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REPORT ON THE IMPLEMENTATION OF THE INTERDEPARTMENTAL METEOROLOGICAL DATA EXCHANGE SYSTEM (IMDES)

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FOREWORD

The OFCM publication, Standard Telecommunication Procedures for Weather Data Exchange (FCM-S3-1991), defines the methodology for linking the meteorological, oceanographic and satellite Operational Processing Centers using standard telecommunication procedures. The resulting system is called the Interdepartmental Meteorological Data Exchange System (IMDES).

This document is the fourth report on Department of Commerce, Department of Defense, and Department of Transportation implemention and operation IMDES. It is intended as a coordinating mechanism to facilitate cooperation and enhance operation of the system. It is a working document which will be revised periodically to reflect changes in architecture or changes in modes of operation.

The report was prepared by the Working Group for Communications Interfaces and Data Exchange (WG/CIDE), under the auspices of the Committee for Weather Information Systems (CWIS).

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and Supporting Research

EXECUTIVE SUMMARY

This document is the fourth in a series of reports on the design, implementation and operation of the Interdepartmental Meteorological Data Exchange System (IMDES). The participants in the system, the National Weather Service and NESDIS/Department of Commerce, the U.S. Navy and the U.S. Air Force/Department of Defense, and the Federal Aviation Administration/Department of Transportation, are acting under the auspices of the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM).

This report describes the capabilities of the IMDES nodes, the communications architecture, and the communications protocols used between the node systems. Also described are the requirements for data exchange for each of the agencies in normal and backup operations.

The IMDES was conceived as a formal structure for the routine exchange of meteorological data and for mutual assistance when one of the participants required backup in the event of operational difficulties. The IMDES has expanded in concept to include exchange of large volumes of satellite data previously exchanged through the interdepartmental Shared Processing Program (SPP).

The communications architecture for the IMDES consists of a combination of dedicated circuits and networks connecting supported agencies to the major nodes. The nodes are connected by a high-speed commercial Asynchronous Transfer Mode (ATM) service. The ATM service was initially installed by the Department of Defense (DoD) as a part of the Navy-Air Force Communications Initiative, under the direction of the Air Force Director of Weather and the Oceanographer of the Navy. This document describes the IMDES operation and agency plans for system upgrades over the next two years.

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CHAPTER 1

INTRODUCTION

1.1 Purpose.

The report documents the design and implementation of the IMDES. This report also documents requirements for the IMDES and describes or references other Federal plans or documents from which requirements are derived.

1.2 Document Description.

Chapter 2 describes the structure of the IMDES. Chapter 3 presents the overall IMDES objective and each agency's specific objectives. Chapter 4 discusses the capabilities of the IMDES nodes and describes the data format that will be used by each agency. Chapter 5 discusses the individual agency data requirements for exchange and backup. Chapter 6 presents the agency plans for the implementation of future IMDES functions at their nodes.

1.3 Other Federal Plans and Documents.

a. The Storage of Weather Product Information and the Exchange of Weather Product Messages in Gridded Binary Form (WMO Code FM 92-VII Ext), Edition (1), 1992, World Meteorological Organization: Geneva Switzerland.

b. Binary Universal Form for Data Representation (WMO Code FM 94 BUFR), 1988, World Meteorological Organization: Geneva, Switzerland.

c. ATM Forum working groups for the User-to-Network Interface (UNI), Network-to-Node interface (NNI) and Data Exchange Interface (DXI), ITU-T Recommendation 1.36.1

d. Federal Plan for Cooperative Support and Backup Among Operational Processing Centers, FCM-P14-1996, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Federal Coordinator for Meteorological Services and Supporting Research: Washington, D.C.

e. Standard Formats for Weather Data Exchange Among Automated Weather Information Systems. FCM-S2-1994, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Federal Coordinator for Meteorological Services and Supporting Research: Washington, D.C.

f. Standard Telecommunication Procedures for Weather Data Exchange. FCM-S3-1991, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Federal Coordinator for Meteorological Services and Supporting Research: Washington, D.C.

g. Applicable Documents and Standards:

MIL-STD-1777	Internet Protocol
MIL-STD-1778	Transmission Control Protocol
MIL-STD-1780	File Transfer Protocol
ITU-T Recommendation V.35	Communications Interface
ITU-T Recommendation I.22	Frame Relay
IEEE 802.3	Ethernet
IEEE 802.6	FDDI
EIA-449	Communications Interface

CHAPTER 2

IMDES OBJECTIVES

2.1 General Objectives.

a. To provide the means through which the major processing centers of the U.S. Government will exchange meteorological data for use in daily operations and for backup.

b. To implement the specific requirements defined in the Federal Plan for Cooperative Support and Backup Among Operational Processing Centers, FCM-P14-1996.

