PN-ABJ-582
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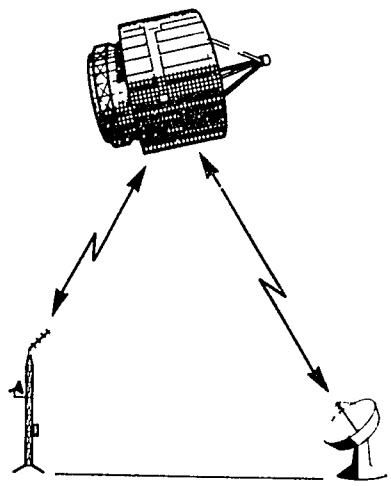
Final Report

U.S. GOVERNMENT INTERAGENCY CONFERENCE ON DEVELOPING PREDICTIVE CAPABILITIES FOR DISASTER EARLY WARNING WORLDWIDE

Sponsored by
Agency for International Development
July 15-16, 1985



AUGUST 1985

Office of U.S. Foreign Disaster Assistance
Washington, DC 20523
Contract No. PDC-1406-03-4116-00 Work Order No. 3

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CONTENTS

I.	INTRODUCTION	1
II.	CONFERENCE BACKGROUND	1
III.	CONFERENCE OBJECTIVES	2
IV.	TECHNICAL DESIGN OF THE CONFERENCE AGENDA	3
V.	CONFERENCE PROMOTION AND RELATED SUPPORT ACTIVITIES	4
VI.	CONFERENCE SUMMARY	5
VII.	CONCLUSIONS AND RECOMMENDATIONS	7
APPENDIX A:	LIST OF MEETINGS WITH PRESENTERS/PANELISTS	15
APPENDIX B:	LIST OF CONFERENCE ATTENDEES	16
APPENDIX C:	SUMMARY OF INTRODUCTORY SPEECHES AND PRESENTATION ABSTRACTS	21
	Predictive Capabilities for Disaster Early Warning - J.W. Becton, Jr.	22
	Opening Remarks by Mr. Horner to the Interagency Conference on Development of Predictive Capabilities for Disaster Early Warning	26
	NOAA/NESDIS Contribution to African Drought Early Warning and Technical Assistance - Louis T. Steyaert	27
	Recent Volcanism and Early Warning on the Global Scale - Lindsay McClelland	28
	Severe Storm Monitoring and Disaster Alert in Bangladesh and Fiji - James C. Dodge	29
	OFDA Operational Tropical Cyclone Threat Assessment Program - Ted L. Tsui	30

I.

INTRODUCTION

The purpose of this report is to summarize the planning and implementation activities carried out by the Environmental Research Institute of Michigan (ERIM) in support of the U.S. Government Interagency Conference on Developing Predictive Capabilities for Disaster Early Warning Worldwide. The Conference, sponsored by the Agency for International Development (AID) Office of U.S. Foreign Disaster Assistance (OFDA) in cooperation with the AID Bureau of Science and Technology and the U.S. Department of State Bureau of Oceans and International Environmental and Scientific Affairs, was held on July 15-16, 1985 at the U.S. Department of State, Loy Henderson Hall Main Conference Room.

ERIM's expertise in the process of educating U.S. government and non-U.S. government officials about satellite-based technologies through an international series of workshops and conferences, as well as its expertise in applications activities, i.e., determining how satellite-based technologies might best be applied, particularly in developing countries, led to an Indefinite Quantity Contract Award with AID during the past year. ERIM's experience, as well as its close working relationship with AID led to OFDA's request that ERIM provide technical assistance for the aforementioned Conference. ERIM carried out this task by assisting with the planning and implementation of the technical agenda, by assisting with Conference promotion and related support activities, and by providing a series of recommendations based on conclusions drawn at the Conference. These activities are discussed in more detail below. Recommendations for further action are outlined in the final section of this report.

II.

CONFERENCE BACKGROUND

During preparations for the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space in 1982, the U.S. Delegation proposed a meeting to address ways in which satelite-based early warning systems could assist in the prediction and mitigation of floods, famine, severe storms, tsunamis, and earthquakes. The original language of the initiative included satellite-based data transfer and disaster telecommunications systems. Scientists and decision-makers from developing countries were to participate, in order to provide them with an orientation regarding state-of-the-art disaster early warning technology available and suitable for operational implementation worldwide.

OFDA, under the Foreign Assistance Act of 1961, as amended, has the mandate to plan, coordinate, and support U.S. government efforts in

foreign disaster prediction and contingency planning assistance, and was thus the appropriate U.S. government agency for carry the initiative forward. For this reason, OFDA supported a policy analysis study, entitled Global Disaster Early Warning System Policy Planning. As a result of this study and ensuing discussions, it became clear that at least two challenges to an operational satellite-based Early Warning System for natural disasters identified in the June 1984 report would have to be met before a meeting involving the international community could take place. These challenges were related to U.S. government interagency responsibility for dissemination of disaster warnings to appropriate agencies expected to respond, and the integration of existing systems into a working global early warning network.

In order to be responsive to the direction and goal of the UNISPACE initiative, an Ad Hoc committee was formed to further define USG goals and objectives and interagency functional interactions related to world-wide monitoring and warning of disasters. Deliberations of the Ad Hoc committee led to the concept of convening this first U.S. Interagency Conference, supported by M. Peter McPhearson, AID Administrator, and the President's Special Coordinator for International Disaster Assistance.

