from Vibrating Jets to Alaskan Mosquitoes

sooner researchers are tackling a wide range of defense problems

By SAM R. POWELL
'60journ

ERY time a new supersonic jet takes off, every time a new missile is ched, safeguarding Americans by the e power of their presence in today's un- peace, millions of man-hours of re- h, study and exhaustive tests lie be- d their flight. And here at O.U., men carrying out research and testing that some day be used to strengthen this nse of the United States.

A look at O.U.'s part in this defense pic- is actually a look at what goes on ind the scenes. The endless months of ous searching, the constant testing, the ng and the failing, is not the stuff that dlines are generally made of.

he University of Oklahoma Research itute is a growing organization which e key to O.U.'s role in national de- e. The Institute is a non-profit busi- organization securing research con- s in many fields—the largest of which fense.

Institute director, Verne C. Kennedy, as guided the research program to the pot in the Big Eight in defense work, ng the O.U. Institute among the top the nation, with a record of over $3 on worth of contracts in 127 projects r way as of June, 1960. Since its ding in 1941, the Institute has had 00,000 contracted for defense research ,100,000 of which has been obtained in last three years. How these contracts are secured for the researchers is a story in itself.

"The Institute bids on projects just like a private company and competes with other research organizations just as companies would in securing a contract," Kennedy explains. "The Institute now has contracts with all three armed services, and we are hiring an increasing number of people from outside the University, as well as a growing number of people, of course, from O.U. every year."

In fact, the project coordinator at the Institute, Garland R. Hadley, says that the saturation point has just about been reached as far as current contracts are concerned, with nearly all O.U. faculty personnel desiring to do research engaged in some sort of sponsored project. However, he points out that additional research projects are needed to support the University's expanding graduate program.

The money from these contracts goes primarily to pay salaries and wages of persons working on the projects. Hadley explains that over 65% of the money goes for this purpose, with some 16% going for supplies and materials.

"All of the defense work that goes on here at O.U. comes through the Institute, and the persons who have the contract can generally make use of the equipment of the University in working out their project, and of course the Institute has a quarter-million dollars in its own research property."

Research, research, research, that is the story that follows the awarding of a contract for one of these projects. But how long does that research go on? As long as the contract holds out, and in some cases even longer.

National defense encompasses a tremendous field. It can range from a spy-in-the-sky satellite to a new type boot that will enable a G. I. to keep all of his toes in freezing weather. The diversification of defense research at O.U. is just about that broad.

Identifying the study of vibrations in jet engines as a defense project is not too difficult. The relation of a study of arctic mosquitoes to national defense is a bit more obscure, yet both are a part of Sooner research for the armed services.

The vibration project has been contracted for Dr. Bruce Ketcham, '56m.eng, chairman of the school of aeronautical engineering. Ketcham and his associates have been working on this relatively new project only six months now. Basically the study is to determine vibration frequency characteristics of turbo-jet engines and their effect on aircraft frames.

Ketcham, who can usually be found at the aero school's building on the North

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Campus where all of his research takes place, points out that initial reports show that with more and more powerful engines in lighter planes, the problem of vibration is reaching serious proportions. Through research it is hoped that an answer may be found to help reduce the danger of frame damage.

The Air Force interest in mosquitoes is not for purely biological purposes, but has its more practical application for the American serviceman's health and comfort. This is one reason that an O.U. researcher has spent part of the summers of 1955 through 1960 in Alaska.

Dr. Cluff E. Hopla, associate professor of zoology and curator of insects for the University, has a contract with the Air Force's Air Research Defense Command, officially designated "The Colonization and Feeding Habits of Alaskan Mosquitoes." The interest in this project stems from the fact that Alaska, one of the guard-posts in the defensive perimeter of the United States, is an ideal place for mosquitoes in the summer months, and they don't do a lot to boost the morale of the thousands of U.S. servicemen stationed there.

Literally nothing is known about the habits of these sub-arctic mosquitoes. A close study of their habits may help solve this problem for the armed forces, while also helping the scientific world learn a little more about these insects.

Dr. Hopla isn't satisfied with just studying the mosquitoes themselves. At the present time he is trying to get the work expanded into including a study of the migratory birds of the arctic: "Birds that roost in these regions migrate to South American sub-tropical areas, and we want to know if they can possibly pass disease from the mosquitoes to human beings."

