

ESSA

NEWS

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- **USSR TO ORBIT WEATHER SATELLITE BY YEAR'S END**During the period October 6-8, U.S.-U.S.S.R. bilateral discussions on the peaceful uses of outer space continued, with Arthur W. Johnson of the National Environmental Satellite Center participating on behalf of ESSA. Of particular interest was the Soviet announcement of plans to launch their first weather satellite by the end of 1965. Satellite pictures and analyses of the photographic data will be exchanged over a direct Moscow-Washington weather link which terminates at the World Weather Centers in both cities. The direct link, established in October of 1964, will be kept in operation as long as both Moscow and Washington have satellite data to exchange.
- **COMMISSIONED OFFICERS TAKE NEW POSITIONS IN ESSA**•On October 4, Commander Hal P. Demuth, former Chief of the C&GS Commissioned Personnel Group, transferred to the Systems Engineering Division of the National Environmental Satellite Center. In this position, Comdr. Demuth will examine the feasibility of incorporating geophysical and oceanographic observing capability in environmental satellite systems.
Another member of the officer corps, Commander Alfred C. Holmes, has moved from the C&GS Division of Photogrammetry, Office of Physical Sciences, to the ESSA Office of Aviation Affairs. Comdr. Holmes is the Office's aeronautical charting representative to the Federal Aviation Agency and works fulltime at FAA headquarters.
- **DEPUTY ADMINISTRATOR ATTENDS HAWAIIAN CONFERENCE** .. Admiral Karo attended the Governor's Conference on Oceanography and Astronautics in Hawaii from September 29 through October 2. The conference evaluated recent developments in the Nation's oceanographic and space programs, including the selection of Hawaii as the primary site for the National Science Foundation's Mohole Project. After the Hawaiian conference, Admiral Karo, as a member of the Mississippi River Commission, accompanied the Commission on its annual low-water inspection trip of the river from October 3-9.
- **WEATHER BUREAU DIRECTOR WINS ROBERT M. LOSEY AWARD**Dr. George P. Cressman, Director of the Weather Bureau, has won the American Institute of Aeronautics and Astronautics' Robert M. Losey Award. The award, named for the meteorologist who was the first American officer killed in World War II, is made annually by the 33,000-member organization in recognition of outstanding contributions to the science of meteorology as applied to aeronautics. Dr. Cressman received the award--\$200 honorarium and certificate--at a meeting of the Institute in St. Louis on October 12. The certificate cited him "For the rapid and effective application of numerical weather analysis and forecasting techniques to aeronautical operations."



THE INSTITUTE FOR TELECOMMUNICATION SCIENCES AND AERONOMY

by
Dr. C. Gordon Little, Director

On October 11, the Central Radio Propagation Laboratory was transferred from the National Bureau of Standards to the Environmental Science Services Administration and acquired a new name: Institute for Telecommunication Sciences and Aeronomy.

The transfer and redesignation of this Institute is the latest step in a continuous history which can be traced back more than 50 years to studies of radio-wave propagation initiated by the National Bureau of Standards in 1909. Milestones in this growth pattern include the creation of the first NBS Radio Section in 1913, the formation of the Inter-service Radio Propagation Laboratory within NBS at the request of the combined Chiefs of Staff of the U.S. Armed Forces in the spring of 1942, the establishment, as a result of an Inter-agency agreement, of the Central Radio Propagation Laboratory as an NBS Division in May 1946, and the designation in 1964 of CRPL as one of the four Institutes comprising the National Bureau of Standards.

CRPL brings with it into ESSA a two-fold mission. As the Institute for Telecommunication Sciences and Aeronomy, its main mission will continue to be support of the \$20 billion per year national expenditure on telecommunications. This support is provided by propagation research and services; that is, by the conduct of research and services on how radio, infrared, and optical waves travel from a transmitter to a receiver. The earth's surface and atmosphere have many effects on such waves; ITSA's goal must be to be able to predict these effects quantitatively, in order that the Nation receive the maximum possible return from its expenditures on electromagnetic telecommunication systems, and in order that this wonderful natural resource, the electromagnetic spectrum, be used with maximum effectiveness and efficiency. Using an agricultural analogy, communicators speak of "farming" the electromagnetic spectrum. ITSA's job as the central Federal agency for propagation research and services is to assist in maximizing this national crop, by obtaining and disseminating information on the distortions and attenuations experienced by the waves as they travel from transmitter to receiver. To meet this mission, ITSA must work at all relevant communication frequencies (from about 10^3 to about 10^{15} cycles per second, or wavelengths from about 10 millionths of an inch to about 200 miles); at all relevant ranges (from tens

of yards to intercontinental or even interplanetary distances); at all heights (including below the surface of the earth or oceans, and to aircraft, rockets, and satellites); in all locations and climates (from pole to pole and in space); and in support of all significant uses of telecommunication (such as defense, aviation, navigation, public safety, public communications, entertainment, and space research).

