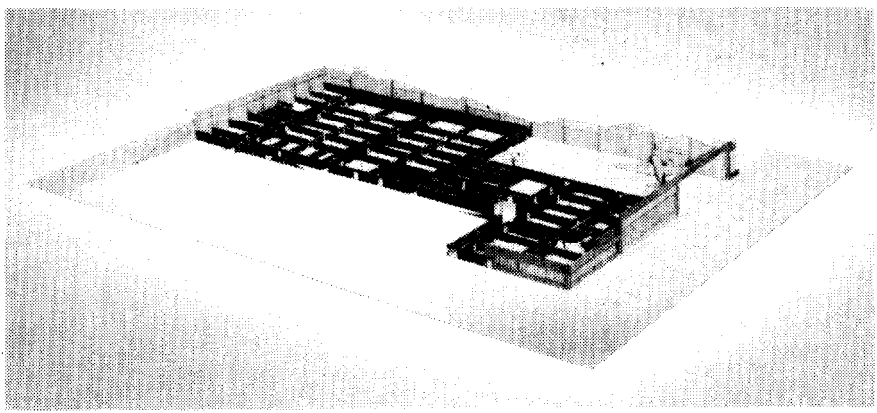
# welcome to AEEL



AERONAUTICAL ELECTRONIC AND ELECTRICAL LABORATORY
U.S. NAVAL AIR DEVELOPMENT CENTER
JOHNSVILLE, PENNSYLVANIA

## From The Director

### WELCOME ABOARD

The Aeronautical Electronic and Electrical Laboratory extends a cordial welcome.

This booklet has been prepared to present a quick picture of the Laboratory. known to us as the "AEEL." The history, mission, function, organization, program, and accomplishments have been touched upon to acquaint you with our activity.

Please feel free to ask any questions you may have about AEEL. The members of the AEEL will be happy to answer them within security regulations.

