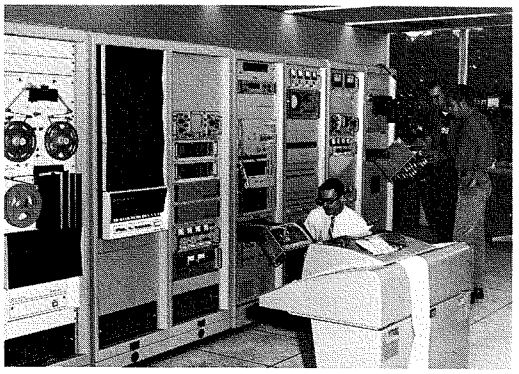
Fig. 8—Mariner Mars '71 equipment checkout laboratory.

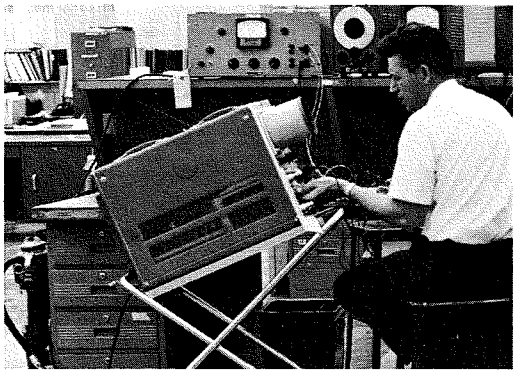
Fig. 10—S. Franklin verifying a design in the fuze laboratory.


Fig. 11—Hybrid microelectronics laboratory.

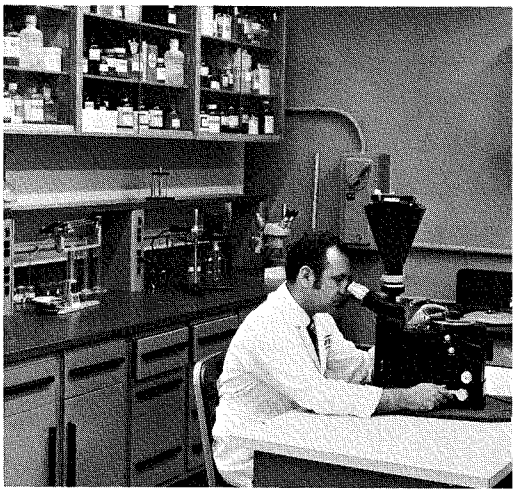
Fig. 12—Hal Rocheleau in the chemical and metallurgical laboratory.

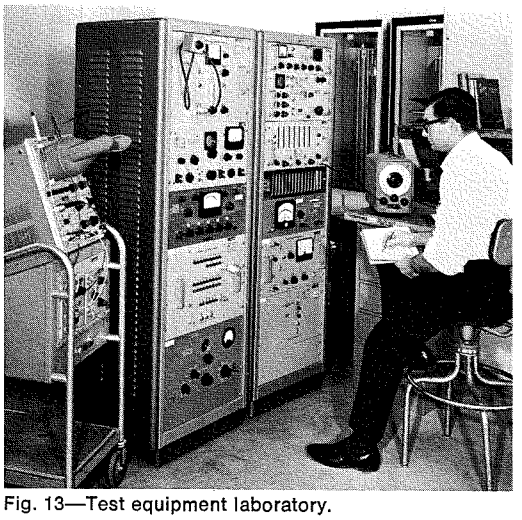
Fig. 13—Test equipment laboratory.

integrated data system are being developed for the Army.

Intrusion—ordnance systems

Intrusion—ordnance systems are divided into three significant products: 1) intrusion-sensing devices; 2) intrusion systems; and 3) fuze devices for height-of-burst control of bombs, missiles, rockets, and motar and artillery shells.

Intrusion-sensing devices have become more important lately because of the evasive "hit-and-run" tactics of the Vietcong and North Vietnamese. Past intrusion sensors used an electronic beam cutting across roadways and paths; however, this was easily discernable. Modern intrusion sensing devices are primarily seismic accelerometers that sense ground waves due to earth vibrations. They detect the movement of personnel or vehicles and transmit the warning signals to a diagnostic receiving station. EASD is one of the top companies in the development of intrusion devices. Currently under development are both seismic and microphonic intrusion devices for the Army.

The development of intrusion systems has been greatly emphasized by the requirements of Vietnam operations. Various designs and applications of intrusion systems are currently being investigated by EASD.

RCA's experience in producing fuzes dates back to World War II. With the escalation of the Vietnam conflict, the demand for fuze devices increased. and EASD was designated as the division to pursue this development and production. Motar fuzes have been delivered to the army in large quantities. EASD also has been successful in high-volume production of fuzes for air-to-ground rockets for the Navy.

Aviation equipment

Aviation equipment for commercial and general aviation is the responsibility of the Aviation Equipment Department. These equipments include distance measuring equipment, weather radars, transponders, navigation/communication receivers and transmitters, and airborne integrated data systems. Most of these equipments are described in some detail in several related papers in this issue.

RCA is a leader in the commercial aircraft equipment market—domestic and international. For example, RCA weather radar is used on fifty percent of the world's commercial airlines and in over sixty percent of the general aviation applications.

Engineering organization

Fig. 9 shows the engineering organization; Table I shows the functional design activities of the various groups, arranged according to product line and technical competence.

Table I—Technical contributions of the design engineering groups.