III.

CONFERENCE OBJECTIVES

The specific objectives of the Conference were most clearly stated in the opening remarks of Mr. Paul Krumpe, OFDA Technical Advsior. They were as follows:

1. To increase the awareness of the U.S. technical agencies concerning the U.S. Government foreign disaster assistance program policies and direction, as well as the components of our evolving operational global monitoring and early warning network.

2. To explore the ways and means whereby the U.S. technical agencies can better apply their expertise and program activities toward real-time or near real-time integrated strategies for disaster warning, avoidance, preparedness and mitigation overseas.

3. To solicit the views, inputs, constructive ideas and cooperation of those in attendance in orer to accelerate the process of formalizing a U.S. Government interagency network of agencies and individuals for worldwide disaster monitoringg and early warning of potential or imminent natural disasters.

4. To stimulate and produce an interagency dialogue on disaster warning at the global scale which will help guide AID in determining the kinds of effective programs we should engage in to better assure the saving of lives and property in the developing world.

IV.

TECHNICAL DESIGN OF THE CONFERENCE AGENDA

Initial planning of the conference agenda took place during March and April, 1985. It was determined that, due to the significant increase in the number of satellite-based technologies capable of being applied to disaster early warning activities and the improved predictive capabilities of space-based systems, the need for information exchange was becoming ever more critical to the tasks of disaster forecasting, prediction, and early warning. But such an exchange of information would not be sufficient in itself; it would be a necessary precursor to building an interactive, cohesive network capable of bringing these technologies to bear in situations where life is threatened. For this reason, the conference was designed in two parts. Presentations focusing on relevant space-based technologies would serve as a foundation for ensuing discussions and panels. This format would allow conference participants to move beyond mere description of existing systems to analyses of the ways in which these technologies are being used and how these applications can be improved through the development of a coherent, though informal network to facilitate the use of these systems.

A list of the disaster early warning, space-based systems having the potential for incorporation in a global early warning system was developed. It was decided that Mr. Krumpe would make closing remarks on the first day, drawing together the various technologies that had been presented in the eight technical presentations and setting the stage for the second day of discussions relating to the need for increased interagency cooperation through the creation of an informal network. The network objectives are outlined below:

1. To strengthen programmatic and institutional linkages between and among AID and the U.S. technical agencies through systematic exchange of information and ideas, so as to significantly enhance the effectiveness of the existing and future AID/OFDA worldwide disaster early warning network.

2. To expand the number of participating agencies and offices which actively contribute to the network, so as to systematically increase worldwide monitoring and warning of disasters in greater numbers and specificity.

3. To focus more attention on the application of science and technology on avoiding and mitigating disasters through increased warning lead times and more appropriate interventions rather than simply reacting and responding to disasters one they have occurred.

(See Figure 1: Interagency Network for Disaster Early Warning Worldwide.)

In order to encourage a dialogue among conference participants, the second day was structured around two panel discussions, the first on Current Disaster Monitoring Capabilities and Future Possibilities; the second on Network Action for Global Disaster Early Warning.

Once the technical agenda had been set, ERIM employees set up a series of meetings with presenters and panelists in the Washington, D.C. area. The purpose of the meeting was to formally invite the participation of the contacted individuals, to discuss the Conference purpose and the nature of the presentations, i.e., results-oriented applications of the technologies to disaster early warning. ERIM employees were able to answer questions regarding the Conference and relayed suggestions and concerns back to Mr. Krumpe for consideration when Conference plans were finalized. (See Appendix A for the list of those visits.)

V.

CONFERENCE PROMOTION AND RELATED SUPPORT ACTIVITIES

ERIM was responsible for designing and printing the Conference announcement. This announcement was mailed to a target group of over 550 professionals in 15 agencies of the federal government. These agencies are the Army Corps of Engineers, Defense Mapping Agency, Departments of Agriculture, Defense, Energy, and State, Federal Emergency Management Agency, Geological Survey, National Academy of Sciences, National Aeronautics and Space Administration, National Oceanic and Atmospheric Administration, National Science Foundation, Nuclear Regulatory Commission, Office of Science and Technology Policy, and the Smithsonian Institution. The mailing list represented inputs from AID (OFDA and the Bureau of Science and Technology providing appropriate names and addresses), the Department of State (the Bureau of Oceans and International Environmental and Scientific Affairs provided relevant contacts on the Hill and in other policy-related agencies), and ERIM (names and addresses of officials with relevant government agencies in the Washington, D.C. area).

In addition to this promotion support, ERIM mailed tentative agendas to presenters and panelists, and requested specific information regarding titles of presentations, etc. for the final Conference agenda.

The final agenda was designed and printed by ERIM for distribution during Conference registration. ERIM employees assisted OFDA personnel with all Conference registration activities.

VI.

CONFERENCE SUMMARY

Seventy-one professionals from twenty-six U.S. government agencies and organizations attended the two-day Conference. (See Appendix B for the list of attendees.) All attendees received a copy of the May 1985 publication, "A.I.D. Policy Paper International Disaster Assistance" which clearly states OFDA's mandate in relation to foreign disaster prediction and contingency planning assistance.