2.2 Operational Objectives.

a. To provide the communications architecture, front-end processing capability, and procedures to allow the major processing centers to exchange meteorological, oceanographic, and satellite data.

b. To define the data volume, delivery requirements, and data formats used among major processing centers.

2.3 Backup Objectives.

a. To provide the communications architecture, front-end processing capability, procedures, and data storage to all major processing centers to backup each other.

b. To define data volume, delivery requirement, data formats, and storage requirements for one major processing center to backup another.

c. To implement specific backup requirements as defined in FCM-P14-1996.

CHAPTER 3

DESCRIPTION OF IMDES

3.1 Introduction.

This chapter describes the structure of the IMDES and presents a brief discussion of the structure of each of the agencies' front-end processing systems that function as IMDES nodes.

3.2 IMDES Structure.

Figure 1 depicts the four primary IMDES nodes and the five secondary nodes. An IMDES primary node is an agency which has, as a part of its mission, the requirement to provide substantial amounts of unique environmental data to other agencies of the U.S. government. Primary nodes are usually interconnected with a high-speed (56 kbps or higher) communications network. An IMDES secondary node is an agency which, to a more limited degree, provides unique environmental data to other U.S. Government agencies. Secondary nodes do not have the data volume requirements to justify connecting to a high-speed communications network.

3.2.1 Fleet Numerical Meteorology and Oceanography Center (FNMOC).

FNMOC is located in Monterey, California, and is a third echelon command reporting to the Commander, Naval Meteorology and Oceanography Command (COMNAVMETOCCOM). The FNMOC mission is to provide responsive quality meteorological and oceanographic (METOC) automated numerical guidance and information to Navy and other Department of Defense activities worldwide to increase safety of forces and to optimize the use of platforms, weapons, sensors and facilities. FNMOC provides real-time global METOC analyses, forecasts, and data for use in support of all elements of fleet sensors and weapons systems. FNMOC is the Numerical Weather Prediction (NWP) processing center for the DoD. FNMOC is connected to the other major environmental processing centers and is a primary IMDES node.

3.2.2 Air Force Weather Agency (AFWA).

AFWA is located in Omaha, Nebraska. The AFWA mission is to build the world's most comprehensive weather database and apply the information in real time to satisfy the operational requirements of the National Command Authorities, Department of Defense, combat forces of the U.S. Air Force and Army, and the multimillion-dollar, weather-sensitive Air Force Precedence 1-1 programs controlled by the Secretary of the Air Force. AFWA is the Satellite Processing Center for the DoD. AFWA is connected to the other major environmental processing centers and is a primary IMDES node.