When the study calls for trips to Alaska, the researchers work closely with the Arctic Aeromedical Laboratory located at Fairbanks, but they also work closely with their friend the mosquito. "We have done a pretty fair amount of camping out when doing research on some of the diseases related to the mosquito in the Alaskan area. We got into some wonderful fishing grounds that people pay big money to reach, but I haven't fished once—been too busy," Dr. Hopla recalls.

As might be expected, most of the research projects that are associated with defense work are found in the engineering and physics departments of the University.

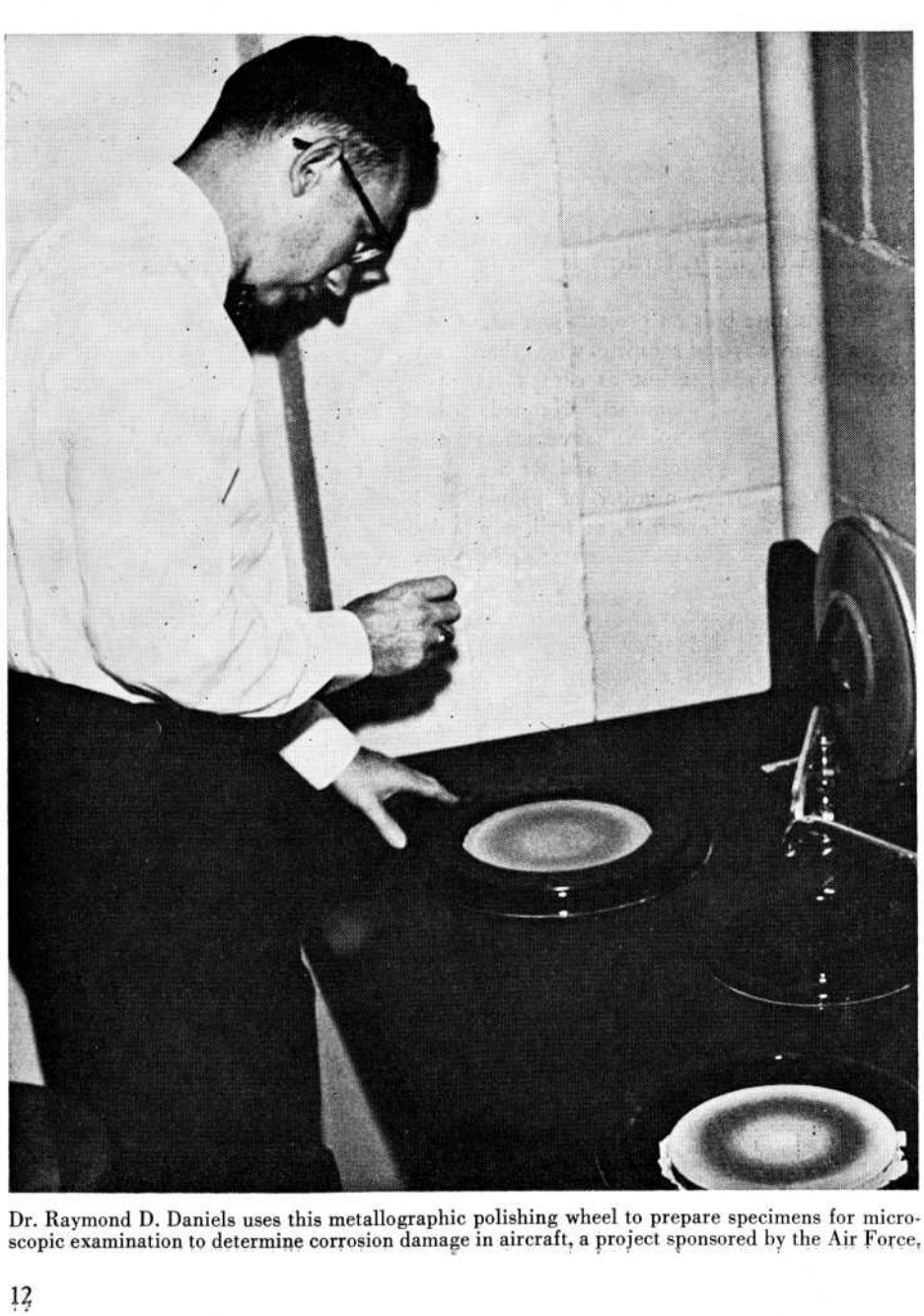
Typical of the successful projects to come out of engineering is one recently completed by Clyde Farrar, electrical engineering professor. Farrar is justifiably proud of the work he and his crew did for the Air Force concerning a zero-drag antenna—an antenna that will not cause drag or air-resistance on high-speed aircraft.