EW systems and technology
Systems and equipment
Equipment development
Power conversion systems
Systems integration
Mechanical development
Systems and techniques
Intercept techniques
ECM techniques
MAPS and ordnance systems engineering
Ordnance systems
Ordnance equipment
Ordnance development
MAPS systems
MAPS development
MAPS mechanical engineering
Advanced EW systems
Displays and peripheral systems engineering
Displays and peripheral systems design
Commercial peripheral products
System programming
Commercial display products
Military system design
Displays and peripheral systems programs
NASA programs
Mass memories and computer systems engineering
Computer systems engineering
Programming
Automation systems
Command & control systems
Military product design
S-3A Program and advanced peripheral technology
Advanced mechanical development
Subsystem development
Advanced mass memory development
S-3A coordination
Advanced peripheral techniques
Staff engineers

The Engineering Activity at EASD's Aviation Equipment Department operates as a separate entity that reports to the Division Vice President of Aviation Equipment Department.

Modern engineering requires many tools to achieve reliable and maintainable products. Such tools include computer-aided design, coordinatographs, scientific calculators, and modern laboratories. Figs. 10 through 13 show some of the laboratories and other equipment used at EASD as tools for the engineers.

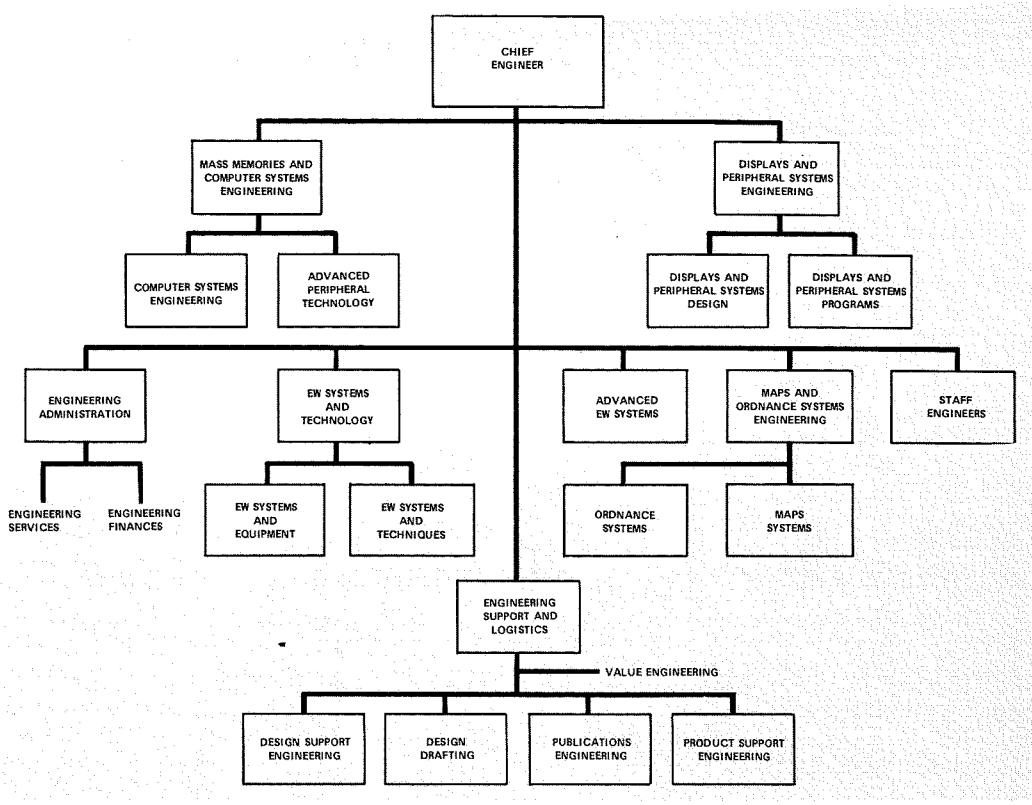

Fig. 9—Engineering organization.

Research and development

Engineering is currently investigating techniques and advanced hardware for each of EASD's product lines.

Research in electronic warfare includes:

1) Lightweight, low-volume, high-efficiency traveling-wave-tube supplies;
2) Advanced threat detection, identification, and processing;
3) Detecting low-level signals of unknown characteristics embedded in a noise environment; and
4) Reduced-size frequency memory.

Advanced hardware development for EW includes:

1) A solid-state modulator for high-power traveling-wave-tube amplifiers;
2) Electronically alterable digital PRP filter/trackers utilizing content-addressable memories; and
3) An amplitude comparison direction-finding system.

Present research in intelligence data systems includes:

1) The development of data-base management and inter-operator communication systems; and
2) Display keyboards.

Advanced hardware development for the IDS product line includes:

1) Advanced graphic display terminals;
2) Improved existing recording technology on drum and disks systems; and
3) A stand-alone, TV-oriented, alphanumeric display using cost-effective LSI logic exclusively.

Military Aviation Products and Systems are currently engaged in the definition and design of VLF navigation receiver front ends and digital phase comparators for a navigation receiver. Another program is devoted to the definition and specification of LSI processing for aircraft communication and navigation functions associated with flight management processors.

Investigations in Ordnance include:

1) Improved packaging and heat transfer techniques to survive gun environments;
2) Increased detection and sensitivity of seismic sensors; and
3) Minimized seismic sensor power requirements.

A satellite of DEP Advanced Technology Laboratories was opened at EASD in January 1970. This joint venture will perform research that is vital to EASD's growth plans.

The Future

Much of the present engineering work at EASD foreshadows several future trends. EASD Engineers will rely more on automation through computer-aided design with greater emphasis on microminiaturization to improve reliability, reduce weight and size, and ease maintainability problems. As always, the accent will be on the development of system concepts and hardware in each product line.