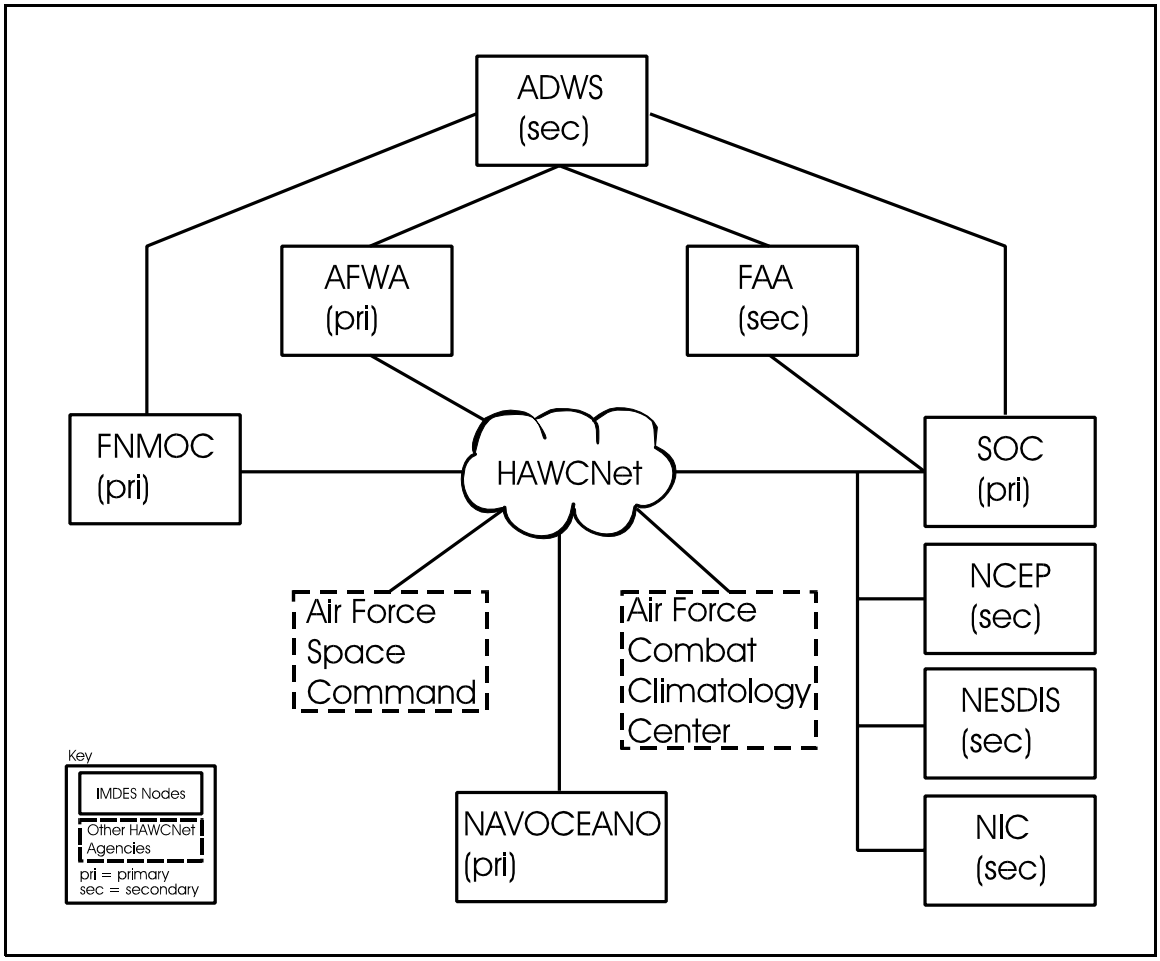

Figure 1 IMDES Structure

3.2.3 National Weather Service Systems Operations Center (SOC).

The SOC is located in the NOAA complex in Silver Spring, MD and is the hub for NOAA communications. The National Weather Service Telecommunication Gateway (NWSTG), a facility operated by the SOC, is the interface to the World Meteorological Organization (WMO) Global Telecommunication System (GTS) for the U.S. Government. The NWSTG receives atmospheric and oceanographic observations, forecasts, and other data from WMO member nations. These data are stored by the NWSTG and forwarded to other departments of the government. FNMOC and AFWA receive data from the NWSTG. The IMDES includes the NOAA metropolitan network at the SOC which connects other NOAA agencies in the Washington, D.C. The SOC is a primary IMDES node.

3.2.4 Naval Oceanographic Office (NAVOCEANO).

NAVOCEANO is located at Stennis Space Center, MS and is the Navy's center of expertise in global and littoral oceanographic data collection and oceanographic products. These data include sea surface temperature, bathymetry, ocean currents, water clarity, sea floor bottom sediment, hydrography, coean modeling and prediction. NAVOCEANO is also the primary government center responsible for surveying ocean topology. NAVOCEANO provides all of the oceanographic data to operational DoD units. NAVOCEANO is a primary IMDES node.

3.2.5 Automated Digital Weather Switch (ADWS).

The ADWS is located at Tinker AFB, OK and is the central database for observational data and text messages for DoD. ADWS Tinker, along with ADWS Croughton, UK and ADWS Hickam AFB, HI, provide observational data and meteorological products obtained from the SOC to all DoD weather processing centers, bases, deployed units, and ships at sea. ADWS Tinker is a secondary IMDES node.

