

SPACE PROJECTS OFFER GREAT CIVIL BENEFITS

Satellites Could Provide Efficient Global Communications Net

By Maj. Gen. James F. Phillips, (USAF-Ret.)

Director, Guided Missile Council
Aerospace Industries Association

The brief history of space exploration has produced a probability that has been largely obscured by national preoccupation with its military significance: peaceful application of outer space knowledge may result in greater long-range civil benefits than any other single activity ever attempted by man.

The foreseeable applications cover four fields:

- Communications
- Meteorology
- Navigation
- Geodetics

General Aviation Sees 1960 as Best Year

General aviation expects 1960 to be its biggest year both in number and value of aircraft produced, and in the number of flight hours.

The growth of general aviation, which includes all civil flying with the exception of airlines, has been spectacular, particularly in the business flying field.

In a five year period from 1954-1958, the general aircraft manufacturing industry more than doubled in number and value. Production this year will reach 7,500 units with a retail value of \$160,000,000, and the growth will continue in 1960.

The general aviation fleet in 1955 flew 8,700,000 hours, and today it is flying in excess of 12,000,000 hours. The increase in number of aircraft is equally impressive. The active general aviation fleet in 1955 numbered about 58,000 planes; the Federal Aviation Agency places the current inventory at more than 68,000.

Business flying accounts for approximately half of the total hours. Through the use of executive aircraft, a businessman today can more than double his productivity.

The use of executive aircraft isn't confined to the man with a briefcase. As an example, four bricklayers commute to a construction job in a light aircraft.



Communications satellites offer a great promise. Even today there is not a truly adequate system of transoceanic communication. For

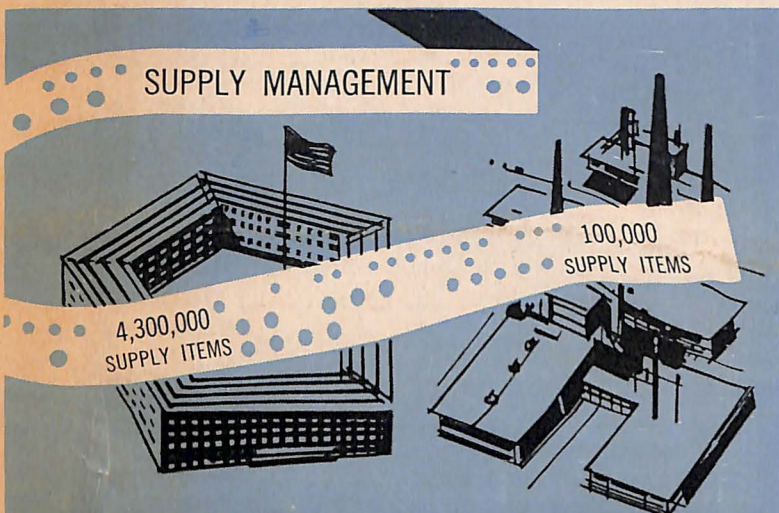
example, the present trans-Atlantic cable has a capacity of 36 voice channels, and this will be completely saturated by 1962. A new cable with several times this capacity will be inadequate to handle the 21,000,000 overseas messages predicted for 1970.

In addition, a single television channel is equivalent to about 1,000 telephone channels. Solution of the communications problem by conventional means would be impossible. The communications satellite offers the most promising approach.

Inflatable Sphere

The National Aeronautics and Space Administration has under advanced development an inflatable sphere measuring 100 feet in diameter. It is made of an aluminized plastic a quarter of a thousandth of an inch thick. The material is folded into a container approximately 30 inches in diameter, and a small amount of water is injected inside the sphere. After reaching orbital altitude the container is broken open and the water, being in a vacuum in space, boils and inflates the sphere.

(See *WEATHER*, Page 7)



The Department of Defense carries 4,300,000 different supply items in contrast with the 100,000 items carried by a large mail order house. The Aerospace Industries Association, in cooperation with the military services, has developed a plan of logistics information exchange, utilizing electronic data processing equipment, which will reduce costs and increase the efficiency of managing the huge Defense Department supply programs.

PLANES/AEROSPACE

Fast-growing Algae May Provide Solution To Food Source for Space Travelers

Eating, drinking and breathing in space are not the least of the problems that today concern scientists as they look to the time when man will make space flights.

While many are working on the vehicle and means for powering it to make manned space flight a reality, others are dealing with the complex problems of keeping man alive.

Here's why food, drink and oxygen supplies are vital to the success of the total space flight plan: several hundred pounds of expensive rocket are needed to boost one pound of payload to sufficient speed (around 25,000 miles an hour) to escape the pull of gravity.

Man needs about five pounds of water, two to three pounds of food and 340 quarts of oxygen daily. This adds up to over two tons of food and water and more than 180,000 quarts of oxygen for a relatively short 516-day round trip to Mars.

Although all sorts of products are subjects of experimentation for the "space menu," a research scientist for one aerospace manufac-

turer thinks algae offer the greatest potential. The single-celled, free-growing green algae this company is using can be found in almost any pond. Algae use light more efficiently than any other plant, can more than double their number in a day and can be harvested continuously for food rich in protein.

Loaded with chlorophyll, algae also act as purification and odor-removing devices.

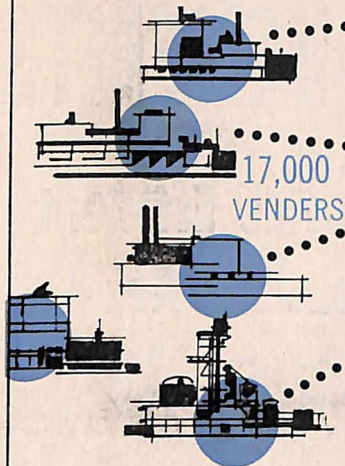
One of the problems facing scientists, though, is that while algae offer great nutritional potential for man in space, man also requires that his food be palatable. And the flavorless, green algae won't meet this requirement.