(See Appendix C for introductory speeches given by Charles E. Horner, Dr. Jack Vanderryn, and General Julius W. Becton, Jr.; as well as a summary of presentation abstracts.) A summary of the program appears below.

Monday

8:00-12:00 am		Registration
9:00 am	Paul F. Krumpe (OFDA/AID)	Opening Remarks and Announcements
9:15 am	Charles E. Horner Deputy Asst. Sec. for Science & Technology Affairs (State)	Welcome
	Dr. Jack Vanderryn Agency Director for Energy and Natural Resources (AID)	Bureau for Science and Technology Activities in Support of Disaster Early Warning
	General Julius W. Becton, Jr. Director, Office of U.S. Foreign Diaster Assistance (OFDA/AID)	OFDA Requirements for Early Warning of Potential Disasters
10:00 am	Louis Steyaert (NOAA)	Global Agroclimate/ Satellite Early Warning System for Food Shortage Forecasting
10:30 am	Coffee Break	

10:45 am	Russell Ambroziak (NOAA)	Satellite Data Analysis for Drought, Crop Production Estimation and Rangeland Monitoring in Africa
11:15 am	Jerry Hebenstreit (NOAA/SAIC)	Advanced Tsunami Warning Systems for Nearshore and Open Ocean Surveillance
11:45 am	Lindsay McClelland (Smithsonian)	Recent Volcanism and Early Warning on the Global Scale
12:15 pm	Lunch Break	
1:30 pm	David Russ (USGS)	Earthquake Forecasting, Monitoring and Location Systems in the Developing World
2:00 pm	James C. Dodge (NASA)	Severe Storm Monitoring and Disaster Alert in Bangladesh and Fiji
2:30 pm	Coffee Break	
2:45 pm	Ted L. Tsui (DOD)	OFDA Operational Tropical Cyclone Threat Assessment Program
3:15 pm	James D. Belville (NOAA)	National Weather Service Severe Storm Warning Program in the Caribbean Basin
3:45 pm	Paul F. Krumpe (OFDA/AID)	Closing Remarks

Tuesday

9:00 am	Panel on Current Disaster Monitoring Capabilities and Future Possibilities	
	Moderator	
	Lisle A. Rose	(State)
	Panelists	
	Stan Schneider	(NOAA)
	Allan C. Ramsay	(DOD)
	Michael Matson	(NOAA)
	Robert Masse	(USGS)
	Charles H. Vermillion	(NASA)
	Irwin M. Pikus	(NSF)
12:00 pm	Lunch Break	
1:30 pm	Panel on Network Action for Global Diaster Early Warning	
	Moderator	
	Paul F. Krumpe	(OFDA)
	Panelists	
	Steve Coffman	(State)
	Lou Walter	(NASA)
	Richard McArdle	(USDA)
	Joan Hock	(NOAA)
	Ted Algermissen	(USGS)
	Tom Potemra	(OSTP)
	Don Gilman	(NOAA)

VII.

CONCLUSIONS AND RECOMMENDATIONS

1. The Conference served the purpose of increasing the awareness of the U.S. technical agencies regarding the research/operational status of space-based systems for disaster early warning. This forum led to an information exchange that will prove useful to the participants. (A few presenters/panelists interviewed by ERIM employees during the preparatory stage of the Conference had suggested that the relevant agencies were fully cognizant of such systems already. However, it became clear as the Conference progressed that there was, indeed, a real exchange of information occurring.)

2. A number of participants raised questions regarding the use of high-technology solutions in the service of disaster early warning activities (See Figure 4). However, the technical presentations clearly

indicated that there have been numerous successes in establishing a global disaster early warning system using satellite-based technologies.

3. An informal interagency network for foreign disaster early warning was favorably received by Conference participants. It was agreed that the network could provide a valuable mechanism whereby U.S. technical agencies, in cooperation with OFDA, can better apply their expertise toward operational space-based systems. A recommended name for the network is the Ad Hoc Interagency Committee for Global Disaster Early Warning Network Action.

The interagency network can be used to identify priorities for further action and to match these priorities with current and future technologies. Informality will encourage participants to analyze the weaknesses as well as the strengths of current systems. This exchange may encourage insightful idividuals within the relevant agencies to come forward with their ideas, rather than being held back by the biases of bureaucratic structures. Necessary compromises may be more easily worked out in this atmosphere and informality will tend to decrease the time required for decision-making processes. Finally, this type of network will reduce overhead during the early stages of exploration and consensus-building.

Despite these advantages of an informal network, several participants did voice concern regarding lack of available resources for the level of commitment they felt would be required. Ultimately, bureaucracies of the participating agencies will have to become involved, in order that the time and resources required of network participants are included in personnel assignments and financial decisions. It is likely that formal agreements among the agencies will be required to give the network necessary stability and authority.

4. Successful network action will require that the participating technical agencies supply data available from satellite-based early warning systems to OFDA. OFDA must then pass this information on to decision-makers responsible for carrying disaster warnings to threatened populations. However, the network objectives may not be fully successful unless the warnings are communicated to those threatened. Public awareness is not enough, disaster preparedness must include plans to protect populations through evacuation strategies and other such actions.