Grayson Merrill
Captain, USN

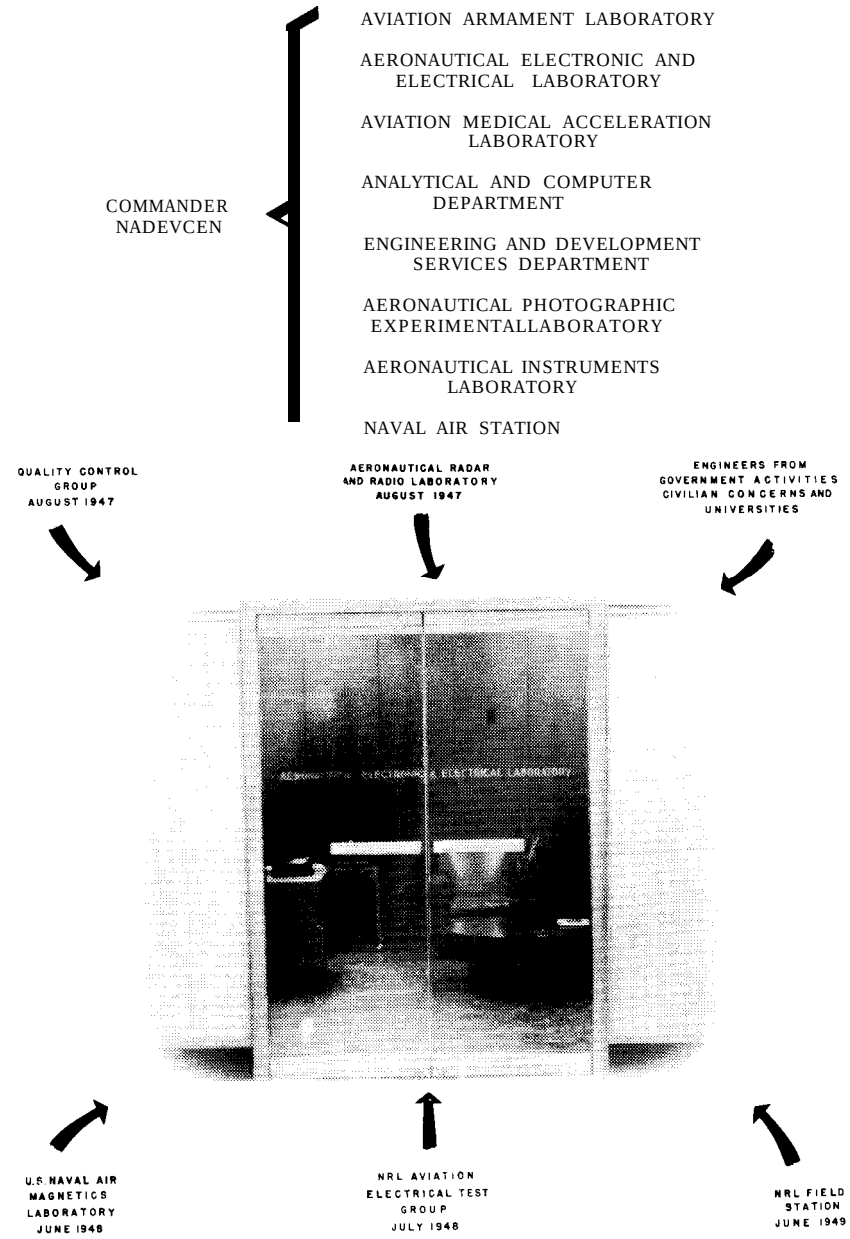
# HISTORY OF THE AEEL

The Aeronautical Electronic and Electrical Laboratory was established to fill several gaps in the U. S. Navy aeronautical electronic andelectrical program through the services of a combined pool of military and civilian talent. Such an organization was found by war experience to be an essential adjunct to industry. Its establishment served to amalgamate the personnel and functionsof several small laboratories that had mushroomed at field activities and leased properties during World War II.

The AEEL came into being by order of the Secretary of the Navy on 1 August 1947, as a unit of the U. S. Naval Air Development Center, under the military and coordination control of the Commandant Fourth Naval District and the management control of the Bureau of Aeronautics.

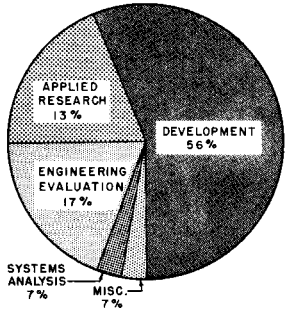
Thephysical growth of the Laboratory began in August 1947 by the transfer to Johnsville of about '75 military and civilian personnel and facilities from the Aeronautical Radio and Radar Laboratory and Quality Control Group of the U. S. Naval Air Material Center, Philadelphia. These two groups formed the nucleus around which the present laboratory has been built, partly by absorption of other activities and partly by the hiring of new personnel. Such activities and their dates of transfer to AEEL were: U.S. Naval Air Magnetic Laboratory, NAS Lakehurst, New Jersey, June 1948; Aviation Electrical Test Group, U. S. Naval Research Laboratory, Washington, D. C., July 1948; and the Naval Research Laboratory Field Station, Boston, Massachusetts, June 1949.

The expansion of the Laboratory has proceeded on a gradual but permanent basis. At present, there are over 400 Naval officers, scientists, engineers, andsupportingpersonnel on board occupying approximately 200,000 square feet of laboratory and office area.



## MISSION AND FUNCTIONS

The mission of the **AEEL** is to conduct systems analyses, applied research, development, design, modification, test, contract technical supervision, and miscellaneous supporting services as designated by the Bureau of Aeronautics to assure that Naval aviation has adequate and effective electronic and electrical systems, components, test equipment, and materials.




The functionof the Laboratory generally follows the evolution of airborne electronic and electrical systems from the realization of their need in military requirements to their actual use by the Fleet.

The first function, therefore, is the engineering analysis of proposed systems and their components to determine their design requirements, performance characteristics, and general suitability for Naval use. This includes the research and investigation into the theories applicable to new or improved systems.

Following this, the Laboratory proceeds with the development, design, and fabrication of experimental models. Included **within** this function is the correlation of data for production, service operation, and maintenance of the systems.

Engineering evaluation is a third function **which** deals with the laboratory and flight testing of experimental, **preproduction,** and finally production models. Such evaluations assure Naval aviation of the highest quality products by determining deficiencies arising during development, and recommending corrective action to meet operational specifications. In some cases, the evaluation function is extended into the investigation and correction of faults found in systems during service use.

By fulfilling these functions, the **AEEL** acts as a vital cog in the wheel of national security. As deputized by the BUAER, the Laboratory is a connecting link which translates military tactical requirements into appropriate language for industry, by providing technical supervision on the progress of airborne electronic and electrical systems from the laboratory to the fleet.