In an effort to solve this the scientist has made algae cookies by mixing the plant with commercial cookie mix. Scores who've sampled the algae cookies to date say they are good.

The scientist experimenting with algae says they also can be treated to taste like many foods such as steak, fish, coffee and tea.

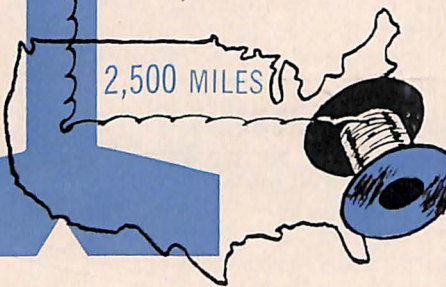
Plane Views

ABOUT 17,000 VENDORS CONTRIBUTE ELECTRICAL OR MECHANICAL PARTS TO AN IRBM (INTERMEDIATE RANGE BALLISTIC MISSILE) WEAPON PROGRAM.



17,000
VENDORS

MORE THAN 2,500 MILES OF ELECTRICAL WIRE ARE USED IN THE SUPPORT SYSTEM OF AN IRBM SQUADRON.



2,500 MILES

25,000
HOMES

PEAK OUTPUT OF THE POWER GENERATION SYSTEM FOR AN IRBM SQUADRON IS SUFFICIENT FOR A COMMUNITY OF 25,000 HOMES.

PLANES/AEROSPACE

PLANES-AEROSPACE

Planes-Aerospace is an official publication of the Aerospace Industries Association of America, Inc., the national trade association of the designers, developers and manufacturers of aircraft, missiles, spacecraft, their propulsion, navigation and guidance systems and other aeronautical systems and their components.

The purpose of *Planes-Aerospace* is to:

Foster public understanding of the role of the aerospace industry in insuring our national security through development and production of advanced weapon systems for our military services and allies;

Foster public understanding of commercial and general aviation as prime factors in domestic and international travel and trade.

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Cost-Cutting Standards

The aerospace industry is the nation's largest publisher: its volume of technical manuals exceeds the combined output of the nation's commercial book publishing houses. But none of them ever reach the "best seller" list, and bookstores do not carry a single volume for sale.

The manuals are furnished to the aerospace industry's customers, principally the military services, and describe the operation, maintenance, overhaul and repair techniques for the aircraft, missiles and supporting equipment the industry develops and manufactures.

The amount of money involved in manuals production is huge. The Air Force alone spends \$250,000,000 a year for technical manuals. The initial cost of manuals for a recent airplane is \$500,000, and the total cost over a four-year production run of the weapon is about \$7,000,000.

An idea of the magnitude of the printing task can be obtained from the fact that the manuals required for a typical aircraft program would make a stack six and a half times as high as the Empire State Building.

And the number of manuals required is increasing due to the greater complexity of modern weapon systems. This means still higher costs.

The Service Publications Committee of the Aerospace Industries Association is spearheading a drive to overcome these increasing costs and improve the publications through a program of manual standardization. A plan to accomplish these goals has been presented by AIA and approved by the Department of Defense.

Technical manual specialists from eighty-three companies and divisions of the aerospace industry have been working for more than a year on the standardization plan.

Basically, the plan establishes a Technical Manual Standardization Committee in the Department of Defense which will work through task forces assigned to specific problem areas—cataloging, maintenance, operations, overhaul and repair. Military and industry manual specialists will be assigned to the task forces to work out the details of reducing the number of specifications.

There is no question that weapon complexity will require more manuals regarding their operation and maintenance. But there are other controllable factors involved.

For example, within the services there are numerous commands, widely separated geographically, that have a part in the procurement, production, inspection and distribution of manuals. This has created a situation where industry must comply with hundreds of basic and subordinate specifications in manual preparation to meet contract requirements.

Format requirements—the general size, shape and make-up of a manual—vary greatly. Today there are twenty basic specifications covering requirements for size of page, type of illustrations and grade of paper in existence. And there are hundreds of directives and bulletins that call for variations from these so-called basic specifications.

It is encouraging news for taxpayers that this purposeful program of manual standardization has been approved by the Department of Defense with AIA's Service Publications Committee providing a central, organized point for the project's accomplishment.

Aerospace Quote

"The astuteness, integrity and managerial skills of industry leaders will determine how soon new systems are brought into the operational inventory. They will also have a direct bearing on the size of the defense bill the taxpayers will have to pay.

"Designers, engineers, and production people, on the other hand, virtually have it in their hands to set the pace of our technological progress. In the final analysis, they are the ones who will determine our success in maintaining the degree of superiority which our aerospace weapons and weapon systems currently possess.

"With ingenuity and vigorous productivity from industry . . . I am confident that we can fulfill this aim."

—Hon. David S. Smith, Assistant Secretary of the Air Force.

New Aerospace Books Listed by USAF

Here are some of the latest volumes on aerospace and related programs published in cooperation with the USAF Book Program.