This interpretation of network success points out the importance of internal, interagency integration, but more importantly defines as a network task those activities that will integrate space-based technologies with a much larger community of decision-makers in the U.S. and abroad. It is important that network participants keep this in mind as deliberations continue regarding the network's purpose and its related activities.

5. Communication systems and related data management issues, including data processing and data dissemination issues were not focused on at the Conference. These issues will require careful consideration during subsequent network meetings.

6. As a result of Conference discussions, it was determined that a global volcano detection and monitoring system using remote sensing technology may be technically feasible and should be explored further by network participants. (See Figures 2 and 3.)

7. Global flood surveillance and warning should be explored by a network subcommittee to include agency representatives from the National Weather Service, U.S. Geological Survey Water Resources Division, Army Corps of Engineers, and others as appropriate.

8. The next meeting of the Ad Hoc Interagency Committee for the Global Disaster Early Warning Network is scheduled to be held on September 6, 1985 in Room 6320 of the State Department. At this meeting, OFDA could provide valuable stimulation for the group by presenting a list of major disasters, ranking their relative destructive power. (One such list is available in Natural Disasters: Acts of God or Acts of Man?, 1984.) Participants could then look at available technological opportunities in terms of the greatest needs for operational systems.

Participants may decide to implement network action by concentrating their efforts on one or two systems matched with one or two major disaster types. Perhaps this would allow for the development of a model for network action. Such a model must include all components of early warning-data collection and analysis, transfer of information from the technical agencies to the appropriate responding agencies, communicating the warning to threatened populations, and providing linkages with those responsible for evacuation and the provision of safe shelter.

Mr. Lisle Rose, OES, suggested looking at two major scenarios: (1) slowly creeping disaster; and (2) rapidly developing disaster. It is possible that two very different frameworks for network activity will be required by these two scenarios.

9. Also in preparation for the September 6 meeting, OFDA may wish to compile some basic information for attendees, as outlined below:

A. The question was raised at the Conference: What is a disaster? Certain agencies require such definitions to trigger action on data collection, release of funds for monitoring activities, etc. The example brought up at the Conference was related to famine. At what point does famine

exist? At what point do agencies identify famine as a crisis requiring network response?

B. While OFDA requirements regarding major disaster types have been compiled, it is not clear that the technical agencies understand them. Data and timeframe requirements for each disaster type should be presented to network participants.

Further attempts to provide systematic application of space-based technologies to specific disaster types will require time, energy, and resources to configure the technology in terms of OFDA requirements.

10. The concept of network action for global disaster warning addresses major challenges to a global, operational satellite-based system. The establishment of this network can build interagency responsibility for disseminiation of disaster warnings to appropriate, responding agencies and can lead to integration of existing systems. When these challenges have been met, it may be appropriate to convene a second U.S. Government conference with selected scientists and decision-makers from developing countries to incorporate foreign participation in the network.

