Hearings on the Voluntary Assistance Program of the WMO

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1. Background

International cooperation in meteorology has a very long tradition of over a century, first under the International Meteorological Organization and then its successor, the World Meteorological Organization (WMO), one of the specialized agencies of the United Nations, with 145 member countries. This tradition has stemmed from the fundamental requirement for the international exchange of weather data to enable individual nations to make weather forecasts for their own territories. The United States, for example, requires global weather data to make forecasts for its territories and to support its global interests. We obtain these data through the actions of the WMO, which arranges and coordinates these exchanges.

In early 1961, after the advent of the space age, and as a result of an initiative by President Kennedy before the United Nations on the peaceful uses of outer space, the WMO established the World Weather Watch (WWW) as the principal program of the organization. The WWW is an international program to improve global weather data acquisition and communications and to improve and automate the handling of weather data and the preparation of weather forecasts for the economic benefit, safety, and welfare of mankind. The program, using the new space technology of weather satellites, was designed as an integrated global system consisting of observing, telecommunications, and data processing functions called, respectively, the Global Observing System (GOS), the Global Telecommunications System (GTS), and the Global Data Processing System (GDPS). Some of the program objectives were:

- 1) improvement in short- and medium-range meteorological forecasting for general purposes and many types of special activities, e.g., aviation, agri-

culture, shipping, fishing, transportation, hydrology, industry, recreation, etc.;

- 2) improvements in extended-range meteorological forecasts for the benefit of long-term planning of agriculture, water management, energy uses, etc.;
- 3) improvement in the timeliness and accuracy of warnings of natural disasters caused by meteorological phenomena, particularly tropical cyclones and other severe storms;
- 4) provision of meteorological and other related environmental information for understanding many aspects of environmental pollution and taking remedial action.

It has been a remarkably successful program that has, indeed, improved the world's weather services and, through such improvement, the weather service of the United States.

We have been able to increase the availability in the United States of meteorological data needed to predict large-scale weather hazards and support industry, aviation, agriculture, and other users of the nation's meteorological services. The Congress, recognizing the importance of this international effort, passed Concurrent Resolution 67 in 1968 in support of the World Weather Program.

2. Implementation of the Voluntary Assistance Program

It became apparent shortly after the program was launched that the goals of the WWW could not be achieved unless some way could be found to assist developing countries in improving their observational, communications, and data processing systems. It was clear that all countries of the world required improved observations and communications from the developing world. Just as important, it was clear that the economic development in developing countries depended on their

¹ The views presented here are the private views of the authors.

ability to improve their own weather services. The membership of the WMO includes about 100 developing countries. Weather networks and communications are particularly deficient in much of Latin America, Africa, and Southeast Asia and on remote islands. Global weather analysis and prediction cannot be satisfactorily performed without weather data coverage from these areas.

To help developing countries remedy their deficiencies and provide for full implementation of the WWW, the WMO, in 1967, established a Voluntary Assistance Program (VAP). The decision to establish such a program was taken when it was determined that other sources of technical assistance, such as that from the United Nations Development Program, were unable to fund the assistance necessary to implement an integrated global program of this kind. The VAP has become a method of assistance to developing countries to implement an internationally agreed WWW Plan, by providing equipment, expert services, and long- and short-term fellowships. Regulations establishing procedures for the VAP and setting priorities for use of funds were adopted by the WMO. These give highest priority to those facilities needed to support the global aspects of the WWW. The priority goals of the assistance program were to eliminate major deficiencies in the global observations and telecommunications and to establish Automatic Picture Transmission (APT) ground readout stations to enable countries to benefit from weather satellite data. A part of the assistance program was reserved for education and training.

The adopted procedures required WMO members to submit project proposals for remedying deficiencies in the internationally agreed WWW Plan. These project proposals are approved by the WMO Executive Committee as qualifying under the agreed procedures and they are circulated to donor countries. The donor countries determine which (ES) projects they will support. Contributions of members to a "cash" fund make it possible to support high-priority projects that no country offers to support. This is referred to as the VAP Fund.

Although there is still much to be done to improve the WWW, the VAP has been a highly successful program. It has permitted the meteorological services of developing countries the opportunity not only to participate in the WWW but also to reap the benefits from it. With use of equipment furnished through VAP, weather data are taken and forwarded through the WWW telecommunications system to internationally agreed world, regional, and national weather data processing and forecast centers. The forecast centers in turn analyze the data and transmit weather maps and forecasts to members, including the original senders of the data. The VAP makes it possible for VAP recipients and the donors to benefit. The United States maintains one of the three World Meteorological Centers (WMC) at Washington, D.C., and receives all global data, which, in turn, are processed and made available via the GTS to all WMO members (including recipients of the VAP

support) and which they may be unable to produce in their own facilities.

3. Magnitude and support of VAP

The United States has contributed \$1 500 000 each calendar year from 1969 through 1976 and \$2 000 000 in 1977. From 1968 to 1976, 50 members have contributed \$3 500 000 to the VAP Fund. Some of the 50 members are from developing countries that wanted to participate in the program but did not have the ability to contribute in equipment, services, and/or training. The total VAP contributions from calendar year 1968 to 1976 have been \$36 300 000, of which the United States has provided \$12 000 000.