3.2.6 National Centers for Environmental Prediction (NCEP).

The NCEP, located in Suitland, Maryland, is the major weather processing center for NOAA. NCEP runs atmospheric prediction models which provide data for the NWS offices throughout the U.S., for the Federal Aviation Administration, and other domestic and international agencies. NCEP is the backup processing center for FNMOC. NCEP is connected to the other major environmental processing centers through the SOC. NCEP is a secondary IMDES node.

3.2.7 National Environmental Satellite, Data, and Information Service (NESDIS).

The NESDIS is located in Suitland, Maryland, and is the organization responsible for processing meteorological satellite (METSAT) data for NOAA. METSAT data collected by NESDIS is relayed in real-time and near real-time to other U.S. government agencies. NESDIS supplies satellite data that was previously exchanged through the Shared Processing Program to other IMDES nodes. NESDIS is a secondary IMDES node.

3.2.8 Federal Aviation Administration (FAA).

The FAA Weather Message Switching Center Replacement (WMSCR) is a dual hub facility located in Atlanta, Georgia, and Salt Lake City, Utah, and provides weather messages to FAA facilities throughout the U.S. The WMSCR is connected to the SOC through the dedicated FAA NADIN Packet Switched Network (PSN). WMSCR is a secondary IMDES node.

3.2.9 National Ice Center (NIC).

The National Ice Center is located in Suitland, Maryland. NIC is a secondary IMDES node.

CHAPTER 4

IMDES SYSTEM ARCHITECTURE

4.1 Introduction.

This chapter describes the capabilities of each IMDES node, the communications architecture, communications front-end computer systems, and communications protocols used between each node.

4.2 General Overview.

The IMDES is comprised of communications front-end processing computers, data servers, high-speed communications networks and dedicated communications circuits. These components work together to provide an automated data ingest and distribution capability for all agencies concerned. The IMDES architecture components also serve other functions within each agency.

4.3 IMDES Characteristics.

Standards have been established for communications between nodes. These standards include communications protocols, data formats, data storage and retrieval procedures, and data delivery/availability requirements. Each IMDES agency has established a Memorandum of Agreement (MOA) and, if desired, an Interface Specification (IFS), which describes each agency's obligation with regard to IMDES. Within these MOA and IFS certain factors remain constant. These include communications protocol and data format.

4.3.1 Communications Protocol.

All IMDES primary nodes will communicate using Transmission Control Protocol/Internet Protocol (TCP/IP), along with File Transfer Protocol (FTP), Hypertext Transfer Protocol (HTTP), ATM User Node Interface (UNI) or Network Node Interface (NNI) specifications, and other protocols as required to perform data exchange. Agencies may agree to push or to pull data as best suits an agency's operations. Agencies negotiate file transfer procedures including logins, directory, data retention, etc. Agencies mutually define data delivery and availability requirements, and system recovery procedures. Secondary nodes may use ITU-T Rec. X.25 access protocol for connectivity to IMDES through the primary node.

4.3.2 Data Format.

All IMDES primary nodes exchange data in Gridded Binary (GRIB) Format, Binary Universal Format (BUFR), and other WMO code formats. Specific data formats are mutually arranged by the sending and receiving agencies.

4.4 IMDES Network and Circuits.

IMDES nodes are connected by high-speed communications networks, dedicated circuits, and government networks.

4.4.1 High-Speed Communications Networks.

High-speed networks used by IMDES include the High-Speed Asynchronous Transfer Mode (ATM) Weather Communication Network (HAWCNet), implemented by DoD. The HAWCNet connects FNMOC in Monterey, CA, AFWA in Offutt AFB, NE, the SOC in Silver Spring, MD, and NAVO in Stennis Space Center, MS. HAWCNet will be replaced with the Defense Information Systems Network (DISN) ATM Service – Unclassified (DAS-U) during Fiscal Year 1999. DoD will coordinate the transition of all agencies from HAWCNet to DAS-U.

The Fiber Network Service (FNS) metropolitan area network connects the SOC in Silver Spring, MD, to NESDIS, NCEP, and the NIC in Suitland, MD.

4.4.2 Dedicated circuits.

Dedicated circuits are used to connect ADWS Tinker to other IMDES nodes. Also, all IMDES secondary nodes are connected to primary nodes through dedicated circuits.