The second component of ITSA's mission has developed from the first. The electrified nature of the upper atmosphere, which permits ionospheric radio telecommunication around the world, results from the absorption of X-rays and ultra-violet light by the upper atmosphere. Occasionally, and especially during the solar disturbances known as flares, major increases in the flux of these radiations occur. These outbursts result in major changes in the upper atmosphere, having important and often catastrophic effects on ionospheric telecommunications. Ever since 1942, ITSA and its predecessors have therefore been active in the study and forecasting of periods of solar activity and ionospheric disturbance. Recently the Federal Council for Science and Technology urged that CRPL should meet the developing common needs of several Federal agencies such as National Aeronautics and Space Administration, Department of Defense, and Federal Aviation Agency for information on changes in the earth's environment in space. In other words, rather than having each agency set up its own space environment forecasting activity, the Department of Commerce was assigned responsibility for acting as a centralized "space weather" agency, meeting the common needs of all agencies.



BASED AT THE FOOT OF THE FRONT RANGE OF THE ROCKY MOUNTAINS, THE INSTITUTE FOR TELECOMMUNICATION SCIENCES AND AERONOMY OCCUPIES MOST OF THIS BUILDING AT THE NATIONAL BUREAU OF STANDARDS' BOULDER LABORATORIES

To meet these two missions, ITSA is divided, both organizationally and program-wise, into the following four areas:

1. IONOSPHERIC TELECOMMUNICATIONS LABORATORY In this laboratory is located all our work relative to the use of the ionosphere for long-distance telecommunication, including, for example, work on problems of over-the-horizon radar, certain navigational systems, AM broadcast, and point-to-point communication to aircraft, ships, or sites beyond the horizon.