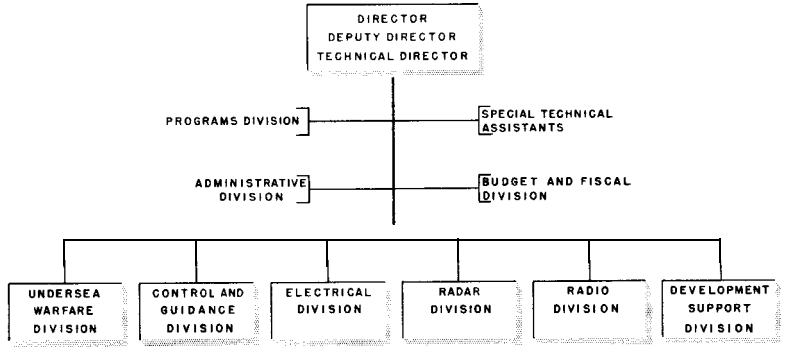


## ORGANIZATION

The Laboratory is staffed primarily by civilian scientists, engineers, and supporting personnel devoted to the development and evaluation interests of the Navy. The higher administrative and liaison positions are filled by Naval officers chosen for their engineering, operational, and management backgrounds. These officers are attached to the activity for about two years so that the turnover affords a flow of experience between the Fleet and the Laboratory.

The civilian complement is of a permanent nature, and is responsible for conducting the technical work on a continuing basis. The complement consists mainly of electronic scientists, electronic engineers, and electrical engineers, with associated mechanical, aeronautical, chemical engineers, physicists, mathematicians, **and other** professional and subprofessional personnel.

The chart given below shows the basic organization of the Laboratory. At the top level is the Director who is responsible for the over-all operation of the Laboratory. The Deputy Director and Technical Director, a Naval officer and civilian scientist respectively, act as the Director's immediate associates and advisors.



Staff assistance is supplied by a group of special technical assistants and by the Administrative, Budget and Fiscal, and Programs Divisions. The special technical assistants are specialists whose talents are utilized in advisory services for all AEEL personnel. The Administrative Division. provides the necessary correspondence control, stenographic, personnel, and messenger services. The Budget and Fiscal Division handles the financial matters of the Laboratory.

The Programs Division is the weatherman for the Laboratory. Upon its shoulders rests the duty of keeping up-to-date on the latest trends in military tactical requirements and giving operational direction to the work of the Laboratory.

Each of the six line Divisions is headed by a civilian engineer as Superintendent who provides administrative and technical supervision. The names of five of the Divisions are derived from electronic and electrical systems upon which the work of each is concentrated. The following list shows the various systems, equipments, and components falling within the realm of the indicated Division:

Undersea Warfare Division
- Sonar systems
- Sonobuoy systems
- Magnetometer systems
- Radiac systems

Control and Guidance Division
- Pilotless aircraft guidance systems
- Sonic, radar, and infrared control and detection systems
- Telemetering systems
- Aircraft stabilization systems
- Radome and irdome development
- Simulation devices for missile guidance systems

Electrica. Division
- Electrical systems
- Aircraft power supply equipments
- Electrical protection devices, controls, components
- Utilization equipment

Radar Division
- Airborne interceptor radar
- Airborne CIC systems
- IFF systems and radar beacons
- Navigation radar systems
- Airborne radar relay systems
- Early warning and ASW radar systems



Radio Division
- Communication systems
- Interference reduction and antistatic devices
- Radio navigation systems
- Countermeasures equipments
- Radio Test equipment

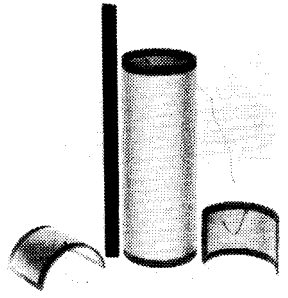
Development Support Division

The sixth Division provides technical support to the other Divisions. It provides laboratory-wide electro-mechanical design and drafting services; evaluates special components and materials which do not relate directly to anv of the other Divisions; operates physical and environmental test facilities: prepares final manuscripts and issues technical publications; fabricates experimental models of equipments and devices; procures, maintains, and calibrates all test equipment.