Interagency Network for Disaster Early Warning Worldwide

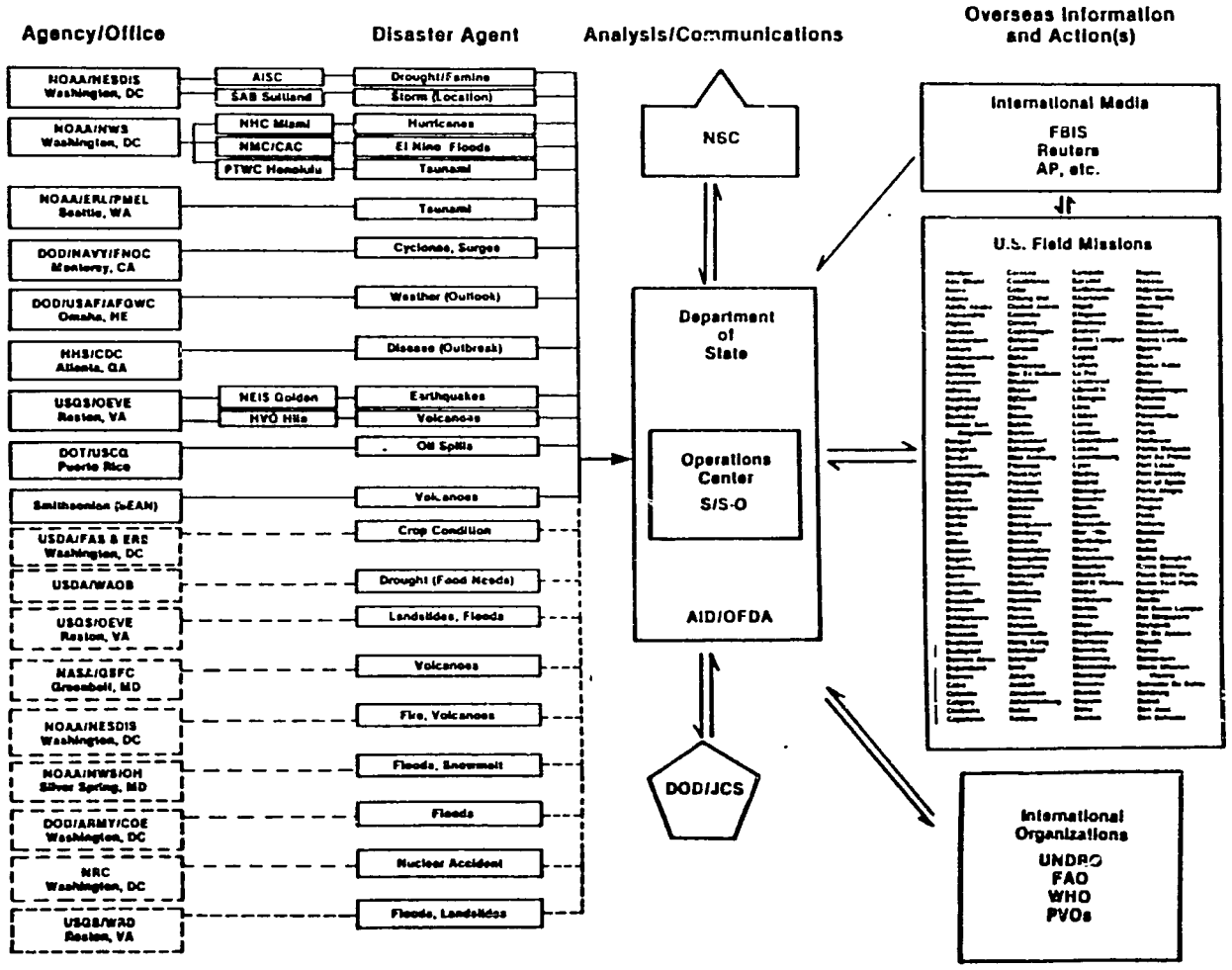

FIGURE 1

BEST AVAILABLE DOCUMENT

BEST AVAILABLE DOCUMENT

ERIM

The Need for a Real-Time Global Volcano Detection and Monitoring System

- To Notify or Warn All Key Agencies and Authorities of Potential Hazard and Disaster Imminence
- To Determine the Location, Size and Magnitude of Eruption(s)
- To Verify or Confirm Event Occurrence
- To Estimate Potential Damage Impacts
- To Initiate the Execution of Evacuation Plans
- To Forecast Future Eruptions Based on Event Frequency and Size

FIGURE 2

The Need for a Real-Time Global Volcano Detection and Monitoring System (Continued)

- To Protect High Altitude Aircraft Through Alternative Routing
- To Establish Liaison Immediately With Local Volcano Observatory and Disaster Management Officials
- To Help Classify Eruption Type and Danger Level in Phased Warning
- To Recommend Implementation of Practical Protective Measures
- To Checkout Communications Systems for Disaster Assistance and Assessment Reporting
- To Daily Re-Evaluate the Hazard Situation and Recommend Disaster Avoidance Measures

FIGURE 3

Factors Inhibiting Early Warning Technology Transfer in the Developing Countries

General Factors	Conditions in Developing Countries
1. Economic	• Labour-Intensive Society • Low Availability of Capital • Inability to Absorb Recurring Costs • Expense of International Activities • Lack of Internal Competition
2. Manpower	• Lack of Available Trained Manpower • Low Prestige of Professionals • Difficulty in Recruiting Specialists • Lack of Continuing Education
3. Physio-Ecological	• Limited Resources • Geographic Isolation
4. Cultural, Demographic and Social	• Large Percentage of Unskilled Workers • Language Barriers • Fear of Modern Technology
4. Con't.	• Inaccurate Expectations of Technology • Information-Seeking Behaviour of Scientists and Technicians
5. Political	• Unstable Governments • Need for Tight Security and Secrecy • Constantly Changing Priorities • Centralization of Decision-Makers • Lack of Scientific Impact at Highest Levels of Government
6. Existing Information Infrastructure	• Poor Quality of Telephone Service • Inadequacy of Postal Service • Tight, Stringent Customs Systems • Inability to Join Telecommunications Networks • Lack of Library and Information Standards • Insufficient Hard-Copy Collections • Absence of Sufficient Informal Information Flow

FIGURE 4

APPENDIX A

LIST OF MEETINGS WITH PRESENTERS/PANELISTS

DATE/TIME	CONTACTS
May 29 2:00 pm	Lisa Shaffer and Jeff McClure NOAA
May 31 9:00 am	Richard McArdle, Raymond Motha USDA
June 12 10:30 am	Russ Ambroziak, Louis Steyaert NOAA
June 12 2:00 pm	James C. Dodge NASA
June 13 9:00 am	Lisle Rose State Deprtment
June 18 10:30 am	Allan Ramsay DOD
June 18 2:00 pm	James Belville, William Schaeffer NOAA
June 19 11:00 am	David Russ, Mary Ellen Williams USGS
June 19 3:30 pm	Steve Coffman State Department
June 26 11:00 am	Donald Miller, Michael Matson NOAA

APPENDIX B

LIST OF CONFERENCE ATTENDEES

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APPENDIX C

SUMMARY OF INTRODUCTORY SPEECHES AND PRESENTATION ABSTRACTS

Predictive Capabilities for Disaster Early Warning

J.W. Becton, Jr.

Good Morning and welcome on behalf of the Office of U.S. Foreign Disaster Assistance. Our mission, mostly simply put, is to save lives and reduce suffering caused by disasters. Our primary function is to provide relief following a disaster's occurrence. In doing so we reduce suffering. We are constantly reminded, though, that the only ways in which we can help to save significant numbers of lives are through reducing the vulnerability of populations and through disaster early warning.