4.4.3 Other Government Networks.

Some government departments run separate Internet compatible networks; e.g., DoD's Unclassified Internet Protocol Router Network (NIPRNET), National Science Foundation Network (NSFNet), and the Defense Research and Engineering Network (DREN). Some state sponsored networks connect universities and research institutions; e.g., the California Research and Engineering Network (CALREN). The FAA operates NADIN PSN, an X.25 network to connect their facilities and provide connections for other Government agencies. IMDES nodes may be connected to one or more of the government sponsored networks.

CHAPTER 5

IMDES DATA REQUIREMENTS FOR EXCHANGE AND BACKUP

5.1 Introduction.

This chapter describes the requirements for data exchange for each of the agencies in normal and backup operations. Agencies mutually define data exchange requirements for normal operations in Table 1 and for backup situations in Table 2. The projected date in Tables 1 and 2 is 2003.

5.2 Data Types.

The data types utilized by the agencies in IMDES include gridded data fields, other alphanumeric text, and satellite images.

5.2.1 Gridded Data.

WMO GRIB is recognized by the U.S. Government as the official standard for gridded data products, and as such, all gridded products and data exchanged among the major processing centers of the U.S. Government will be in GRIB format. The resolution of grids, orientation of grids, and other GRIB parameters will be consistent with agency data exchange agreements. All agencies will include the Grid Definition Section (GDS) on all gridded data and products.

5.2.2 Alphanumeric text.

Alphanumeric text includes both free text and coded messages in accordance with WMO and OFCM manuals on codes.

5.2.3 Satellite data.

The Shared Processing Operations Working Group (SPOWG) coordinates the exchange of satellite data between IMDES nodes.

5.3. Primary Node Requirements.

Some primary nodes have unique data exchange requirements. Solutions to these unique requirements are the responsibility of the agency or agencies involved.

5.3.1 NWS unique data exchange requirements.

Alphanumeric data and text products which must ultimately transfer through the NWSTG must not exceed 3,800 octets per file or message. Binary data (GRIB, BUFR, etc.) must not exceed 15,000 octets per file or message. Data which transfers to other NOAA agencies without going through NWSTG are not restricted. All data/products destined for the Global Telecommunications System (GTS) must transfer through NWSTG.

5.3.2 AFWA unique data exchange requirements.

AFWA will perform a gateway function to other Air Force customers. If required, the NOAA and Navy products received over IMDES will be processed and reformatted into product formats acceptable to the supported destination system. AFWA will exchange data in WMO format, FCM-S2 format, and unique binary formats under bilateral agreement. The specific types of information to be shared is identified in FCM-P14-1996.

5.3.3 ADWS Tinker unique data exchange requirements.

The ADWS at Tinker AFB, OK, currently exchanges data with three other IMDES primary nodes and the FAA's WMSCR, a secondary IMDES Node. Data formats are currently restricted to those specified in Air Force regulations. Software restrictions at the ADWS inhibit the ability to reroute data from one IMDES center to another if the products are not in the presently recognized formats or exceed the ADWS maximum product size. For the near future, ADWS Tinker will continue to exchange data through the existing FCM-S3 X.25 interface. ADWS Tinker is in the process of upgrading to an IMDES compliant (DISN compliant) network capability.

5.3.4 FNMOC unique data requirements.

FNMOC will accept and generate data in WMO formats and other formats as needed to meet mission requirements. FNMOC will exchange data with IMDES agencies in WMO formats; primarily GRIB for gridded fields and BUFR or ASCII text for alphanumeric text data. Satellite data will be exchanged in the formats as defined by the SPOWG.

5.3.5 NAVOCEANO unique data requirements.

NAVOCEANO will accept and generate data in WMO formats and other formats as needed to meet mission requirements. NAVO will exchange data with IMDES agencies in WMO formats; primarily GRIB for gridded fields and BUFR or ASCII text for alphanumeric text data. Satellite data will be exchanged in the formats as defined by the SPOWG.

5.3.6 FAA unique data requirements.

The current data requirements are for the exchange of alphanumeric data in WMO format between NWSTG and WMSCR and between ADWS and WMSCR. In the future, the WMSCR will exchange alphanumeric data, as well as vector graphic and gridded binary product data with the NWSTG. The WMSCR will adhere to WMO and FCM-S2 formats. The file/message sizes will range up to 1,000 octets per file or message. During back-up operations, the IMDES Nodes supporting FAA will provide backup support as identified in FCM-P14-1996.