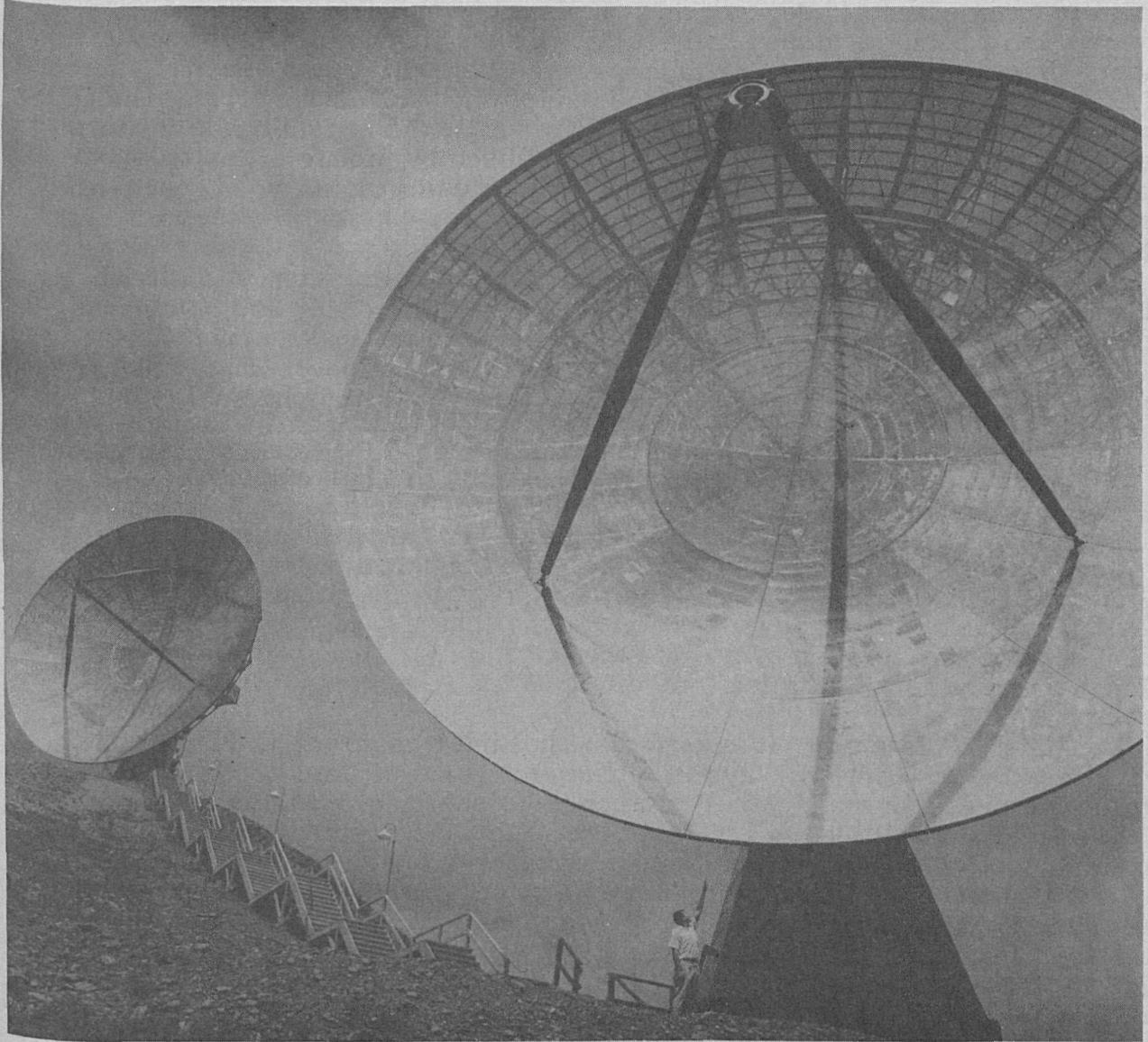
The ionosphere is a complex electrified region of the earth's upper atmosphere, extending from about 50 to 500 miles above the earth's surface. For many years, it has been known that the ionosphere can act as an efficient reflector of radio waves. It can also scatter radio waves beyond the horizon, using regions of electrified gas such as the trails left by meteors as they enter the upper atmosphere. The laboratory has played a key role in the discovery of new modes of electromagnetic propagation by the ionosphere and the practical use of such new electromagnetic telecommunication techniques. An important public service is the publication of a regular "radio weather" forecast series, issued three months in advance, which contains predictions of the best frequencies for ionospheric radio transmissions.

2. TROPOSPHERIC TELECOMMUNICATIONS LABORATORY In this program is located all our work relative to electromagnetic communication via the lower atmosphere, or troposphere. Tropospheric telecommunications represent about 80 percent of the Nation's telecommunication activities, or about \$16 billion expenditure per year. The laboratory's research makes it possible to evaluate the effects which terrain and weather have on the transmission of frequencies such as are used in television and in microwave relays. In addition, studies are made of natural and man-made noise which together form the background against which electromagnetic signals must be detected. ITSA's mission in this field was expanded greatly during the past six months by action of the Federal Council for Science and Technology, which urged that our mission of research and services in support of radio communication be expanded to cover infrared and optical frequencies. This has added an additional 5 decades of frequency (from about 10^{10} cycles per second to about 10^{15} cycles per second) to the three decades hitherto covered by our tropospheric telecommunications activities.

3. SPACE DISTURBANCES LABORATORY The need for research on the effects of solar disturbances and how to predict them is expanding rapidly. Until recently, man confined his activities to the surface of the earth and the lower atmosphere, and the upper atmosphere acted as a protecting blanket, shielding him from the harmful effects of solar particles and rays. As man's interests and activities have expanded to greater heights, his need to understand and predict the effects of solar disturbances has become more important. For example, such national activities as manned space-flights and the monitoring of the nuclear-explosion test-ban require additional services and research in this area.

In February of this year, in response to recommendations developed for the Federal Council for Science and Technology, CRPL reorganized to create this laboratory and focus attention on the problems associated with space disturbances and their forecasting. These problems are rapidly becoming more acute for we will soon be approaching sunspot maximum, a time when solar flares may be expected to be 30 to 100 times as frequent as at the present sun-

spot minimum conditions. The urgency is made even more acute as a result of the rapidly accelerating man-in-space program of NASA and the Department of Defense.