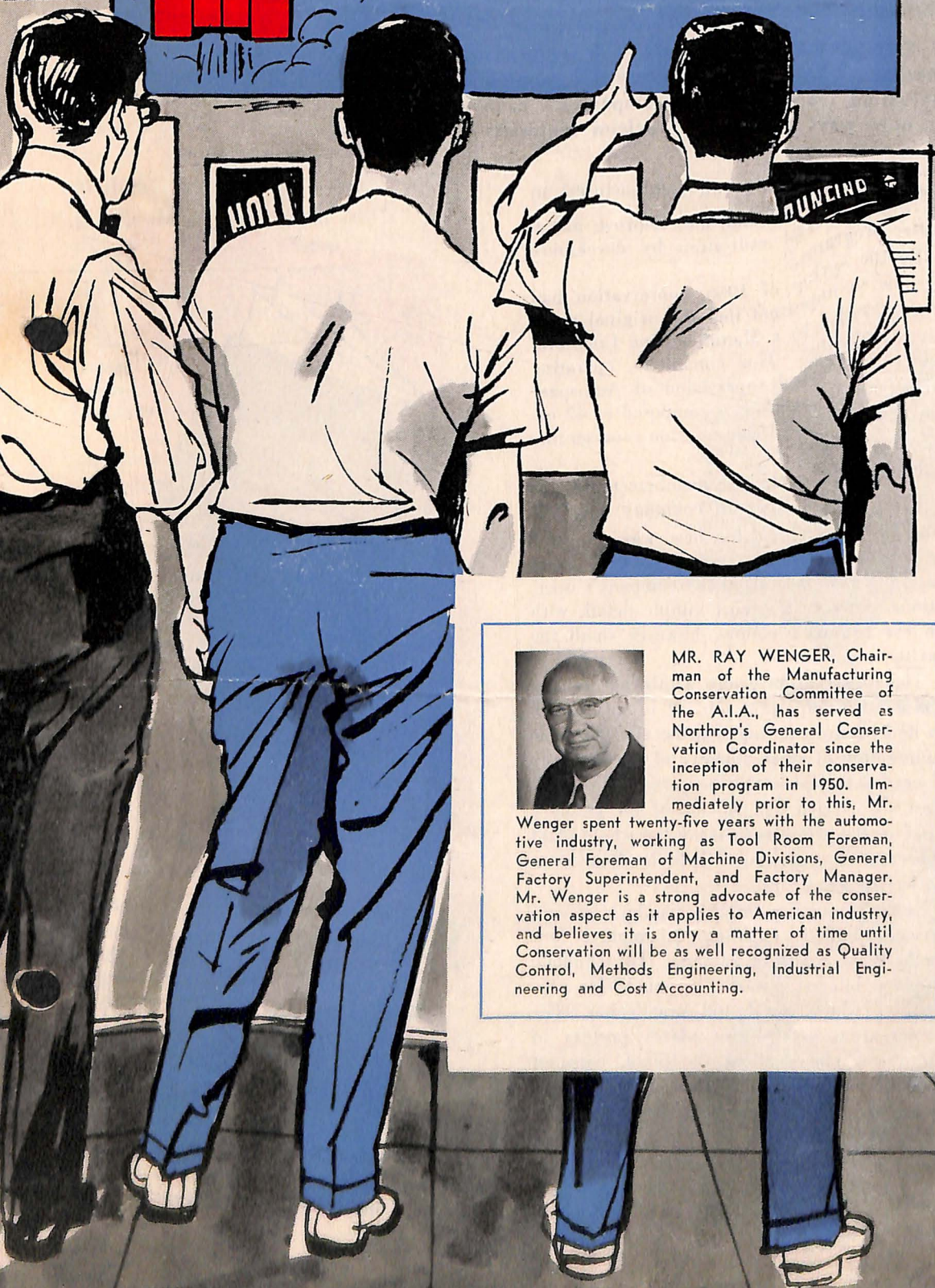
FLIGHT FROM ASHIYA, Elliott Arnold (Knopf, \$3.95). A major novel about the USAF Air Rescue Service mission and operations in the Far East. Story is centered around an ARS unit at Ashiya Air Force Base and features dramatic air rescue of Japanese civilians whose ship was sunk by a typhoon in the China Sea.

THE EXPLORATION OF SPACE, Arthur C. Clarke (Harper, \$4.50). Revised, updated edition of a major classic, with latest information on the Sputniks, Explorers, and the Air Force's missile and space vehicles.

THE STORY OF THE U. S. AIR FORCE, Robert Loomis (Random House, \$1.95), with foreword by General Curtis E. LeMay, USAF. A well written and interesting history of the USAF written in terms of the record, the heroes and the leaders who pioneered the conquest of the air and space.



*Waste is not
for our birds!*



COUNTING DOWN COSTS

By Ray Wenger

Chairman, Manufacturing Conservation Committee
Aerospace Industries Association



MR. RAY WENGER, Chairman of the Manufacturing Conservation Committee of the A.I.A., has served as Northrop's General Conservation Coordinator since the inception of their conservation program in 1950. Immediately prior to this, Mr.

Wenger spent twenty-five years with the automotive industry, working as Tool Room Foreman, General Foreman of Machine Divisions, General Factory Superintendent, and Factory Manager. Mr. Wenger is a strong advocate of the conservation aspect as it applies to American industry, and believes it is only a matter of time until Conservation will be as well recognized as Quality Control, Methods Engineering, Industrial Engineering and Cost Accounting.

THE Government's conservation programs, in which the nation's natural wealth—its forests, soil and minerals—are conserved for future generations, are familiar to the American public.

Not so familiar, in fact practically unknown, is another type of conservation program undertaken by the aerospace industry, one designed to reap more immediate benefits and one of considerable importance to national defense.

Under this program, the member companies of the aerospace industry have joined forces in an energetic war on waste in the manufacture of aircraft, missiles and spacecraft. It is important to the defense effort because it is another method of reducing the cost of the



MANUFACTURING CONSERVATION COMMITTEE meets to exchange ideas on cost reduction methods. The AIA Committee is composed of 42 experts in the field of conservation representing 32 companies. Each member constantly searches for new ways to save or reclaim materials and services.

end product, and cost reduction is rapidly becoming as important a factor in defense production as the quality of the product. Modern aerospace equipment is becoming ever more complex, of necessity because of the continuing need to match or better foreign technological progress. With each degree of complexity comes an attendant rise in costs, yet the dictates of the national economy impose a limit on the amount of money which can be spent for defense. It is obvious that, to maintain strength in numbers as well as technical excellence, every effort must be made to reduce the unit cost of defense equipment.