Farrar worked for about 10 years on this project and came up with over 100 different antenna designs, some of which were practical, some not. "The design was the primary aim, but we also investigated the band width, that is, the broad possibility of using one antenna for all the transmitters on, say, a big bomber."

Several aircraft companies have adopted the basic design which the Sooner researchers recommended, and are now adapting it to their aircraft.

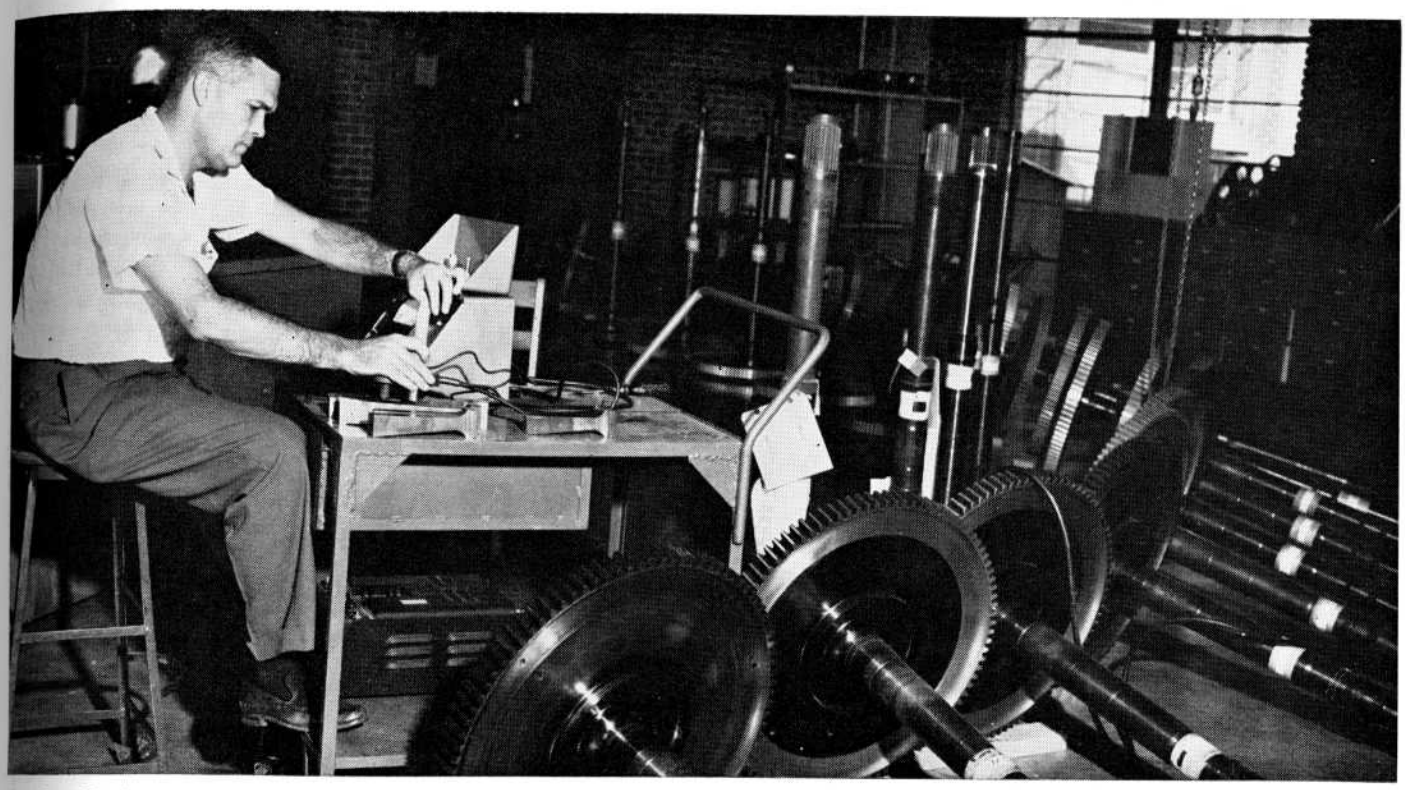
A project undertaken by a research professor, Dr. R. L. Huntington, '17ba, chemical engineering, ended with different results. The subject of research was an extremely simple little piece of equipment known as the Hilch Tube.