Statistically, it is clear that we have not done a very good job of helping to protect third world populations from natural hazards:

- The Swedish Red Cross finds evidence that 6 times as many people died from natural disaster in the 1970s as in the 1960s.
- The United Nations Disaster Relief Office has noted that up to 95% of deaths from natural disasters occur in less developed countries.

We may question the validity of these precise figures, but I believe we must draw two conclusions from them:

First: Burgeoning populations, forced to live in marginal or dangerous areas are becoming more vulnerable to natural hazards.

Second: Developing countries lag far behind the industrialized world in early warning technology, including basic communications systems.

It is this latter conclusion which brings us together this week. The innovative resources of the U.S. Government and private sector in early warning technologies and techniques can help disaster prone countries to save countless lives in future disasters.

I'd like to provide an example of the way in which early warning technology can be applied successfully. In 1970, over three hundred thousand people died in a cyclone which struck East Pakistan-Bangladesh.

In the late seventies and early eighties, OFDA, NOAA, and NASA transferred meteorological satellite receiving hardware to the Government of Bangladesh. Training and the development of sophisticated forecasting software were provided.

This year a cyclone of roughly the same magnitude as that of 1970 struck the coast of Bangladesh. Tragically, some ten thousand people died, but compared to the three hundred thousand who died in 1970, and considering the rapid increase in the country's vulnerable population, we can speculate that improved early warning saved the lives of many thousands of men, women and children.

There were many skeptics here in the U.S. when the idea of transferring this "hi-tech" solution to a South Asian environment was first considered. In fact, there were many obstacles to the deployment of the system. The end result is, though, that the Government of Bangladesh now maintains this state-of-the-art system and has used it effectively to protect its population from several severe storms.

Let us take a few moments to review the basic components of early warning. Hardware - the "black box" - is just one piece of a complex series of interactions which must all work together to provide effective warning. OFDA recognizes five distinct phases.

- The hardware is extremely important in the collection of data which indicates anomalous physical conditions and it must continue to be improved.

- Interpretation of the scientific data is an element in which both the decision makers and ultimately the populations which will be asked to heed the warnings must have confidence. Training in scientific analysis is an integral part of the technology transfer process.

- Decision making - whether or not to warn, and who to warn - is a critical factor which must balance a faith in the scientific evidence against the social, political and economic costs of making a wrong decision.

- Basic communications must be in place if the decision to warn is to be carried to the populations at risk.

- Basic infrastructure and evacuation planning should be in place in order to assure disaster avoidance.

- Finally, the public response is dependent on a variety of influences which include the perception and credibility of the warning received and the personal costs of the options available for seeking protection.

We are looking today and tomorrow primarily at the technological aspects of early warning and the need to better coordinate our efforts. We must always keep in mind the fact that, ultimately, from OFDA's perspective,

all the technical means and scientific acumen in this world are useless unless they serve the humanitarian needs of the populations threatened by natural hazards.

Each natural hazard has different precursors: tropical depressions; precipitation - or the lack of it; seismic gaps; radon emissions - and on and on. Each precursor lends itself to a different time frame for warning and suggests different sets of probabilities that a given event will occur in any one place. We are here to find out how technology and systems are evolving in the U.S. to meet the unique early warning requirements of each disaster type.

All of OFDA's activities are affected by the capacity to foresee what future hazards hold in store - tomorrow or five years hence. We prioritize our preparedness and mitigation activities on the basis of hazard analysis and the potential effects of future disasters on the most vulnerable populations. Training and other technology transfer activities are geared to the most likely and imminent threats. Mitigation programs are formulated on assumptions of how and to what degree future storms, earthquakes, droughts, tsunamis, volcanoes, landslides and floods will affect specific communities. Contingency planning for relief is tied to similar assumptions.

As dependent as we are on early warning, OFDA maintains no predictive capabilities of our own. We depend on the technology and techniques developed by other offices, agencies and the private sector under the guidance of OFDA. The cyclone warning system we installed in Bangladesh, the Philippines, and Fiji; the seismic monitoring network in Costa Rica or Peru; the volcano monitoring in Papua New Guinea or Indonesia; the tsunami alert system in Chile: these are possible only because of the innovative ground work to which we have all contributed.

OFDA, AID's regional bureaus and our overseas missions provide the mechanism for matching developing countries' needs for disaster early warning systems with U.S. ingenuity. It is <u>your</u> ingenuity, <u>your</u> ability to implement and train upon which we depend to make the developing world's populations less vulnerable to disasters.

A few months ago, at the Emergency 85 exposition here in Wasnington, D.C., Gilbert White suggested that by the year 2000 the world would not only face more frequent disasters, due to a fast-deteriorating ecology, but would also face new threats posed by hazards we have not yet imagined.

Collectively, we face an awesome challenge: to save lives and protect the meager resources of populations which are in jeopardy because the ideas and technical resources of the United States have not been sufficiently focused on the third world. I sincerely hope that this

conference represents our collective acceptance of the challenge. We in OFDA will do all that is possible within our resources to apply the ideas formulated during this meeting into humanitarian, lifesaving programs to the benefit of the disaster prone world.

