

Smithsonian Institution Smithsonian National Air and Space Museum Archives

Technology Review, November 1961

Extracted on Apr-18-2024 10:43:41

The Smithsonian Institution thanks all digital volunteers that transcribed and reviewed this material. Your work enriches Smithsonian collections, making them available to anyone with an interest in using them.

The Smithsonian Institution (the "Smithsonian") provides the content on this website (transcription.si.edu), other Smithsonian websites, and third-party sites on which it maintains a presence ("SI Websites") in support of its mission for the "increase and diffusion of knowledge." The Smithsonian invites visitors to use its online content for personal, educational and other non-commercial purposes. By using this website, you accept and agree to abide by the following terms.

- If sharing the material in personal and educational contexts, please cite the Smithsonian National Air and Space Museum Archives as source of the content and the project title as provided at the top of the document. Include the accession number or collection name; when possible, link to the Smithsonian National Air and Space Museum Archives website.
- If you wish to use this material in a for-profit publication, exhibition, or online project, please contact Smithsonian National Air and Space Museum Archives or transcribe@si.edu

For more information on this project and related material, contact the Smithsonian National Air and Space Museum Archives. See this project and other collections in the Smithsonian Transcription Center.

over a field of view somewhat greater than 180 degrees, so the full horizon would be available for ascertaining the orientation of the satellite even when it was librating (rocking) because of gravitational perturbations. These satellites could be solar powered in the manner of TIROS; hopefully, reduced power consumption would permit reduction in the weight of the power supply components.

No provision would be made in this system for the storage of data on board the satellite. The simplest mode of transmission of pictures to the ground involves interrogation of the satellite by a ground station beneath it. This could cause it to take a single picture, or possibly a sequence of pictures, to be directly televised to the same ground station. In this fashion, a ground station could obtain a detailed view of the clouds in the atmosphere for a distance of 1,000 or more miles around it, which is ample coverage for short-range forecasting. Assembly of reports from a number of such ground stations could give very nearly complete coverage of the globe.

The frequency at which such observations could be made would be determined by the number of satellites in orbit. Because of the low orbit and cheap construction, 30 or so satellites could be in orbit simultaneously; failure of one or a few would not be catastrophic. A central data processor would have to keep track of the individual satellites, however, so that each ground station would know when to expect a satellite in its area for interrogation.

A more complex system of weather satellite communications would be possible with the network of low-flying active communications relay satellites that has been projected. In this case satellite interrogation could occur from a central station, the interrogation signal being relayed through the satellite communication network to the vicinity of the meteorological satellite assigned to take an observation. The transmission of its televised observation, slowed down to fit the capacity of the available communication channel, would return over the same route as the interrogation signal. Such a system would permit complete flexibility of operation, since irregular but frequent reports could be obtained from the entire earth and be available at one or a number of central stations.

Let us assume now that the mechanical and electronic problems of establishing full and frequent meteorological satellite coverage of the earth have been solved. What, then, may we expect from the forecasters? It may readily be predicted that, in general, forecasts will be improved. The degree of improvement to be expected, however, is still open to question.

Since the TIROS satellites survey the same region at best once each 24 hours, attention has been focused largely on forecasts of that period. For these short-range forecasts, the value of the satellite meteorological observer is almost self-obvious. The pictures show graphically the cyclones, fronts, and other major meteorological features of consequence in forecasting. They are shown so clearly that a mosaic of TIROS pictures has been called a "self-analyzed weather map."