The Hilch Tube is a small hollow tube through which air is forced at high velocity in a circular motion. Part of the air is con



Dr. Raymond D. Daniels uses this metallographic polishing wheel to prepare specimens for microscopic examination to determine corrosion damage in aircraft, a project sponsored by the Air Force.

Research for Defense



Another Ketcham project for the Air Force involves overheating in these jet turbine wheels. Already 2½ years of testing have gone into the search for an instrument which can detect overheating in the turbo-jet rotors without cutting into the rotor itself to determine whether damage has occurred.

pressed against the wall of the tube and becomes heated, while the rest of the air goes through a mouth-like opening as cool gas. It's simple, requires no moving parts; theoretically the idea is a good one, but it proved to be unfeasible.

"We were trying to determine whether it would be possible to use this little tube for refrigeration in electrical equipment on military aircraft. If developed, it would have been a means of keeping certain equipment cool without adding a lot of weight to the plane. Conventional methods of refrigeration, of course, are vastly heavier than this would have been, and it would have been tremendous — if it worked. But the overall comprehensive view showed that it just wouldn't," Huntington explains.

But where one group of men may work many months on a project, only to find that the answer isn't there, others may come up with something new and different—an exciting improvement over anything seen before. That's what happened with another of Dr. Ketcham's projects. Ketcham, undoubtedly one of the busiest men in the research business, has completed his research on high-capacity, lightweight compressors, a contract with the Army Air Division.

The study performed, the results indicated that such a compressor was entirely feasible, and the proof is housed in a building on the North Campus. The small compressor consists of an oscillating valve turned by a universal-type crankshaft. It provides a 30% increase in volume and 100% increase in valve space, while weighing one-fifth to one-third as much as a standard compressor. Now constructed, the new compressor is being tested to determine its use for extreme low-temperature gas pumping.

Ketcham says that the five-horsepower unit is being considered for pressure-jet helicopter use in the future. "There are many possible uses for this development, such as replacing car air-conditioning compressors which weigh 17 to 34 pounds. We worked about three years on this, some of it sponsored and some of it not."

The Air Force, one of the top sponsors for O.U. projects, has one engineering professor working on something of an entirely different nature, but equally important in keeping an airplane flying. Walter Ewbank, associate professor of mechanical engineering, has been assigned the job of solving problems in the area of operational aircraft bearings and lubricants. Ewbank, like many of his fellow researchers, is hopeful of getting his project expanded.

"I want to investigate what happens to the lubricants when you subject them to high pressure and a high shear rate (as in forcing gears together rapidly under tremendous pressure). This has great influence on their wear, and it is my feeling that we will be able to improve our lubricants if we can learn the answer to this."

Ewbank plans to work in this specific area whether he gets sponsorship or not. Several potential sponsors have looked into the idea, and Ewbank's team is going ahead with it, but of course, more can be done if they get a contract and the money necessary for complete study.

Researchers such as Ewbank frequently run into special problems which they cannot handle themselves, and he is enthusiastic in his praise of the many skilled people at the University. "There are a great number of highly trained specialists right here at O.U. whom you can call in to help

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out, and in the past we have had several occasions to do this."

Another engineering professor who has two impressive sponsors in the Air Force and Atomic Energy Commission is Dr. Raymond Daniels, assistant professor of metallurgical engineering.

Daniels' A.E.C. program concerns the effect of hydrogen on the strength and inductability of metals. For these tests the researchers constructed a complete vacuum-hydrogenating and gas analysis machine (used in testing metals with hydrogen). The Institute also purchased a machine to test tensile strength of metals primarily for use with this study.

Corrosion and the problems it causes in high performance aircraft is being studied in Dr. Daniels' other current project. The general aim here is to help the Air Force improve their estimate of a plane's life, by providing accurate information on exactly how corrosion may speed the plane's break-down.

"We are testing to see if we can find the difference in, say, the longevity of a jet based on Wake Island, and one based in this area. How does difference in climate affect the plane, how may corrosion be prevented with proper care as the plane is built and then used? That's what we are after. From our end of the study we are interested in the materials and the processes that occur in them," Daniels says.

His present project with the air arm of our defense was the result of a past project, concerning the metallurgical examination of some wing skins of the B-47, a mainstay of the Air Force. At this time a tremendous program was going on, sponsored by the Air Force, to help find the answer for the failure of some of the wing skins on these planes.