Since the inception of the VAP to the end of 1976, 746 projects have been approved for circulation to members for support. Assistance has been pledged for 464 projects. To illustrate the growth of the VAP assistance and participation of the United States and the other members of the WMO, we have included a chart showing the contributions to the WMO VAP through 1976 (see Fig. 1).

4. The United States and VAP

A list of the countries and the systems in VAP, such as the GOS, GTS, and GDPS, supported through the efforts of the United States is given in Table 1.

Early in the program we concentrated our efforts on improving the collection of meteorological data on the national level and its subsequent transmission to the regional telecommunications hubs (RTHs) and then globally on the WWW main trunk communication circuit. A critical need for this support existed in South America, Central America, and Africa. Through the VAP we have provided modern single sideband transmitters and receivers for the RTH in Brazil, as well as the subcenters in Ecuador, Colombia, Venezuela, and Argentina. The results have been gratifying. We have

FIG. 1. Contributions to the World Meteorological Organization's Voluntary Assistance Program.

TABLE 1. Countries supported through the WMO VAP by the United States.

Country	Observations		Telecommunications			APT	Fellowships		Pollution Monitoring
	Surface	Upper Air	National	Regional	RTH		Short Term	Long Term	
Africa									
Botswana								X	
Burundi								X	
Cameroon		X					X	X	
Central African Empire								X	
Chad								X	
Egypt				X	X				
Ethiopia						X		X	X
Gabon		X					X		
Ghana		X					X	X	
Guinea	X	X							
Kenya				X	X			X	
Liberia		X					X		
Mali		X							
Mauritania		X				X	X		
Mauritius							X		
Morocco								X	
Niger*								X	
Nigeria						X	X	X	
Senegal		X						X	
Sierra Leone	X	X				X	X	X	
Somalia	X		X			X	X	X	
Sudan†	X		X						
Tanzania		X					X		
Togo								X	
Tunisia						X	X		
Upper Volta		X					X	X	
Zaire								X	
Zambia						X	X		
Asia & Southwest Pacific									
Afghanistan								X	X
Burma			X			X	X	X	X
India					X				
Indonesia		X					X	X	
Laos								X	
Malaysia								X	
Maldives		X					X		
Nepal						X	X	X	
Pakistan		X							
Penrhyn		X					X		
Philippines		X					X	X	
Sri Lanka						X	X		
Thailand					X	X	X		
Caribbean									
Bahamas		X				X	X	X	
Barbados						X	X	X	
Dominican Republic			X			X	X		
Jamaica								X	
Netherlands Antilles						X	X		
Trinidad & Tobago						X	X	X	
Central America									
Belize								X	
Costa Rica		X	X	X		X	X	X	
El Salvador			X	X		X	X	X	X
Guatemala	X	X	X	X		X	X		X
Honduras	X	X	X	X		X	X		
Nicaragua		X	X	X		X	X		X
Panama			X	X				X	

* A meteorological radar was installed.

† Hydrological support.

TABLE 1. Continued

Country	Observations		Telecommunications			APT	Fellowships		Pollution Monitoring
	Surface	Upper Air	National	Regional	RTH		Short Term	Long Term	
Middle East & Europe									
Greece	X								
Iran								X	
Israel								X	
Jordan								X	
Saudi Arabia								X	
Syrian Arab Republic			X					X	X
Turkey								X	
North America									
Mexico		X					X	X	
South America									
Argentina			X	X					
Bolivia		X	X	X				X	
Brazil		X		X	X		X		
Chile		X		X					
Colombia		X		X			X	X	X
Ecuador		X	X	X		X	X		
Paraguay		X		X		X	X	X	
Peru		X		X		X	X	X	
Uruguay	X		X	X		X			
Venezuela				X	X			X	

noticed a significant increase in the amount, as well as in the timeliness, of data received at the WMC in Washington, D.C. The data amounts continue to increase as more telecommunication and observing equipment is installed. In Central America, the United States, through the WMO VAP, sponsored and partially funded the establishment of a meteorological data teletypewriter circuit linking most of the countries with both send and receive capabilities. The connections of this circuit are through Costa Rica to the WMC, Washington, D.C., where the data are then exchanged worldwide.

The United States and the Latin American countries, as a result of the VAP, are obtaining tropical data previously unavailable. The National Hurricane Center in Miami uses the Central American data in the preparation of analyses and forecasts of tropical storms and hurricanes.

In Africa, the United States VAP has also provided weather data telecommunications improvements similar to those in Latin America. We have provided high-powered high-frequency single sideband radio equipment, as well as the associated teletypewriter terminal equipment for the RTH in Nairobi, Kenya. We also have cooperated with other WMO donor nations, such as the United Kingdom and France to improve some of the telecommunications subcenters. We are currently involved in upgrading telecommunications equipment in Cairo so that the data processing and telecommunication switching computers can operate effectively.