## ACCOMPLISHMENTS

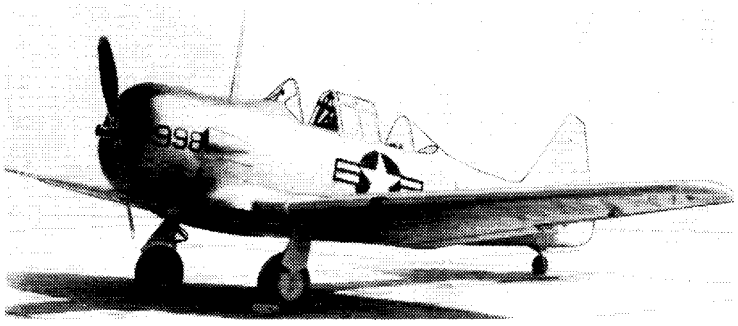
The majority of accomplishments of the AEEL fall in the classified security status and cannot be discussed in this booklet. However, typical unclassified jobs are:

Development of Ferroelectric Transducers - Under a program to exploit ferroelectric ceramics for use in airborne sonar transducers, the AEEL developed processing techniques by which barium titanite transducer elements are manufactured. The techniques produce satisfactory yields of 80 percent or greater.

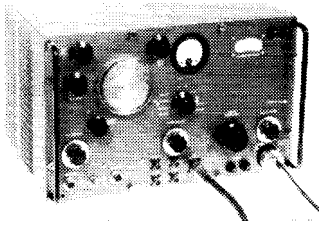


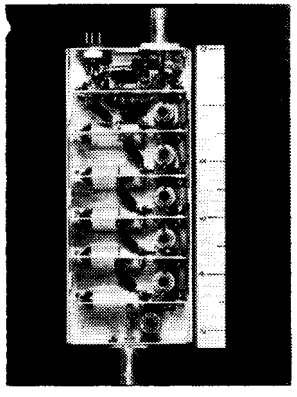
Development of Radomes - An extensive program led to the development of radomes (streamlined aircraft housings for radar antennas) for aircraft such as the Navy Model PO-1W, P2V, and R5D. These radomes are resistant to all weather-phenomena and gun blasts. yet transmit radar signals with a minimum of deflection and loss of strength. The program is being continued with the aim of developing radomes with better materials and characteristics.

Development of Modernized Electrical System for SNJ Aircraft - In order that the latest electronic equipment might be installed in the SNJ-type aircraft for training purposes. the present 12- and 28-volt d-c systems in the SNS-4, -5. and -6 aircraft were removed and replaced by a modernized 28-volt d-c system. The resulting aircraft became the SNJ-7.



Development of S-Band Signal Generator - A new signal generator was developed, featuring high stability and precision of performance. This unit produces radar-like signals for use in adjusting radar receivers in the range from 1890 to 4300 mc. Pulse-modulation of a klystron tube in a lunable, coaxial cavity produces an output signal whose amplitude is adjustable by a piston attenuator accurately calibrated in decibels.





Miniaturization and Improvement of Electronic Equipment - The never ending fight to reduce the size and weight of airborne electronic equipment has led to the development of miniaturized circuits and major assemblies by utilization of printed circuits. subminiaturized components, and potted assemblies. The effort is being continued by the Investigation of the use of transistors, different methods of making printed circuits, and the possibilities of automatic assembly techniques.



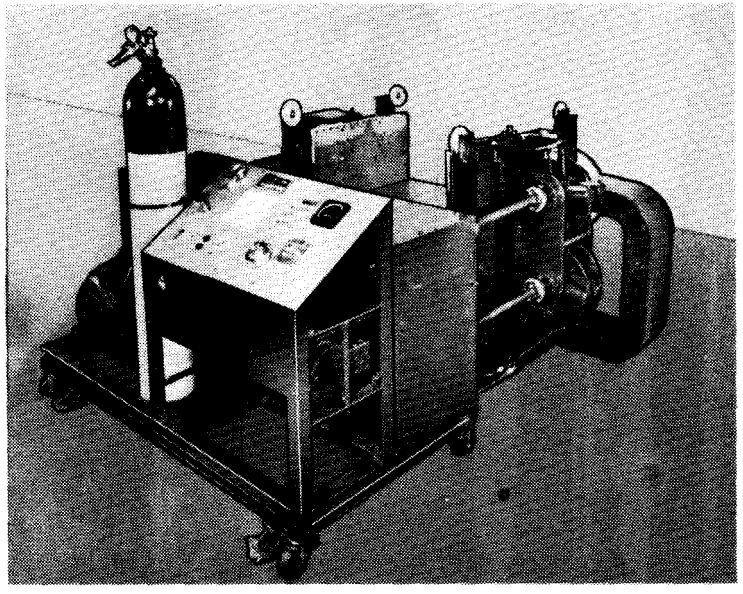
FACILITIES

A vital part of the initial plans for the AEEL were working areas and facilities which would be effective for carrying out the Laboratory's mission. These plans materialized in 1953 in the completion of a $2,600,000 laboratorv area and $2,500,000 of development and evaluation facilities, making the AEEL one of the finest electrical and electronic laboratories in the country.