The aerospace industry, extremely cost-conscious, has for several years pursued a campaign of cost reduction on several fronts. The unheralded conservation program is one such front. It deals largely with minutiae, tiny savings here and there on such trivial items as memo paper and flashlight batteries, on the unchallengable theory that a penny saved often enough becomes a million dollars. With the vast amount of material and services being poured into aerospace production, there are infinite possibilities for saving pennies, and these pennies have been translated in many millions of dollars of savings.

The conservation program is industry wide, and it is unique in that respect, because while Macy's most certainly does not tell Gimbel's how to reduce costs, the members of the aerospace industry team are eager to share their individual triumphs in the battle against waste with their competitors.

The industry conservation program got under way on an organized basis in the spring of 1950, when the Manufacturing Methods Committee of the Aircraft Industries Association (now Aerospace Industries Association) established a Conservation Panel, the stated objective of which was "to exchange infor-

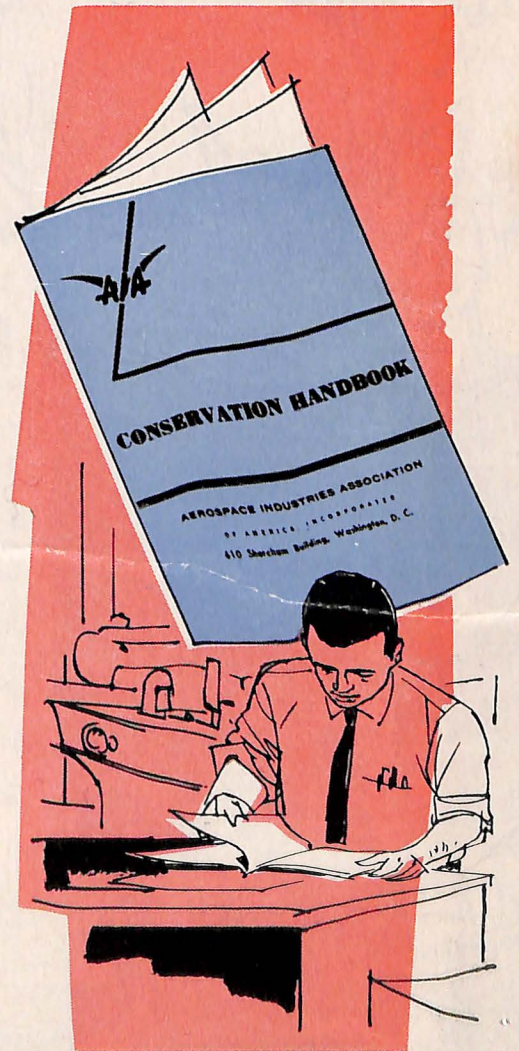
mation among the aircraft manufacturers in the field of conservation and improve industry-wide material utilization by developing better programs."

By the spring of 1956, conservation had become so important that the original panel was expanded to a Manufacturing Conservation Committee. This committee, operating under the general supervision of Aerospace Industries Association, is composed of 42 experts in the field of conservation representing 32 companies.

Each of the committee members represents a group within his own company which is constantly searching for new ways to save or reclaim materials or services. This group carefully examines all of the company's operations, down to the most minute detail, with an eye toward economy, however small the saving might be.

The conservation group within a company has another important job. It is not enough to find out how savings can be effected. The cooperation of every employe of the company is needed to insure that conservation procedures are carried out, so one of the primary tasks of the group is to make the whole plant conservation conscious. This is done in a variety of ways.

Some companies publish regularly a conservation bulletin, explaining to employes new methods of realizing savings. To stimulate employe interest, awards are made for suggestions which are found practicable. The conservation group also places posters in prominent places about the plant, constant reminders of the need to save. A typical one: "You are two persons—a producer and a buyer of what you produce. If you conserve, your defense dollar will buy greater air power, more national security." Similar slogans are printed on pay checks, paper cups, etc., and



AIA HANDBOOK contains the accumulated knowledge of the experts in the aerospace industry on conservation.

booklets and manuals containing more detailed suggestions relative to conservation are published. News and feature stories are published in plant newspapers, "horrible examples" of waste are prominently displayed, congratulatory letters and certificates of appreciation are presented for some accomplishment in conservation, and a variety of other methods employed to get home the message to the employe. These techniques have met with considerable success in making the labor force more "conservation conscious."

It is, of course, up to the conservation group to provide direction as to *how* savings can be effected. This is a year-round process in which the conservation team delves into every phase of the company's operations in microscopic detail. The use of brooms, for instance, might seem a subject of infinitesimal importance for examination, but one company found that it could save \$25 a week by using spring handle type brooms in place of the conventional type with wooden threaded handles. Original cost is approximately the same, but breakage is reduced.

The \$25 savings might, in turn, seem insignificant in an industry whose gross sales run into many billions. But remember that this is only one of hundreds of items within that one company where small savings are constantly being realized. Total all of them and the *annual* savings runs into a considerable sum. Multiply this sum by the number of plants engaged in aerospace production and the gross result is a very significant reduction in the overall cost of defense weaponry.

The members of the AIA Manufacturing Conservation Committee hold three major meetings a year to exchange information. This is done by means of "handouts," printed or mimeographed bulletins in which each committee member describes the new conservation techniques his company has uncovered since the previous meeting, to be adopted by the other companies if practicable. Very frequently one member company finds savings possibilities that have escaped the others.

Prior to each meeting, members submit questionnaires to the committee staff regarding possible areas of conservation that the individual company may not have touched, but which might have been explored by other companies. The questions are combined and submitted to all members of the committee, then the replies are summarized and sent back to each member. *In practice, it has been found that a committee member finds 10% of the questionable areas profitable ones for further investigation.*

One of the most important achievements of the committee was the publication of the Conservation Handbook, a resume of the conservation suggestions and experiences of a great many individuals and companies in the aerospace industry. This book was first published in 1953 and revised in 1958. It contains the accumulated knowledge of the industry in the field of conservation, from the broad outline of program organization to specific detail regarding all the methods found to date to cut costs. The handbook is distributed throughout the industry and to the military services,

and it is available to any company which might be interested. (The handbook, published by Aerospace Industries Association, is printed and distributed by National Standards Association, 616 Washington Loan and Trust Building, Washington 4, D. C., and is available at the nominal price of \$3.00 per copy).