I thank you all for providing fresh approaches to this very important problem of minimizing death and destruction caused by disaster.

OPENING REMARKS BY MR. HORNER TO THE
INTERAGENCY CONFERENCE ON DEVELOPMENT OF
PREDICTIVE CAPABILITIES FOR DISASTER EARLY WARNING
Loy Henderson Conference Room
Monday, July 15, 1985, 9:00 a.m.

Dr. Vanderryn, General Becton, Ladies and Gentlemen:

I am pleased to extend to you a warm welcome on behalf of the Department of State to this interagency conference on development of predictive capabilities for disaster early warning worldwide. As many of you know, the background of this conference was laid at the UNISPACE 82 Conference at Vienna three years ago when the U.S. formally offered to host an international conference on global disaster early warning. This conference was to focus particularly upon the needs of developing countries for predictive data and the capacity of the U.S. and its foreign space partners to supply that data from their civil space satellites. Subsequent consideration of this issue within the U.S. Government indicated how difficult it is to develop a coherent and consistently effective approach to space-based disaster early warning worldwide without falling into the traps of programmatic overlap and duplication, and ineffective or misdirected applications of satellite-derived data.

Over the next two days, under the direction of AID's Office of Foreign Disaster Assistance which holds mandated authority to develop a disaster warning program, you will begin to sort out and sort through the many problems associated with effective application of satellite data to such diverse natural disasters as tropical storms, flooding, drought and famine.

It is imperative at a time when Government services and programs must justify their expense and effort that maximum utilization be made of our civil space satellites. AID and its partners in NOAA, NASA, USGS and other agencies have begun an impressive series of programmatic assaults upon global natural disasters using satellite data. Such disasters are not only tragic in terms of loss of human life, they are also terribly costly to both the victims and to those, such as the U.S., who provide needed relief. Any and all efforts to successfully predict and effectively prepare for extensive natural disasters can be justified on both humanitarian and economic grounds. The Bureau of Oceans and International Environmental and Scientific Affairs at State welcomes the opportunity to join with all of you in helping to developing wider, more coherent and more effective means of combatting natural disasters through satellite technology.

NOAA/NESDIS CONTRIBUTION TO AFRICAN DROUGHT EARLY WARNING
AND TECHNICAL ASSISTANCE

The African food crises of 1983-84 have demonstrated the need for timely and reliable quantitative assessment of food shortage conditions induced by drought. Food security managers (donors and African recipients) require reliable information including crop production, consumption, impacts and exports, food commitments, shipments and stocks to determine food aid needs. Among these, timely and accurate crop production forecasts are essential for food aid decisions as well as domestic agricultural policies. This paper outlines how climatic impact assessment technology can contribute to several weather sensitive problem areas including the need for improved crop production forecasting within the African countries. This timely, reliable, inexpensive methodology is needed and complements other types of information systems.

In the short-term, the NOAA/NESDIS Operational Early Warning Program can be focused on the Sahel Region to produce regular special assessments for each country. Initial assessments of weather impact on crop production can be made in August 1985. This quantified, forecast information can be provided to U.S. government (USDA and AID) and host-country decision makers. The assessment technology, based on routinely available weather and environmental satellite data, can also help the countries operate their own assessment programs. These programs focus on drought monitoring and crop condition analysis. The NOAA/NESDIS system is in place and can be upgraded to achieve its maximum potential in a matter of months, given adequate funding.

The NOAA/NESDIS approach is needed and complements other information systems. For example, the area frame and objective yield estimating system, based on statistical ground surveys, is needed to generate reliable agricultural statistics. The NOAA/NESDIS system can meet immediate requirements for improved crop production forecasts until this longer-term, more resource intensive survey system is in place (August 1985 versus 2-5 years). The NOAA/NESDIS system can provide crop forecasts well before the survey results are available (30-60 days before harvesting versus at least 30 days after harvesting). Yield surveys are conducted near the end of the growing season, and the results become available after processing massive amounts of data. The two approaches are also complementary in that early season estimates of crop area based on the survey can be coupled with NOAA/NESDIS yield forecasts to estimate production. Finally, precise agricultural statistics from the ground survey system will lead to improved climate impact assessments.

Finally, the African nations must learn how to scientifically use weather and climate information. Rainfall variability accounts for as much as 80 percent of the year-to-year changes in agricultural production. Because the relationship is so strong in semi-arid regions, climate impact assessment technology will work. Rainfall data are converted into agricultural forecasts, which are essential for agricultural policymaking (imports, exports, pricing incentives, marketing strategy, etc.) and food security management. The long term goal of decreasing climate vulnerability and increasing food production also requires scientifically sound analysis based on weather and climate data. The same assessment techniques used for crop production forecasting can also significantly contribute to improving agricultural practices. The NOAA/NESDIS approach has performed successfully in each of these areas. It represents an appropriate technology that is inexpensive to develop and use.

Prepared by Louis T. Steyaert, Manager, Early Warning Program, Assessment and Information Services Center, NOAA/NESDIS, Page Bldg II, Rm. 140, 3300 Whitehaven Street N.W. Washington, D.C. 20235 (202 634-7288 or FTS 276-5283).