The working area is partitioned into laboratory, office, and other working spaces. The latest in lighting, ventilation, flooring, intercommunication equipment, and many other facilities provide excellent working conditions.

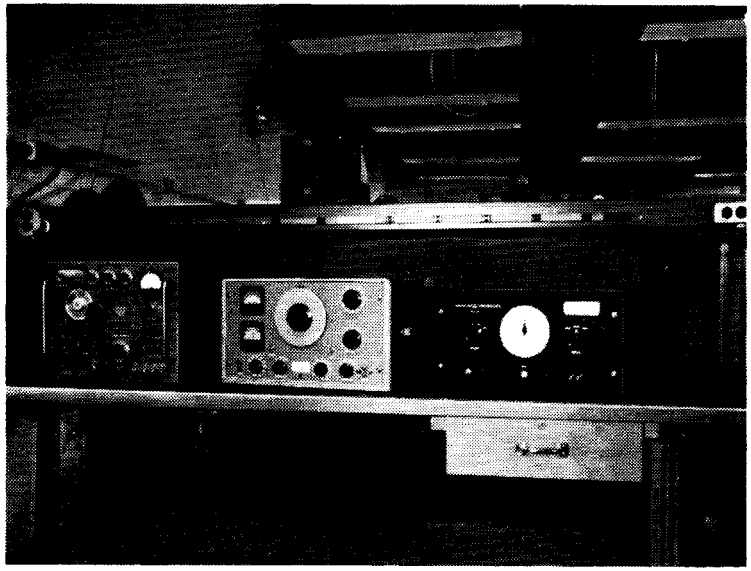
Some of the special facilities set up for development and evaluation are as follows:

1. Vibration with variable amplitude and/or frequency, and constant acceleration - This facility has a 500-lb 10-g capacity for vibrating equipment along each of the three major axes of the test specimen. Heavy equipments like the AN/ART-13 communications transmitter are subjected to simulated service vibrations on this machine.



2. Impact shock under controlled conditions - A drop-type impact shock facility is available in which the form and time duration of the shock waves are controlled. Impacts up to 60 g are possible with the use of the special test-specimen mounting table and sand pit.

3. Portable test facilities - Portable test equipments worth more than $1,000,000 are available for calibrating and checking the performance of electronic and electrical equipment.



4. Radome evaluation - A large interior area is devoted to checking the transmissivity of experimental radome materials at various angles of incidence. A test range is also set up on the roof for checking the efficiency and transmission characteristics of complete radomes.

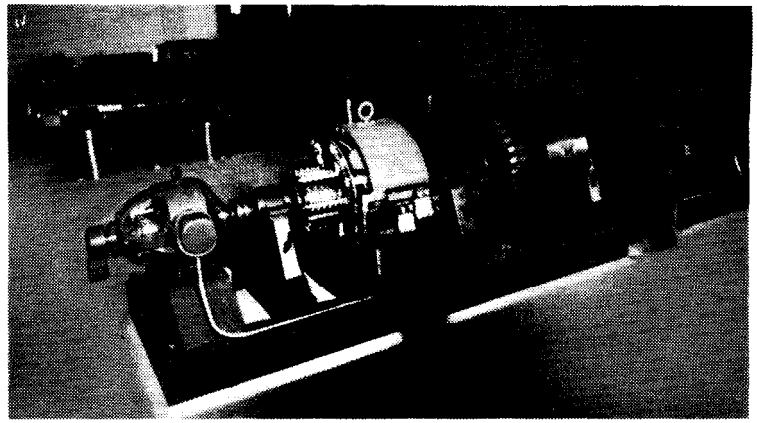
5. Meter calibration - Several large standard calibrating units are on hand for checking and calibrating all types of indicating and measuring instruments. The units are used for frequency range from 0 to 1600 cps and currents from 1 ma to 100 amperes.