The industry conservation program takes two forms. First, there is preventive conservation, based on the concept that the best way to avoid waste is to keep it from occurring in the first place. This involves a program of education and training to instill in the minds of all employes the necessity of combating waste. Coupled with the education program are methods of establishing automatic means of preventing waste; for instance, an automatic shut-off valve on faucets to prevent waste of water.

The second conservation area is reclamation which involves 1) the screening of materials to determine which may be utilized, sold as scrap, or dumped as worthless, and 2) determining the best methods of utilizing those materials withheld from disposal.

To understand fully the scope of the conservation program, consider some specific examples:

- Containers, such as barrels, are returnable to the vendor if they are in good condi-

tion and each barrel carries a \$6.00 deposit. Industry was losing considerable money because personnel would fill the barrels with waste liquids which contaminated them and made them unacceptable for return. Simple programs, such as stenciling the value of the barrel on its side or pasting on a sticker resembling a dollar bill, coupled with educational bulletins, brought cooperation from employes, resulting in savings of several thousand dollars a month to a single company.

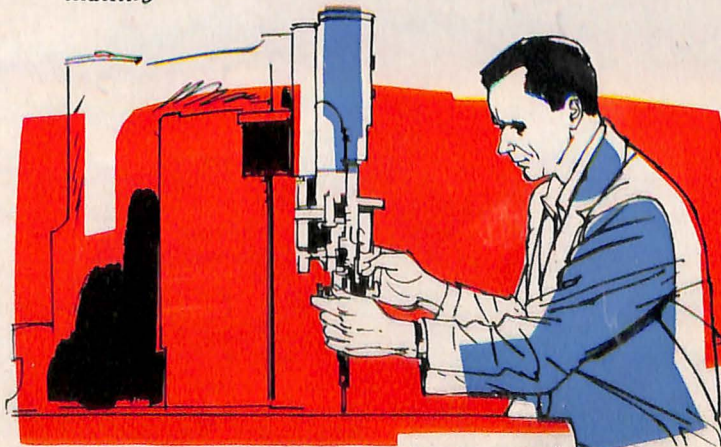
- Substitution of a traveling spray booth instead of a stationary spray booth for certain manufacturing operations brought about savings in electricity, fuel, space and initial cost of the spray booth, amounting to a very substantial \$164,000 reduction in a single year.

- Sometimes it is found that spending more money initially will result in substantial end savings. For example, for trimming certain structural glass parts, former practice was to use a relatively inexpensive carbide cutter, the average life of which was only 200 linear cutting feet. It was found that the more expensive diamond cutters had a life of 26,000 linear feet. Thus, by spending a little over twice the cost for the original cutter, industry was able to get 130 times the use from each cutter, a substantial saving.

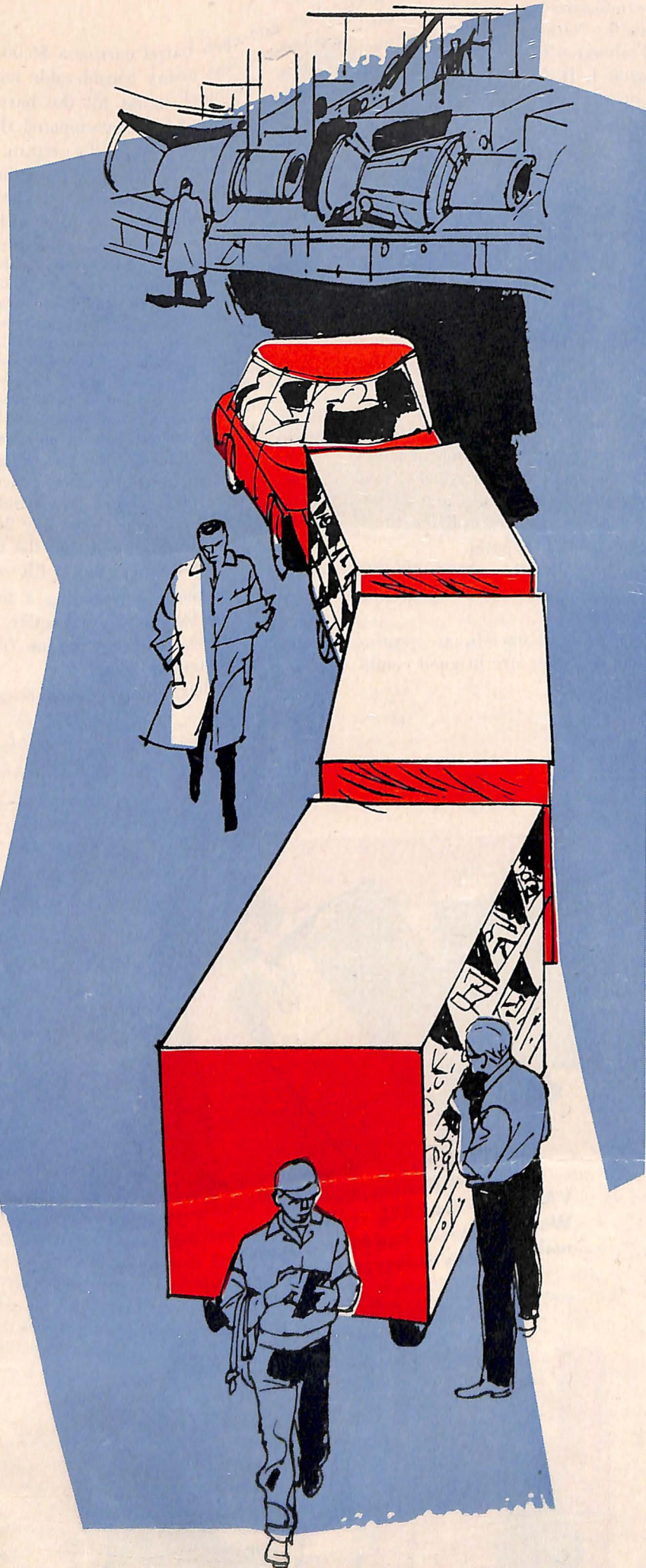
- Standardization on six spool sizes of type-



VALUE OF BARREL is illustrated for employes. Waste materials had been disposed of in barrels, making them unacceptable for return.