DoD/FNMOC

Data Type	Send		Receive	
	Current	Projected	Current	Projected
Fields	12 GB	2.4 TB	1.6 GB	160 GB
Sat	1 GB	200 GB	5 GB	1 TB
Other(1)	3 GB	600 GB	1.4 GB	140 GB

DoD/NAVOCEANO

	Send		Receive	
	Current	Projected	Current	Projected
Fields	300 MB	1.2 GB	100 MB	100 MB
Sat	100 MB	100 MB	1 GB	2 GB
Other	100 MB	100 MB	100 MB	100 MB

DoD/AFWA

	Send		Receive	
	Current	Projected	Current	Projected
Fields	156 MB	300 MB	3 GB	6 GB
Sat	10 GB	20 GB	37 MB	50 MB
Other	0	5 GB	2.3 GB	4 GB

DoC/NWS

	Send		Receive	
	Current	Projected	Current	Projected
Fields	1.9 GB	225 GB	885 MB	104 GB
Sat	N/A(2)	N/A	N/A	N/A
Other	671 MB	6 GB	402 MB	3.5 GB

DoT/FAA

	Send		Receive	
	Current	Projected	Current	Projected
Fields	N/A	N/A	2.9 MB(4)	N/A
Sat	N/A	N/A	27.8 MB(5)	55.6 MB(5)
Other	11.7 MB(3)	N/A	5.9 MB(3)	N/A

DoD/ADWS

	Send		Receive	
	Current	Projected	Current	Projected
Fields	500 MB	630 MB	80 MB	319 MB
Sat	0	0	0	0
Other	0	0	0	0

Table 1. Routine Daily Data Types and Quantities

DoD/FNMOC

Data Type	Send		Receive	
	Current	Projected	Current	Projected
Fields	12 GB	2.4 TB	1.6 GB	160 GB
Sat	1 GB	200 GB	5 GB	1 TB
Other(1)	3 GB	600 GB	1.4 GB	140 GB

DoD/NAVOCEANO

	Send		Receive	
	Current	Projected	Current	Projected
Fields	300 MB	1.2 GB	100 MB	100 MB
Sat	100 MB	100 MB	1 GB	2 GB
Other	100 MB	100 MB	100 MB	100 MB

DoD/AFWA

	Send		Receive	
	Current	Projected	Current	Projected
Fields	156 MB	300 MB	3 GB	6 GB
Sat	10 GB	20 GB	37 MB	50 MB
Other	0	5 GB	2.3 GB	4 GB

DoC/NWS

	Send		Receive	
	Current	Projected	Current	Projected
Fields	1.9 GB	225 GB	885 MB	104 GB
Sat	N/A(2)	N/A	N/A	N/A
Other	671 MB	6 GB	402 MB	3.5 GB

DoT/FAA

	Send		Receive	
	Current	Projected	Current	Projected
Fields	N/A	N/A	2.9 MB(4)	N/A
Sat	N/A	N/A	27.8 MB(5)	55.6MB(5)
Other	11.7 MB(3)	N/A	5.9 MB(3)	N/A

DoD/ADWS

	Send		Receive	
	Current	Projected	Current	Projected
Fields	500 MB	630MB	80MB	319 MB
Sat	0	0	0	0
Other	0	0	0	0

Table 2. Backup Daily Data Types and Quantities

Notes:

General: All the numbers in tables 1 & 2 are estimates based on center specific assumptions and subjective evaluations. No attempt has been made to reconcile data quantities between IMDES nodes.

(1) Includes derived imagery products.

(2) N/A- Information was not available at time of publication.

(3) Source of data: "National Weather Service Telecommunication Gateway (NWSTG) to Weather Message Switching Center Replacement (WMSCR)", NAS-IR-90022507, Revision A, March 8, 1991, Part 1, Appendices I & II.

(4) Source of data: "National Weather Service Telecommunications Gateway To Weather Message Switching Center Replacement (WMSCR)", NAS-IR-90022507, February 27, 1987, Part 2, Appendix I.