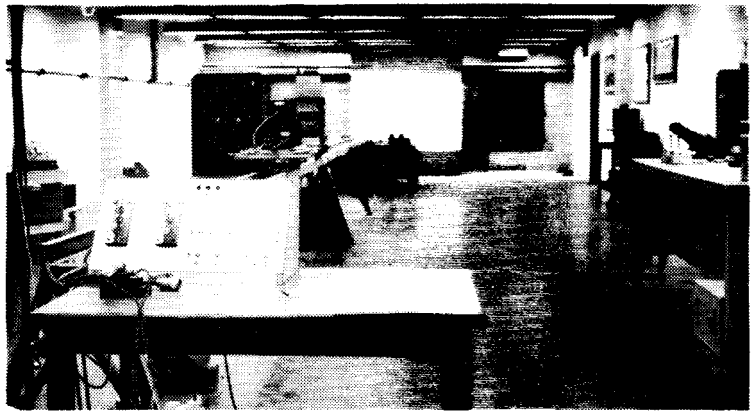
6. Evaluation of radioactivity detection equipment - A large safe-storage and test tunnel for high-intensity radioactive sources is used to test detection devices. Complete provisions exist for remote control of the sources and devices.



7. Evaluation of infrared equipment - A 100- by 15-foot light-proof room is located on the main floor for the evaluation of infrared detection and homing equipments under controlled temperature conditions. A special infrared spectrometer is available for determining infrared absorption and transmission properties of materials.

8. Central laboratory power supply - A special room is set up to provide power sources of 25.000 amperes at 30 volts dc, 120 kva at frequencies which are variable from 320 to 1000 cps, and direct current at 120 and 250 volts. These powers are available to various sections of the laboratory through a unique patch-panel system.

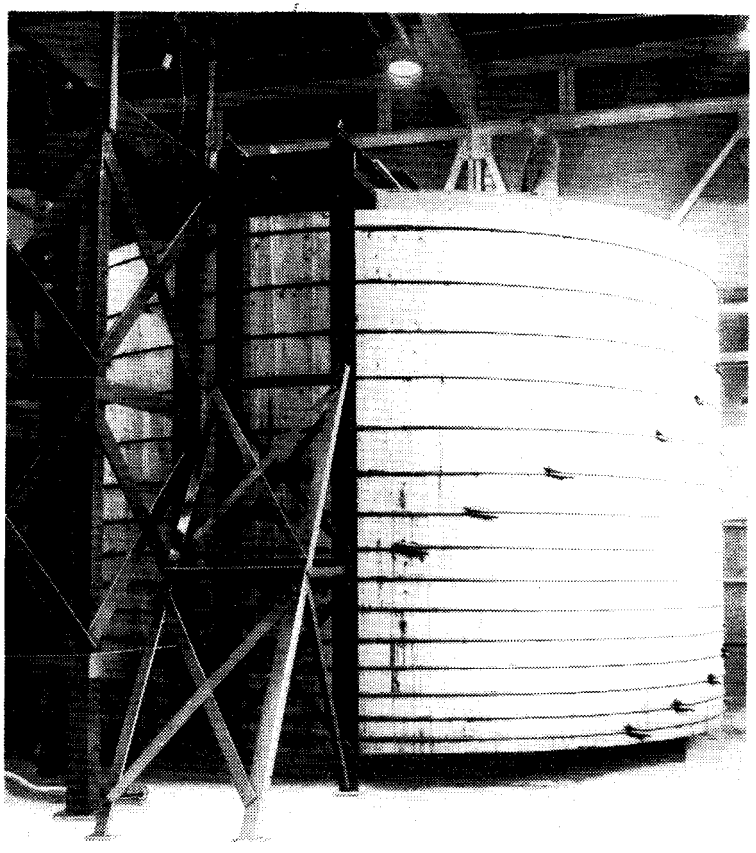




9. Screen rooms - Several screen rooms have been built in various sections of the laboratory to shield equipment from radio interference during calibration and evaluation.

10. Vibration of aircraft-engine-mounted accessories - One of the few existing machines of its kind is located at this laboratory for subjecting aircraft engine-mounting accessories to simulated aircraft engine vibrations at frequencies up to 250 cps at varving amplitudes and vibration forms.