In addition to using the VAP to improve WWW telecommunications, we provided assistance for facilities to

obtain upper-air and surface weather observations. Between 1972 and 1976, we implemented nine new rawinsonde stations required by the WWW Plan, complete with automatic radio direction-finding equipment (for tracking radiosondes), meteorological data recorders, and, in most cases, the necessary communications and vital backup power sources. Activating these stations in remote parts of the world and keeping them operating are difficult tasks. It has, however, been very rewarding, as the data from these stations have entered the global data pool. They are now being used in daily analysis and forecasting at the WMC, Washington.

One of the most rewarding aspects of our VAP support has been in the provision to developing countries of satellite ground receiving stations (APT systems). These ground receiving stations have permitted the direct use of satellite weather data by developing countries for the protection of their people against weather hazards such as tropical cyclones. They are also very useful for short-range forecasting to support the economic development of these nations. The humanitarian benefits to all peoples have been widely recognized.

Initially, we activated 24 APT ground stations in Latin America, Africa, and Southeast Asia. We chose a very inexpensive system and one that could be easily maintained in order to provide as many countries as possible with this equipment. Now, due to changing satellite technology, and because many of the stations have become outmoded, we plan to replace these sets in time for use with the new, soon-to-be launched TIROS-N series orbiting satellite. The new systems in-

stalled in the Western Hemisphere within radio range of the satellite are also designed to receive weather data from U.S. geostationary satellites. We anticipate major new benefits, both to the United States and to recipient nations, as a result of these installations. The weather facsimile transmission capability of the geostationary satellites will be used to transmit weather charts now sent by radio. The radio weather chart facsimile transmissions now made by the United States to other nations are not as effective as required, and the use of the satellite for this purpose will be welcomed by the meteorological services in the Caribbean and Latin America.

For the calendar year 1977-78 programs, the United States is placing major emphasis on improving observing and telecommunications programs for the Global Weather Experiment (GWE). This experiment is the most comprehensive attempt to place the global atmosphere under observation. The nations of the world plan to deploy an unprecedented system of 5 geostationary and 2 polar-orbiting satellites, fleets of aircraft and ships, and networks of ocean buoys during 1979. The purpose of the experiment is to provide the data for extending the time range of weather forecasts. The VAP is being directed as a matter of highest priority to obtain upper-level wind data from the tropics and Southern Hemisphere. Fourteen wind-finding radars have been purchased for installation at tropical stations. Six of these systems are already operational in South America and Africa, with the remainder to be installed by the end of calendar year 1978. One of these systems will be installed on a remote island in the mid-Pacific and another will be installed on an island in the Indian Ocean. Both of these stations are particularly critical to

the GWE because of the scarcity of data from these areas. In addition to support for the experiment, the upper-air data from the 14 wind-finding radars will provide the WWW with invaluable day-to-day operational data.

To further assist developing nations in improving the quality and reliability of their weather observing and communications programs, the United States, through VAP, has provided expert technicians to provide on-the-spot assistance to nations in Central and South America in the installation and maintenance of observing and telecommunications equipment. The VAP has also been an important means for providing both short-term training programs for foreign nationals at the National Weather Service's training facility in Kansas City and long-term fellowships for more basic training in meteorology.

Although there are other WWW activities for which the United States has provided VAP support, we feel that the information presented here gives a good cross section of our effort. This has been an excellent and effective VAP. It has been targeted to achieve certain specific weather objectives that benefit both the United States and the recipient nations, as well as all nations of the world. We believe this program should be maintained and, if possible, expanded to provide assistance to developing nations for other important meteorological and hydrological activities. There is now underway an international effort to develop a World Climate Program, aimed at reducing the vulnerability of nations to climate changes. We believe the VAP could make a major contribution to this world effort and consideration should be given to expanding it to encompass the needs of that program. ●

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Satellite imagery for TV weathercasters

The National Oceanic and Atmospheric Administration (NOAA) is making satellite imagery available to the public media through an extension of the GOES-Tap service provided by NOAA's National Environmental Satellite Service (NESS) since 1975. The new service helps meet special needs of the public media, providing 28 images from NOAA's East Coast GOES (Geostationary Operational Environmental Satellite) and 16 from a similar satellite that views the West Coast. The imagery available was selected after discussions with public media representatives and includes several full disk infrared images, as well as sectors of the full disk covering the 48 contiguous states, the western, eastern, and central

portions of the country, and Alaska and Hawaii. The imagery schedule will be reviewed semiannually.

Presently available only at the Washington Satellite Field Services Station through a dedicated telephone circuit, the new service also makes available to subscribers the entire series of imagery received by that station. Future plans are to include the even broader range of imagery available from the NESS Washington GOES Central Data Distribution System. Current fee for the service includes an initial cost of \$1000 and an annual charge of \$100, in addition to telephone line costs. Details on both the new public service and the basic GOES-Tap service are available from the National Environmental Satellite Service, Washington, D.C. 20233 (tel: 301-763-8051).

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