For forecasts for periods shorter than 24 hours, the outlook is even more encouraging. The TIROS pictures present structural details of meteorological features that were never before available to the forecaster. In general, the lifetime of a structural element of the

cours a tield of view somewhat greatter the 10 digras, to the full initials betwee would be available for coertinating the orientation of for utability ones when it was libraring (recking) because at govitational singled characted and electronic problems of chemical and mechanic problems ar-olapical staffing coverage of the cards have been solved. What then, may no expect home the fossion-and h may modely be predented fast, in general, forcests will be (recently) because an prototobal perturbation. These satisfies could be salar provined in the memory of TIROS: hopefully, toduced point consumption would permit radiaction. reprised. The depute of improve-ment to be expected, forward, in in the weight of the power supply camponents. components. No providen would be made in this overen for the storage of data on board the satellite. The implete mode of transmission of planases to the ground involves interrugation of tall open to anothers. Since the TIBOS solution survey the same region at best once cach. 24 hours, attention his been focused largely on forecasts of that period. For these short-range forecasts, the the setellite by a presend station be-math it. This could ensure it to take value of the satellite meteorelispical much it. This most come is to type a single picture, or possibly a ac-symmer of pictures, to be directly taking have been used unlike to the faster, a ground station outd obtain a directed use of the clouds in the strengthere for a dis-tance of the strengthere for a disobserver is almost self-advices. The platents show graphically the cy-closes, bonts, and other responses tourological features of consuperior. in forecasting. They are shown so-clearly that a monaic of TIBUS pictarke of 1,000 or more miles around it, which is ample coverage for shorttores has been rolled a "sell-ans-band washist map." For forcasts for parkads thorn for a force of the second s range forecosting. Assembly of mstations could give very nearly com-plete coverage of the globe. The frequency at which such ob-enrations could be made would be entermined by the number of saidinducted against the series and a series and castar. In general, the identity of a structural alument of the atmospherlites in orbit. Because of the low orbit and absop construction, 30 art so to electricity in "optime") is pro-portional to its size. The convers-tional materialized ration/k has and interpretensives, 30 mm are collines could be in a risk charac-neously, fulface of one or a har-world are be conservedy. A correct data processor would have to keep track of the individual southan-benevers, so that each paradit sin-benevers, so that each paradit sin-benevers, so that each paradit sin-tem model house where to expect a smalless in the area for interruption. A more resourcement souther of house, been for too crosse to dokin dotally of size much semiller than major eyclosic dotants or entire frontal sys-tems. The weather radar, on the other hand, has preven itself of value cash a precipitation forecasts A more complex system of sachait or rate at heat. The auto-or satellite communications would be possible with the network of heat periods the dreamy of data correcting. provide the density of data coverage nacidal to supply detailed herecasts fying active communications take model to supply detailed between to sublikes that has been projected. It for periods of intervet to most of as this case tiltility atternightor world rectar from a control station, the in--one day down to a low hours. The stality of the materorelegical treeprior signal being school satellits in longer stage freewasting through the satellite communication in by no manus as char. The vertricenetwork to the siziality of the mete-reological settlike assigned to take of suverage of the TIROS satellace. And made it defined to using the at observation. The transmission of its televised observation, closed down to fit the capacity of the analfeasibility of the interpretation of giant-scale clead systems (cyclina-"faulies") is tires of the kupable communication channel, would range Strecast. Once we consider the problems of forecasting for periods greater rotate over the same route as the interrogation signal. Such a system would premit complete flexibility of than fire days or sa, we must abary don simple extrapolation of existing operation, since irregular but fre-quare reports could be obtained from the critic carth and he avail-

52

able at one or a number of counts intrans. The un assume rook that the resobsticiations determines by the entropy of solids. To be intracting the determines by the entropy of solids. To be intracting the determines by the entropy of solids. To be intracting the determines by the entropy of solids. To be intracting the determines by the entropy of solids of the entropy on entropy these the fouriers of the entropy of the supported. The deputy of improves that in guarral, herecasts will improve the termines the entropy of the supported. The deputy of improves

As der fremast is evens of a mention au, is auch appar fint semest depend spon the facilitation discoveries bezug mach by these whises studing the relation to between madifications on the sam and the wordhar on armh. It may such he that opecal sensers on board the theoremetipped solutions to execute the behavior of the far obtaviolet mad corey attained on the messers made orey attained on the messers pueldle.