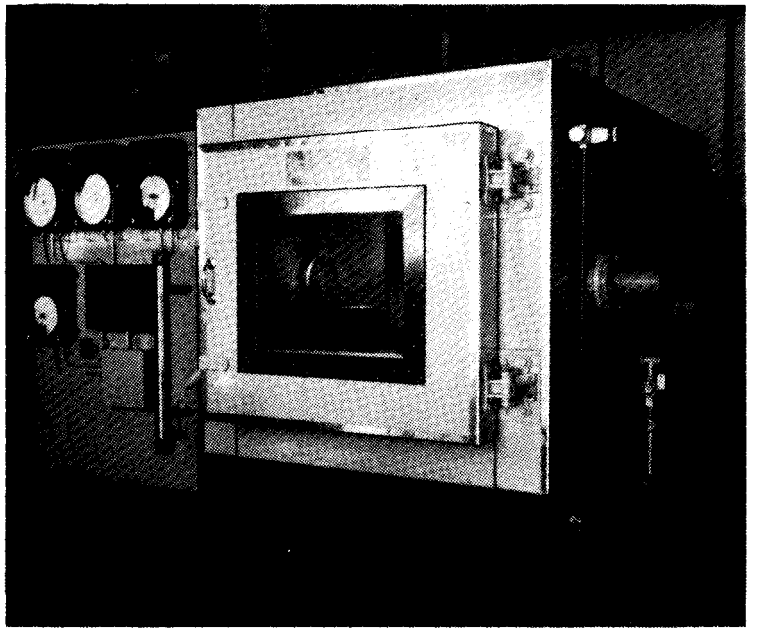
11. Evaluation of underwater sound detection equipment - A 33,000-gallon water tank is installed within the building for testing various underwater sound-ranging and detecting equipments.





12. Torsional Rotational Oscillator - A torsional rotational oscillation simulator is available for testing shaft and coupling fatigue in aircraft generators.

13. Environmental chambers - An important part of the physical test facilities consists of special chambers in which equipments and components may be evaluated under controlled environments of altitude, temperature, humidity, salt spray, sand and dust, and explosive atmospheres.



EMPLOYEE RELATIONS

The Laboratory maintains a policy of employing only well qualified personnel to fill its positions. As an aid in procuring such abilities, close relationships are maintained with universities, technical societies, and private industries throughout the country. Close coordination between the Laboratory and the Industrial Relations Department of the Center assists in efficient hiring of personnel.

It is the policy of the Laboratory to rely upon the ability, initiative, and integrity of its personnel rather than rigid administrative control and supervision. It is felt that this policy affords the individual a sense of pride and responsibility in his work, and a feeling of being a vital part of the organization. It is believed that this policy has and will continue to improve the over-a.11 effectiveness of the Laboratory and the ability of the personnel.

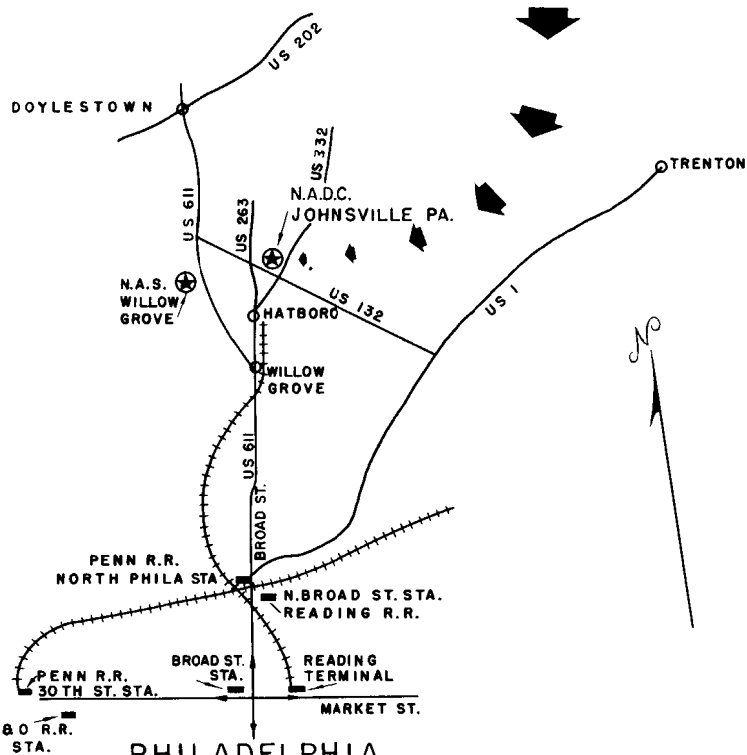
Several training programs are available to AEEL personnel. These programs are designed to increase their education and competence. Both graduate and undergraduate college courses are given at the Center through working arrangements with universities in the Philadelphia area. Management meetings and technical symposia are held regularly as a means of disseminating pertinent technical data.