THESE 60-FOOT ANTENNAS NEAR BOULDER ARE AT ONE END OF A 165-MILE RADIO PATH USED BY THE INSTITUTE FOR TELECOMMUNICATION SCIENCES AND AERONOMY TO STUDY THE PROPAGATION CHARACTERISTICS OF RADIO FREQUENCIES ABOVE 100 MEGACYCLES.

4. **AERONOMY LABORATORY** This laboratory covers our research in aeronomy, the science of the upper atmosphere. Its basic research program supports the mission of our Ionospheric Telecommunications and Space Disturbances Laboratories and conducts research in support of NASA and D.O.D. missions. It is a unique program in the Nation, because it covers within one administrative unit a strong and integrated program of theoretical, laboratory, ground-based, and

rocket and satellite studies of the upper atmosphere.

Increased national involvement in space research and satellite applications requires a detailed knowledge of the characteristics of the upper atmosphere to great heights. To meet this challenge, several new methods of measurement have been developed. These include the Jicamarca (Peru) scatter radar, which uses an extremely high-powered transmitter and sensitive antenna of great size, and also satellite-borne equipment such as the topside sounder and beacon satellites. Investigations continue of the possible relationship between "the night airglow," a faint light caused by atomic emission about 50 miles above the earth's surface, and the dynamics of the upper atmosphere. Variations in electron distribution of the lower ionosphere are measured and studied by sweep-frequency radar techniques.

In addition, important laboratory studies are being made of the behavior of atmospheric gases in ionized conditions. By using controlled conditions, processes known or believed to be of importance in the upper atmosphere, interplanetary medium, or the sun are studied quantitatively. Such studies are leading to major improvements in our understanding of the physical and chemical processes controlling the ionosphere.

In order better to describe the current mission of CRPL and its role within ESSA, its organizational title is being changed to "Institute for Telecommunication Sciences and Aeronomy." Not only does this new title more accurately reflect the mission of the organization than its old title of Central Radio Propagation Laboratory, but it makes for a clearer understanding of its relationships to its three sister Institutes, the Institute for Earth Sciences, the Institute for Oceanography, and the Institute for Atmospheric Sciences. Together these four Institutes form the ESSA Institutes for Environmental Research.

Looking to the future, it is expected that the transfer of CRPL into ESSA will improve in important ways its ability to meet its mission of enhancing the telecommunication and space-disturbance-forecasting capabilities of the Nation. Essentially all of ITSA's programs involve one or more aspects of man's geophysical environment; it therefore seems clear that ITSA scientists and engineers should be able to meet their goals more readily than before, because of more immediate and complete access to the environmental sciences and services available elsewhere in ESSA. In addition, it is expected that ITSA will contribute in major ways to the vital missions of other components of ESSA through application of remote probing and other telecommunication techniques. The creation of a single administration dealing with the solid, liquid, gaseous, and electromagnetic components of man's geophysical environment offers new and exciting opportunities for environmental research and services; the staff of ITSA looks forward to participating effectively in these efforts.

- **ADMINISTRATOR TO SPEAK AT SEMINAR** ESSA Administrator Robert M. White will speak at a seminar of The Travelers Research Center in Hartford, Conn., on October 21, on the advances being made in numerical weather forecasting. Dr. White was president of the Center before becoming Chief of the Weather Bureau in 1963.
- **UNITED NATIONS DAY, 1965**...United Nations Day, 1965, will be observed throughout the country on October 24, marking the 20th anniversary of the founding of the organization. Noting that 1965 has been designated by the U. N. General Assembly as International Cooperation Year, President Johnson has issued a proclamation urging the citizens of this Nation to observe that day by means of community programs which will contribute to a realistic understanding of the aims, problems, and achievements of the United Nations and its associated organizations.
- **PATENT OFFICE EXHIBIT MARKS ANNIVERSARY** ...An exhibit entitled "Progress of Industry Through Patents" will open at the Department of Commerce in Washington on October 18. The exhibit is part of a four-day series of meetings and functions to be held to commemorate the 175th anniversary of the U.S. Patent System. The exhibit will be open to the public daily from October 18 through November 4.
- **ESSA SAFETY OFFICER ADDRESSES NORFOLK GROUP** .. Milton S. Aronstam, Safety Officer for the Environmental Science Services Administration, spoke at the October 14 luncheon meeting of the Norfolk, Va., Chapter of the Federal Safety Council, with the Atlantic Marine Center serving as host. Mr. Aronstam's topic was ESSA's safety program.

National Oceanic and Atmospheric Administration

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