(5) Source of data: "NAS Weather Data Communications Architecture Analysis Report", March 1996.

CHAPTER 6

IMPLEMENTATION PLANS

6.1 Introduction.

This chapter addresses implementation plans for data exchange between the various IMDES nodes.

6.2 Implementation Plans for NWS.

The NWS/OSO in Silver Spring, MD serves as the hub for Washington, DC area NOAA agencies and provides access to other IMDES nodes through the HAWCNet. NWS/OSO will be an active participant in the migration of HAWCNet to the DAS-U. Additional communications services may also be required as plans for mutual backup with FNMOC materialize and are put into place.

6.3 Implementation Plans for AFWA.

AFWA is currently a primary IMDES node and will be an integral part of the transition of HAWCNet to the DAS-U. AFWA, as the DoD center of expertise in satellite processing, will continue to provide increased satellite data capability to the IMDES centers.

6.4 Implementation Plans for ADWS.

The ADWS will undergo major upgrades during the next 2 years. Among these changes will include the capability to support modern communications protocols, making ADWS data accessible to a larger number of agencies. ADWS will continue in its role as the primary supplier of observational data for DoD. Additional communications capability may be added to ADWS as a part of this upgrade. ADWS could become a primary IMDES node as a part of the transition of HAWCNet to the DAS-U.

6.5 Implementation Plans for FNMOC.

FNMOC is currently a primary IMDES node and will be an integral part of the transition of HAWCNet to the DAS-U. FNMOC, as the DoD center of expertise in numerical modeling and weather prediction, will continue to provide meteorology and oceanography predictions to all IMDES agencies, as well as other government agencies and allies.

6.6 Implementation Plan for NAVOCEANO.

NAVOCEANO is currently a primary IMDES node and will be an integral part of the transition of HAWCNet to the DAS-U. NAVOCEANO, as the DoD center of expertise in numerical oceanography and oceanographic prediction, will continue to provide oceanography predictions to all IMDES agencies, as well as other government agencies and allies.

6.7 Implementation Plans for FAA.

FAA will continue in its role as a principal user of NWS and AFWA products and will remain a secondary IMDES node.

GLOSSARY

AFDIGS	Air Force Digital Graphics System
ADWS	Automated Digital Weather Switch
AFGWC	Air Force Global Weather Center
AFOS	Automation of Field Operations and Services
AFWA	Air Force Weather Agency
ATM	Asynchronous Transfer Mode
CAWIS	Committee for Automated Weather Information Systems
CFEP	Communication Front End Processor
CNS	Consolidated NOTAM Service
COMNAVMETOCCOM	Commander, Naval Meteorology and Oceanography Command
DEF	Data Exchange Format (FCM-S2)
DoC	Department Of Commerce
DoD	Department of Defense
DoT	Department of Transportation
DPS	Distributed Processing System
FAA	Federal Aviation Administration
FAX	Weather Facsimile
FCM-P14	Federal Plans for Mutual Support and Cooperative Backup Among Operational Processing Centers
FCM-S2	Standard Formats for Weather Data Exchange Among Automated Weather Information Systems
FCM-S3	Standard Telecommunication Procedures for Weather Data Exchange Among Automated Weather Information Systems
FLENUMMETOCCEN	Fleet Numerical Meteorology and Oceanography Center
FNMOC	Fleet Numerical Meteorology and Oceanography Center
Green Book	FCM-S3
GRIB	Gridded Binary data format
HAWCNet	High–speed ATM Weather Communication Network
IMDES	Interdepartmental Meteorological Data Exchange System
ITUT-T	International Telecommunication Union Telecommunication Standardization Sector
NADIN	National Data Interchange Network
NAVOCEANO	Naval Oceanographic Office
NWS	National Weather Service
NWSTG	National Weather Service Telecommunications Gateway
OFCM	Office of the Federal Coordinator for Meteorological Services and Supporting Research
OMB	Office of Management and Budget
PSN	Packet Switched Network
POPS	Primary Oceanographic Prediction System
Red Book	FCM-S2
SDHS	Satellite Data Handling System
SPS	Satellite Processing System

WG/CIDE	Working Group for Communications Interfaces and Data Exchange
WMO	World Meteorological Organization
WMSCR	Weather Message Switching Center Replacement