Scientists and engineers are encouraged to keep abreast in their special fields through attendance at professional society meetings and through the publication of technical papers. The preparation of papers for presentation at meetings and for publication in technical journals is facilitated by management aid in sponsorship and security clearance. Technical and legal assistance is provided for Laboratory personnel in the development of inventions and the procurement of patents in their names.

Extracurriclar activities are endorsed by the AEEL to maintain high employee morale. Through the NADEVCEN Welfare Association, bowling teams, basketball teams, tennis teams, baseball teams, hunting and fishing club, savings and credit union, children's Christmas parties, and laboratory-wide dances and parties, are supported.

The employees are assisted in finding suitable housing. The immediate area abounds with small villages and cities having excellent residential sections and good transportation facilities. The nearness of Philadelphia. affords easy access to the best in shopping, recreational, and cultural activities.

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DOYLESTOWN
US 332
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JOHNSVILLE PA.
TRENTON
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WILLOW
GROVE
US 132
HATBORO
US 1
WILLOW
GROVE
US 611
BROAD ST.
PENN R.R.
NORTH PHILA STA.
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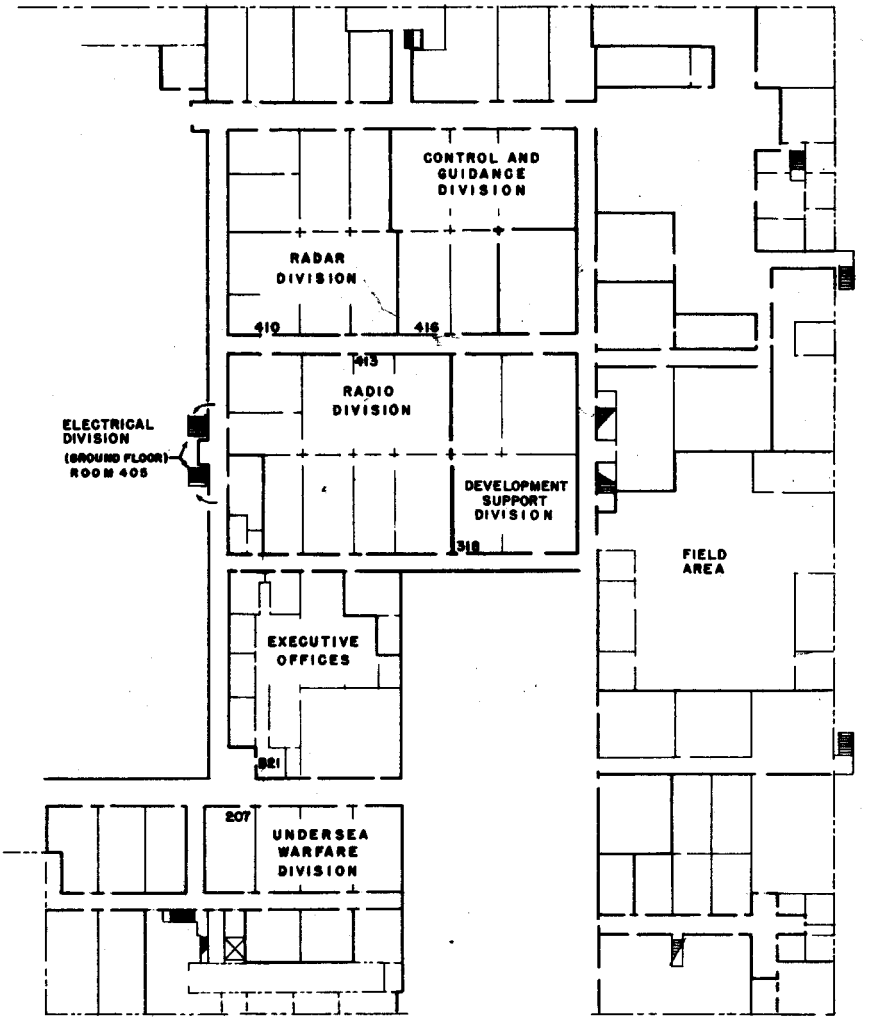


AEEL FLOOR PLAN



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