DIAMOND CUTTERS were substituted for less expensive carbide cutters, but the diamond gives 130 times as much service for only twice the cost.



MOBILE UNIT distributes hardware items to workers on the assembly line. Distribution formerly required the services of 14 employees in one company. Annual savings is \$60,000.

writer ribbons eliminated 19 various ribbon types formerly in use and resulted in savings on purchasing, record-keeping and deterioration.

- An engine company found that a reinforced plastic cover, used to seal off the rear portion of an engine for shipping, could be used effectively instead of the formerly-used welded steel cover. It is estimated that this will result in a saving of \$145,000 a year.

- Distribution of hardware items to factory stock bins by hand required the services of 14 employees in one company. Use of a mobile unit, consisting of a power driven cab and three or more trailer carts on which are mounted cabinets containing several hundred standard type file bins brought an annual saving of \$60,000.

- One company found considerable damage to its supply of aluminum sheet, resulting largely from the fact that the sheet crates were stacked one on top of the other to a height of eight feet. To counteract this condition, the company stored its sheet on "A frames" in a long aisle, permitting easy transfer to a fork lift truck for removal to the manufacturing area. In addition to reducing damage to the aluminum sheet, labor costs were reduced 33% because of simplified handling.

- Investigation of such a minor item as flashlight batteries produced a saving for one company. It was found that procurement of batteries was on a markedly rising trend, because new processes required light for longer periods than had previously been necessary. By changing the type of bulb used in the flashlights for a better but slightly more expensive one, the company realized a decline in battery procurement of 50% within six months, another example of how net savings can be effected by slightly higher initial expense.

- One company found that, where one of its shops was buying about \$75 worth of copper wire a month, another shop in the same plant was scrapping wire of the same size, a simple example of reclamation.

- A number of companies, particularly those in water-shortage areas, have conducted extensive investigations of all the manufacturing operations involving the use of water and devised a great many ways of cutting down on its use. One company realized water savings of almost 900,000 gallons *per week*, a substantial monetary saving to the company as well as a direct benefit to the water-short area in which the plant is located.

These are but a few of thousands of conservation items discovered by industry experts in the continuing war on waste. Few of them are spectacular; for the most part they involve trivial items, but the mass of savings effected by concentrating on such trivia is contributing many millions of dollars of savings annually to the defense program. The energy with which the aerospace industry's conservation experts pursue this program is but one more evidence of the industry's determination to cut costs of defense production to the greatest extent possible and to make the most of every dollar expended for security.

Weather Satellite Would Locate Storms from Above Atmosphere

(Continued from Page 1)

The sphere, known as a passive communications satellite, reflects radio waves from the Earth back to another distant station on Earth which receives them. However, transmission and reception of the signal requires extremely powerful stations on the ground.

Another planned communications satellite—the active repeater—will contain electronic equipment such as a receiver, transmitter, antenna and a power source. A signal transmitted from Earth would be received and immediately transmitted to Earth on another frequency. Present plans call for these satellites to orbit at a 22,300-mile altitude which means their position remains fixed with respect to a point on the Earth's surface.

Signal Bounces

If three of these satellites were placed in 24-hour orbits, complete coverage, except for the polar regions, could be obtained. A signal could be sent around the Earth in "bounces" either from Earth to satellite to satellite to Earth or from Earth to satellite to Earth to satellite to Earth.

It is expected that satellites of this type will be available in about 5 or 6 years. Satellites of this type would weigh from 800 to 3,000 pounds and require rocket power systems of extremely high thrust that are not now available.

Meteorological satellites for the first time offer to man platforms that permit observations from above the atmosphere. Heretofore, practically all of our knowledge of weather has been based on observations made from the ground.

A weather network has been developed over the years that covers most of the populated areas, ships at sea, and, recently, some of the polar area. But because of the size of the ocean, deserts and polar area only about a fifth of the atmospheric mass is accurately and regularly observed. Storms can exist in many parts of the world without being seen by an observer.

Probing Cloud Cover

A satellite or several satellites equipped with television, photo-cells, film cameras, infra-red detectors and radar will enable weather experts to know a great deal more about cloud distribution over the earth.

There is a great advantage to forecasters in being able to see an integrated picture of the cloud cover over a large area rather than trying to re-construct it from a

large number of independent observations. Five years ago a rocket launched from a base in New Mexico made pictures during its flight that later revealed a whirlpool-like cloud formation—the "fingerprint" of a hurricane. The U. S. Weather Bureau re-checked its maps and did not find a hurricane reported on the surface for that day. This led the experts to believe that a hurricane existed unobserved above the surface, which produced winds on the ground of only 35 miles per hour, but caused unexpected heavy, flooding rains as far north as Chicago. This pointed up the utilization of satellites to forecast weather.

Taped Signals

Vanguard II produced more than a quarter of a million feet of taped signals on cloud cover. This was the first step in the development of a global weather forecasting system.

An advanced meteorological satellite system may use six to eight satellites in polar orbits ranging from 500 to 1,000 miles high as well as several other satellites in 22,300-mile orbits around the equator. The high altitude satellites will permit a steady observation of selected areas having unusual weather conditions.