Recent Volcanism and Early Warning on the Global Scale

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A computerized data bank, compiled over the last 14 years at the Smithsonian Institution, allows summaries to be made of recent volcanism. However, the record of most volcanoes is poor before the last 100 years and some eruptions pass unreported even today.

The median time interval between eruptions of each volcano is a misleadingly short 5.0 years, but much longer intervals commonly precede unusually violent eruptions. For the 25 most violent eruptions in the file (with known preceding interval), the median interval is 865 years. Of the historic eruptions in this group, 50% resulted in fatalities. The interval between an eruption's start and its most violent paroxysm may be measured in months or years but is usually short. Of the 205 larger eruptions for which there are data 92 had the paroxysmal eruption within the first day of the eruption, allowing little time for emergency preparation after the eruption's opening phase.

To compare the recent vigor of different volcanic belts, we developed three measures that correlate reasonably well, serving to contrast vigorous belts such as Kamchatka and Central America with relatively quiet belts such as the Cascades, Greece, and southern Chile. However, two of the largest explosive eruptions of recent years, at Mt. St. Helens in 1980 and El Chichón in 1982, came from relatively quiet belts.

The Smithsonian's Scientific Event Alert Network (SEAN) gathers information on current volcanic activity and rapidly disseminates that information via telephone, telex, and the monthly SEAN Bulletin. Information is received from a variety of sources, including volcanologists, satellite specialists, government officials, airline pilots, and the news media. Preliminary address, geography, and specialty information for more than 800 volcanologists has been captured on computer and can be used to seek scientists with knowledge of particular volcanoes or specific monitoring techniques.

Weather satellites can be used to quickly detect plumes produced by moderate to large explosive eruptions, and to monitor the vigor of a continuing eruption. Geostationary weather satellites return data as often as every 30 minutes between 60°N and 50°S latitudes, and polar orbiters provide global coverage twice a day. However, weather clouds often obscure volcanically active regions, and volcanic plumes are frequently difficult to distinguish from common meteorological phenomena such as thunderstorms and cirrus clouds extending downwind from mountain peaks. Most volcanic eruptions produce substantial quantities of sulfur dioxide, and large concentrations of this gas can be detected by the TOMS instrument on the NIMBUS 7 polar orbiting satellite. Limited testing of this technique has revealed previously unknown eruptions at several volcanoes and helped to confirm possible volcanic plumes observed on weather satellite images. If sufficient funding were available, TOMS data could be used to generate a daily computer map of anomalous sulfur dioxide concentration, a potentially very valuable volcano monitoring tool.

Effective monitoring at the eruption site is crucial for the detection of pre-eruption activity and for following the progress of the eruption once it begins. Few of the world's volcanoes are systematically monitored, particularly in third world countries. Training programs for local volcanologists and technicians, and funding of volcano monitoring equipment would substantially improve the ability to anticipate and respond to hazardous volcanic activity. Under the auspices of UNESCO and the World Organization of Volcano Observatories, volcanologists have proposed procedures for quickly dispatching international scientific teams with monitoring equipment to sites of volcanic crises. Sufficient funding has not yet been identified for these programs. Communications between national and international agencies must also be improved if effective rapid response to volcanic crises is to occur.

Severe Storm Monitoring and Disaster Alert in Bangladesh and Fiji

by
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ABSTRACT

The USAID has sponsored the development of two important projects that will assist the responsible agencies in threatened developing countries to provide timely, accurate, and specific warnings of impending weather-related catastrophes.

In Bangladesh, NASA has implemented, with NOAA coordination, a comprehensive project to receive, process, display, and interpret relevant direct-readout satellite data from international satellites within sight of Dhaka. Since Bangladesh is frequently threatened by killer cyclones and floods, this system with the in-country warning procedures forms the basis of a capability to save literally thousands of lives each year. Additional information for flood warnings comes from a set of NASA-installed measurement platforms located at key sites along the major rivers. These platforms relay their information through orbiting satellites directly to the analysis center in Dhaka.

In addition to disaster-related warnings, the remotely-sensed data will be used for a large variety of practical applications within the various government agencies of Bangladesh. Some analyses will be directed towards assessing vegetative cover and crop development. Others will help identify good fishing areas in the Bay of Bengal. Still others will guide those concerned with managing water resources, reforestation, and new land development.

In Fiji, NASA is implementing the South Pacific Severe Storm Detection and Warning Project, a directed effort using U.S. and Japanese satellite data to locate and track tropical cyclones more accurately than before and to estimate the potential flooding depths due to the storm surge which preceeds storms of this type. Warning messages will then be sent via radio to the many small island groups of the South Pacific Ocean.

OFDA Operational Tropical Cyclone Threat Assessment Program

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Abstract

The operational tropical cyclone threat assessment program executed by the Fleet Numerical Oceanography Center for OFDA will be described. This program computes hurricane and gale force wind probabilities for 130 major cities worldwide. Additionally 2-meter storm surge probabilities are computed for coastal segments around the Bay of Bengal. Probabilities are expressed in a four tiered color code system of increasing urgency of estimated disaster threat. Probabilities are based on the storm forecasts issued by the Department of Defense (or the Department of Commerce for areas adjacent to the U.S.).

The performance of this program during the May 1985 Bangladesh cyclone will be briefly discussed.