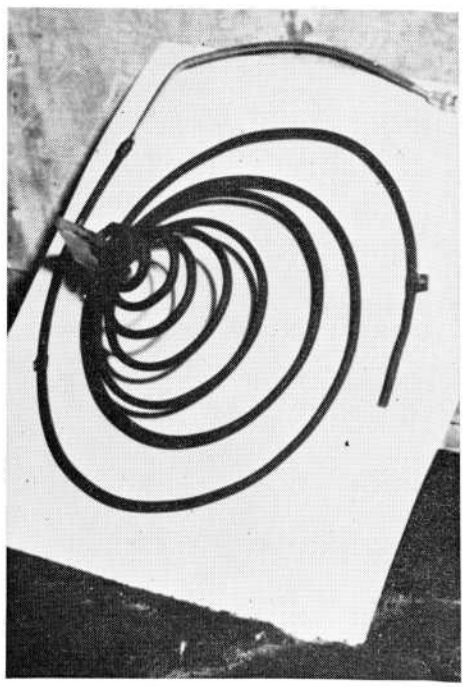
Daniels and the men working with him examined some of the fractured skins, which had been damaged by wing stress, but in this study the inquisitive scientists also found that possibly corrosion could play a big role, and a contract to investigate this angle resulted. But Daniels still isn't satisfied: "We hope to get some support in the near future for the study of fundamentals of the mechanics by which corrosion influences fatigue fracture on aircraft, and really go into it deeply."

Along with studies such as those concerning the B-47, where any person can understand basically what is going on, there are also those projects at O.U. which bear such names as "Rayleigh Scattering" and "Optical Relaxation of Excited Atoms." These projects originate in the physics department, probably the most active single department in research work at O.U.

One of the most active in that department's research is Dr. Richard G. Fowler, chairman of the school of engineering physics. Fowler is working on two projects at the present time, and in the past has had funds contracted for five or six different projects. He also has some definite ideas on the subject of research itself.

"I can never guarantee anything from any of my research; some of it may not be worth a plugged nickel. But any good project worth its money just seems to snowball. I tell my students that if you do some real honest work, you can't fail to stumble across something that hasn't been found or completely understood. . . . We are learning something every day that we work, and we have a lot of work to do . . . no good research project is ever completed."

The chairman of the physics department, Dr. Colin A. Plint, views research as it affects the University—strengthening the general academic standards while helping the scientific world. His case in point is the physics department:



More than 100 different antennas for high-speed aircraft resulted from Farrar's 10-year project.

"We now have one of the 10 largest undergraduate enrolments in the United States. We are actually much bigger than we should be, but of course we are very happy about this. This is primarily because our students are taught by men who are doing research and know what they are talking about. Just about everyone in the department is actively engaged in some kind of research. The men who are teaching have the desire to do research in their field and help its progress, instead of just rocking along and doing their required teaching job and no more. This is helping our department, and we believe it is greatly helping every student who graduates in physics."

Dr. Plint himself has the contract for "Rayleigh Scattering," which is very simply a study of what happens when a beam of light passes through transparent material. This is a study closely related to the atomic energy field and is sponsored by the Office of Ordnance Research. He has been working on it for three years and estimates the work will run for three or four more.

And so the research goes on. The men working at night, on the weekends, during vacation time, at any spare moment. Each of these men is carrying a full load of teaching in addition to research. Many others besides those mentioned here are working at the present, or have recently worked on projects in this field:

Dr. W. R. Upthegrove, chairman of metallurgical engineering school; Dr. C. M. Sliepcevich, chairman of the school of general engineering; G. W. Reid, chairman of the school of civil engineering; D. B. Turkington, chairman of the school of mechanical engineering; Dr. F. M. Townsend, '48eng, '51m.eng, '55ph.d, chairman of natural gas engineering; J. D. Palmer, assistant professor of electrical engineering; Dr. R. A. Howard, professor of physics; Dr. S. E. Babb, Jr., assistant professor of physics; Dr. C. C. Lin, assistant professor of physics; Institute Director Kennedy and many others.

Their projects are too numerous, too complicated and too varied to be included in anything short of a book. This brief cross-section is intended only as a quick glance at some O.U. men with a part in the overall defense effort—a tedious, sometimes frustrating, yet basic job which must continue if the United States is to keep herself ready for any emergency that may arise.