Another problem that has long puzzled the scientific community is whether Earth as a whole is becoming warmer—i.e., does it receive more energy from the Sun than it is giving back to space. The weather satellite could measure these radiation streams.

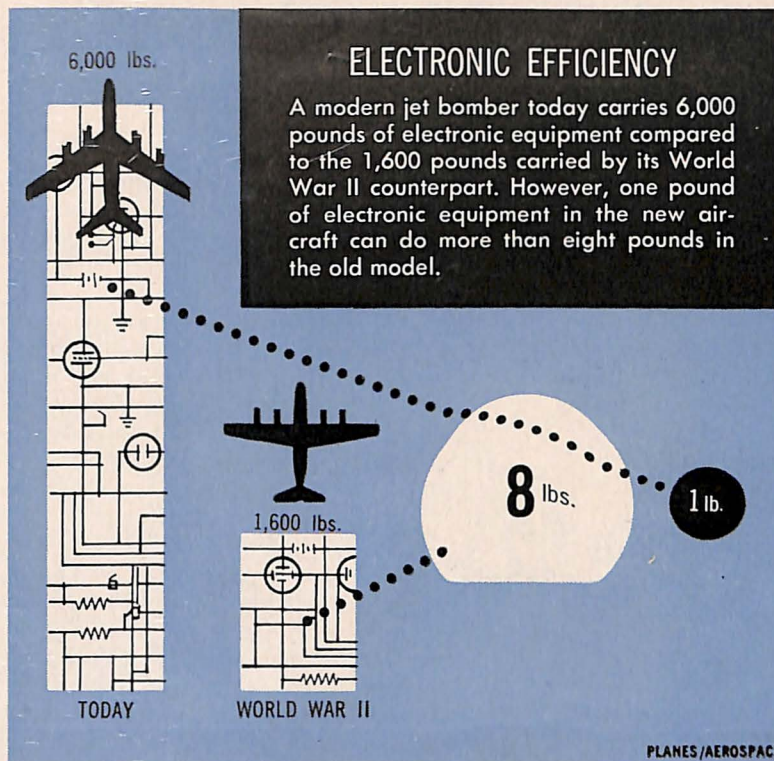
Finally, meteorologists hope that this vastly improved understanding of the atmosphere may open the door to some system of weather control.

Navigational satellites whose orbits are precisely known could provide precise location fixes for aircraft and ships. A ship or airplane could receive signals transmitted by the satellite and make measurements which would determine the position of the ship or airplane with respect to the satellite. Since the position of the satellite is known and stable, this gives the position of the moving vehicle.

Accurate Fix

The fix should be accurate to less than a mile, and available in any weather. Space scientists say that this system of navigational satellites will supersede most of the other navigational aids known today.

Geodetic satellites for the first time should make available accurate information on the precise



Zonta to Award Grants to Women for Advanced Studies in Aeronautical Engineering

Zonta International is offering its 22nd annual Amelia Earhart Scholarship grants to women who qualify for advanced study in aeronautical engineering and to whom a grant of \$2,500 would be a major factor in pursuing graduate work.

The scholarship awards were es-

shape of the Earth and the gravitational variations.

The Vanguard I furnished the first reliable information on the pear-shape outline of the Earth. A geodetic net could be established which would view optically these satellites and establish an observer's position on Earth with an accuracy of possibly 60 to 100 feet. The importance of this is underlined by the fact that a Pacific Island was recently found to be mapped 100 miles away from its true location.

Wide Utilization

Further, the equipment developed for these programs will have wide utilization. The miniaturization of parts, necessary to reduce size and weight of the satellites, can be used in many household appliances. The high-temperature and high-strength alloys will have numerous industrial uses, and data processing systems can be adapted for commercial purposes.

These are only the obvious civil fruits available from an energetic space program. If the history of any of man's projects holds true, additional benefits, far outstripping those visible today, will result from space exploration.

tablished by this service organization of business and professional women executives as a memorial to the world-famous air pioneer.

Funds for the annual grants are provided by contributions from Zonta's member clubs which now number 415 in 16 countries. The awards represent an international service project of the organization whose clubs are additionally dedicated to service projects benefiting their local communities.

A bachelor's degree in a science qualifying a candidate for graduate work in aeronautical engineering or space physics, in a college of her choice and approved by Zonta's special scholarship committee, is the basic requirement, plus evidence of exceptional ability and personal character.

There are no geographical bars; awardees to date include students whose initial degrees in engineering, mathematics or physics were earned in various European countries or in Egypt or Formosa, although the majority have used Zonta's grants in U. S. graduate schools.

Candidates, or instructors wishing to recommend students, can obtain further information about the Amelia Earhart scholarship grants from Zonta's headquarters office, 59 East Van Buren Street, Chicago 5, Illinois, or direct from the chairman of Zonta's Amelia Earhart scholarship committee: Dr. Helen Pearce, 490 Oak Street, S.E., Salem, Oregon. Deadline for filing applications is March 1, 1960.

'Spark Bomb' Offers Inexpensive Means of Forming Metal

A "spark bomb" technique developed by an aerospace company is pointing the way to a new and inexpensive method of forming the high strength metals used in advanced weapon systems.

The "underwater lightning" stores up electrical energy and then within 40 millionths of a second releases it with a force of 6,000 horsepower. Some of the new metals used today and being readied for future use in the aero-

space industry have practically no stretchability, and require complicated hydraulic equipment of tremendous force to shape them to the tolerances and smoothness required.

The device operates on the same principle as lightning, complete with flash and thunderclap. Electric power is fed into a battery of capacitors. Wires from the plus and minus terminals of the capacitors are attached to two electrodes immersed in water.

When the switch is released an explosion occurs, and the resulting spark travels through the water at extremely high velocity, creating a shock wave. The shock wave does the actual forming of the metal.