The sub a caloud primit of the second primit of the primit of the primit of the primit of the second primit of the

for periods of lotters to interform -men day down to a lot hour of as -men day down to a lot hour of as -men day down to a lot hour of as -men day down to a lot hour of as -men day down to a lot hour of as -men day down to a lot hour of as -men day down to a lot hour of as -men day down to a lot hour of as -men day of the interpretation transformed or difference of the lot -men day of the interpretation of the lot -men day down to a lot hour of the lot -men day of the interpretation of the lot -men of the lot another of the lot -men of the lot another of the lot -men day down to a lot hour of the lot -men day of the lot hour of the lot -men day down to a lot hour of the -men day down t

THE TECHNOLOGY REVER

Smithsonian Institution Transcription Center, Smithsonian National Air and Space Museum Archives

atmospheric circulation (a "system") is proportional to its size. The conventional meteorological network has been far too coarse to define details of size much smaller than major cyclonic elements or entire frontal systems. The weather radar, on the other hand, has proven itself of value only in precipitation forecasts of an hour or two at best. The meteorological satellite, then, appears to provide the density of data coverage needed to supply detailed forecasts for periods of interest to most of us-one day down to a few hours.

The utility of the meteorological satellite in longer range forecasting is by no means as clear. The restricted coverage of the TIROS satellites has made it difficult to assess the feasibility of the interpretation of giant-scale cloud systems (cyclone "families") in terms of the long-range forecast.

Once we consider the problems of forecasting for periods greater then five days or so, we must abandon simple extrapolation of existing systems or groups of systems and consider the basic energetics of the atmosphere. Here the infrared observations of the meteorological satellite may prove of value. Techniques for using these observations for such purposes are being explored, but it is far too early to judge whether our grasp of the workings of the atmospheric heat engine is sufficient for such long-range forecasts.

As for forecasts in excess of a month or so, it would appear that we must depend upon the fascinating discoveries being made by those who are studying the relation between manifestations on the sun and the weather on earth. It may well be that special sensors on board the meteorological satellites to measure the behavior of the far ultraviolet and x-ray emission of the sun may make such far-extended forecasts possible.

After such a cautiously optimistic evaluation of the potential of the meteorological satellite the question may well arise, "Is it worth it?" But how does one evaluate man's increasing knowledge of, and control of, his environment? The economic value of accurate forecasting has been so well established that no one questions the continuous expenditure for our excellent network of conventional observations, both on the surface and in the upper atmosphere. By the use of this network, the U.S. Weather Bureau has achieved a level of proficiency of forecasting usually described pessimistically as "85 per cent accurate." It is quite impossible to estimate the value of even a small increase in that accuracy. Any substantial increase could bring enormous economic benefits.

Even if it should be found that the complex network of satellites and communications required for a full operational meteorological satellite system is not economically feasible for some time to come, we have collected a tremendous amount of new information already about the nature of the atmosphere, its storms and its clouds-and this flow of information is continuing. The new knowledge gained has already started to make itself felt in forecasting. Soon we may expect to see the quality, the scope, and the imaginativeness of weather forecasting improved to the point where the investment we have made will seem amply repaid. THE TECHNOLOGY REVIEW

Technology Review, November 1961 Transcribed and Reviewed by Digital Volunteers Extracted Apr-18-2024 10:43:41

Smithsonian Institution Transcription Center, Smithsonian National Air and Space Museum Archives



Smithsonian Institution

Smithsonian National Air and Space Museum Archives

The mission of the Smithsonian is the increase and diffusion of knowledge - shaping the future by preserving our heritage, discovering new knowledge, and sharing our resources with the world. Founded in 1846, the Smithsonian is the world's largest museum and research complex, consisting of 19 museums and galleries, the National Zoological Park, and nine research facilities.Become an active part of our mission through the Transcription Center. Together, we are discovering secrets hidden deep inside our collections that illuminate our history and our world.

Join us! The Transcription Center: https://transcription.si.edu On Facebook: https://www.facebook.com/SmithsonianTranscriptionCenter On Twitter: @TranscribeSI

Connect with the Smithsonian Smithsonian Institution: www.si.edu On Facebook: https://www.facebook.com/Smithsonian On Twitter: @smithsonian