Engineering Services

Six years of design and construction culminated in 1972 with the completion of test chambers 3 and 4 of the Propulsion Systems Laboratory, a project valued at more than $14 million. The new facility will begin operation in February of next year.

The test chambers, each 24 feet in diameter and 30 feet long, can provide for the operation of full scale prototype or production aircraft jet engines in an environment that simulates the pressure, temperature, and Mach number to be encountered in flight operation. In anticipation of future needs, the test chambers, exhaust gas coolers and associated piping systems, were designed to accommodate engines requiring twice the combustion air flow and exhaust pumping capacity presently available.

Nearly 9,000 tons of steel were used in the facility, much of it associated with unique, specially designed items such as coolers that withstand engine exhaust gas temperatures of 3,400°F. and internally-insulated pressure piping that conducts air at 1,200°F. from the heaters to the test chamber. The heaters also are unique in that they utilize the exhaust gases from J-57 aircraft engines as the heat source for combustion air supplied to the test chamber.

Technical Services

During 1972, this directorate accomplished its assigned mission of providing mechanical, electronic, and electrical support to the Center's R&D programs. Under a limited manpower mode, the work has been performed with great efficiency and skill. The role of the trades and craftsmen as bona fide members of the R&D team has received Centerwide recognition. After our recent service awards ceremony, I found that 46 percent of the personnel in this Directorate had more than 20 years of service at Lewis. Obviously, the specialized experience and knowledge resident in our people is very high in the propulsion and power areas. To offset our aging problem, a new trades apprentice class of 30 has been initiated this year.

Some of the current support efforts now underway are FSL 3 and 4 facility preparations for Quiet Engine testing, the low-cost ordnance engine, communications satellite and project SPHINX, heavy operations of our large wind tunnel facilities, aircraft engine digital control, "bumpy torus" plasma containment rig.

The research divisions are our prime customers. 52 percent of Technical Services manpower is performing work in support of the aeronautics programs. This reflects requirements in operating the large air-handling facilities and large scale hardware.

This year, we formally installed the Technical Services Building Manager concept as an information, coordination, and reporting network. It recognizes the many peripheral assignments laid on our supervisors and features emergency planning and drill exercises. This year, the Center is compiling one of its best all-time safety records based on lost-time accident statistics. It appears we will only reach about one-third of our previous norm. With the Center's wide range of potential hazards, this is indeed a notable achievement.

A new Instrument Applications Office has been attached to this directorate to provide professional technical support to the CURE operation, the Center Instrumentation Committee and to the research divisions in the design and applications areas of measurement, data acquisition, and control systems. A comprehensive survey of Center research instrumentation requirements has been recently completed and is being documented.

Basic Research

Basic research serves both as the seed bed for new technologies and as the source of fundamental understanding so important to the progress of existing technologies. Because basic research is an integral part of most R&D efforts, the special contributions that have been made during 1972 would be included in the summaries of each of the directorates.

The basic research effort at Lewis was presented to the OAST Research Council on July 10-11, 1972. A printed book entitled "Lewis Basic Research Review" summarizes each individual research effort. This book is available upon request. The Council evaluated the entire program and sent comments to the Center Director, and the Center responded. The letter and response will be included along with an overall evaluation of the OAST basic research program in a document now being printed entitled "Evaluation of OAST Basic Research Program — FY 1973". The Research Council also considers university grants and contracts which were summarized in the two volumes of "OAST University Grants and Contracts for Basic Research FY 1972. This is currently being updated for FY 73. A seminar series has been planned for basic research on alternate Wednesdays after the first of the year. Individual topic notices will be distributed to engineering and scientific supervisors.

The basic research effort of the Center frequently results in papers and publications. The report output for 1972 averages more than 1 1/2 report per professional man year of research effort.

Aeronautics... (Continued from page 5)

The first of two experimental quiet engines, utilizing a low speed, high aspect ratio fan, was subjected to a series of acoustic performance tests in the Lewis engine test facility on the hangar apron. The tests included an effective and dramatic demonstration for 400 attendees of the Lewis Aircraft Engine Noise Reduction Conference in May. The second of the experimental engines, utilizing a high speed, high aspect ratio fan, was delivered to NASA in December. The contractual phase of this successful program is essentially complete. In recognition of the technology resulting from the experimental quiet engine program, members of the Quiet Engine Project Office and supporting associates at Lewis received NASA's Group Achievement Award.

The Division completed two engine design study contracts to investigate features of alternate engine types suitable for advanced STOL aircraft. Preparations for competitive procurement of an experimental engine program are underway. The Division's STOL Propulsion Project Office is managing this program. Members of the Division chaired and presented the Propulsion Session of the NASA Conference on STOL Technology at Ames in October.

The STOL Propulsion Project Office also conducted an extensive in-house test program at Edwards Air Force Base with an acoustically suppressed TF-34 engine, wing and nacelle. The engine if representative of turbofan engines suitable for the NASA QUEST Program. A new Project Office was organized in the Division to launch a program to demonstrate the feasibility of flight testing a new engine designed to reduce noise output of the present fleet of 707, 727, 727, DC-8 and DC-9 commercial jet aircraft. The first phase of this effort is now underway with the engine and aircraft manufacturer.

In addition to numerous technical reports and presentations associated directly with major projects, the Division's in-house research activities resulted in approximately forty-five technical publications during 1972 in the fields of propulsion system noise abatement and V/STOL propulsion.

heating load.

Among the many important contributions of the Engineering Design Division during 1972 were two major projects. One of these major jobs was the vertical lift engine facility which provides all mechanical, electrical and sound recording systems to test engines, up to 30,000 pounds thrust, mounted in wing sections. A unique aspect of the facility is a moveable 50-foot engine service hangar. The division also designed the hangar and noise test facility which provides support systems for testing jet engines up to 100,000 pounds thrust. A second division project was the design and construction of a number of other smaller test systems, research hardware, and provided technical direction on Lab projects. And none of these projects would have materialized without the managerial expertise of the Construction Division.