The present release time of 40 millionths of a second can be speeded, engineers believe, which will create even greater horsepower.

The aerospace company is working to develop the device into a standard machine tool. "It is very possible," says the firm's director of Manufacturing Research, "that such a tool, costing about \$50,000, will replace the conventional hydraulic presses that run about half a million dollars apiece. Besides, this device would take up just a fraction of the floor space needed for the giant presses."

Space Pilots May Use Seat-within-a-Suit

One aerospace manufacturer reports the space age may put it into the clothing business.

It has designed a seat-within-a-suit in which tomorrow's space pilot may hang suspended in the cabin of his space vehicle.

The nylon-net suit resembles long-handled underwear with steel cables sewn into the seams.

It works like a hammock, eliminates the need for a pilot's seat, permits the pilot to operate controls of a space ship without tumbling around the cabin in gravity-free situations. It also would protect his body from effects of extreme acceleration during takeoff.

Among requirements which the suit meets for protecting a pilot as he is boosted into or travels through space are: complete head and body restraint in all flight positions when necessary; high acceleration protection; light weight; simplicity; comfort; mobility when necessary; vibration protection, and quick hookup and release.

'Snake' Batteries Power Underwater Cables

Flexible, snake-like batteries that are activated when immersed in water have been developed by an aerospace industry company for use in powering submarine communications cable repeaters.

The batteries, placed next to each transistorized repeater, are spliced into communications cables every mile to boost voice or teletypewriter signals. Their snake-like construction enables them to be wound on drums with the repeater units and military communications cable. Five-eighths of an inch in diameter and 30 inches long, they deliver a required five milliamperes continuously at one volt for one year.

They also can be built to any size, with a delivery rate of more than 40 watt-hours per pound.

Self-discharge (corrosion) of the batteries in sea water is negligible and they have an infinite shelf life and activated stand life.

Honeycomb Structures Resist Rocket Heat

Rocket-powered missiles and aircraft in flight send off exhausts ranging in temperature from 4000 to 7000 degrees Fahrenheit. Controlling these very hot gases is one of the problems facing space vehicle builders.

One aerospace company thinks it may have part of the answer.

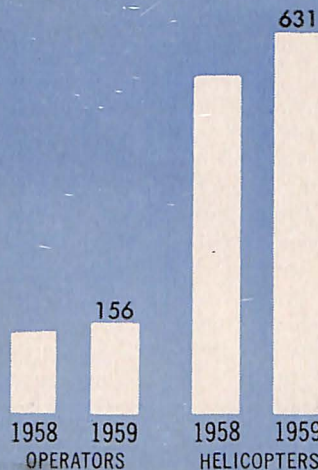
In its research laboratories, it has developed a structure combining super-alloy honeycomb sandwich with a refractory ceramic filler.

Assemblies made of this material combination are being fabricated for evaluation as rocket jet deflectors and for components in rocket nozzle throat and cone areas.

The honeycomb sandwich is filled with zirconia, an extremely high temperature ceramic, and is made of a cobalt base super-alloy. It will withstand temperatures up to 2100 degrees F. The zirconia filler material has a melting point of about 4500 degrees F.

HELICOPTERS

Tool for Industry



There are 156 commercial helicopter operators in the U. S. today using 631 'copters, an increase of 10 per cent in operators and 11 per cent in helicopters since 1958. The helicopter performs a wide variety of functions, giving industry one of its most valuable and versatile tools.

PLANES/AEROSPACE

Paddle-Wheel Engine May Provide Power For Earth Satellites

A space age version of the external combustion engine that once turned packet-boat paddle wheels on the Mississippi River soon may provide electrical energy for earth satellites.

Such a plant—which utilizes solar, nuclear or chemical energy as fuel and can operate unattended for two years or more—now is under development.

A laboratory model of the proposed satellite power plant already has been operated successfully on solar radiant energy. Smaller than a desk telephone, the laboratory engine produces sufficient power through an alternating current generator to operate a small radio. This Stirling-cycle engine under development is capable of producing one and one-half horsepower.

Light in weight and virtually noiseless, the engine is designed to operate on a wider variety of fuels and at a greater thermal efficiency than internal combustion engines of comparable horsepower.

'Electronic Witch' Checks Wiring

The "water witch" method by which legendary experts claimed they could tell where to drill water wells has been matched by an "electronic witch" developed by aerospace engineers.

The device can check the mass of complex wiring in a heavy jet bomber and identify individual wires in a matter of seconds. The "witch" is contained in an aluminum box weighing only five pounds, and verifies that current is flowing through the correct wire.

There are 651 wire bundles in the bomber, connecting its electronic elements. In many cases, the wires have several strands with pinned connectors at each end. Methods for checking whether a pin is properly connected are well established.

But in some phases of final assembly or in modification, checkers must verify that current is flowing properly after the wires have been connected.

The sensing device has a hinged iron element with a coil which opens and closes like a pair of pliers. When the iron is clipped to a "hot" wire, voltage is induced into the coil. Through the use of a miniature tube, a small neon lamp is made to glow.

The unit is portable, operates on two small batteries, and can be conveniently used where space is limited.

Biggest 'Whistle' Yet To Test Plane Parts

Engineers at an aerospace company claim they are building the biggest "whistle" ever made for testing aircraft structural parts.

The "whistle" is created by a siren as part of a sonic fatigue test facility, and will generate levels up to 173 decibels. The company already has in operation an acoustic facility whose noise is generated by amplifiers, and radiated by a bank of high-wattage speakers. This produces a level of more than 140 decibels—loud enough to cause immediate loss of hearing.

But there is no danger that the sound will get outside the operating chamber. Using advanced sound muffling techniques, the siren's sound will be bottled up. The siren will test airframe structures to determine their resistance to high level sonic environment. The acoustic facility tests the effects of sound on airborne equipment.

These facilities are typical of the unique research requirements for high performance weapon systems being developed by the aerospace industry.