NOAA Technical Memorandum NWSTM PR-18

AN OPERATIONAL MESSAGE COMPOSITION SYSTEM USING THE N.W.S. AUTOMATIC DATA ACQUISITION SYSTEM (ADAS) COMPUTER SYSTEM

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UNITED STATES
DEPARTMENT OF COMMERCE
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I. INTRODUCTION

In some National Weather Service Forecast offices, such as WSFO, Honolulu, the usual method of message composition is as follows:

1. The forecasters either prepares on a pre-printed form, a draft of his new message or he may edit the last message and use it as the current one.

2. He then turns it over to the N.W.S. communicator for punching onto paper tape and subsequent transmission on a teletype circuit.

This procedure leaves much to be desired since the multiple handling of the message increases the possibility of errors in the final message. Also much time can be wasted if the communicator cannot read the scribbling of the forecaster or if he does read it, he reads and punches it erroneously. This coupled with the fact that a large percentage of messages must be transmitted during certain "peak" hours compounds the problem especially during periods of inclement weather when additional warnings, advisories, etc. must be disseminated.

Here at WSFO, Honolulu the requirement for rapid and efficient distribution of forecasts and messages has increased during the past four years. In August of 1975, the Federal Aviation Agency of Honolulu decided to automate its relay center in Honolulu. This weather relay center handled an exchange of international aviation traffic in the "AFTN" (Aeronautical Fixed Telecommunications Network) and messages in the "WMO" (World Meteorological Organization) formats, both international and domestic. The automation was accomplished by connecting the FAA circuitry with the Kansas City FAA computer. Unfortunately for WSFO, Honolulu, the Diamond Head relay center performed a number of manual functions, such as weather message servicing, change of heading functions, request/replay operations that could not be automated. These mundane tasks were passed onto the WSFO Honolulu communicator to perform in addition to all previously assigned duties.

To meet this challenge without increasing manpower, a simple but effective "stand-alone" system consisting of:

- a Beehive Model 3 KCRT

- a Sykes 3220 Cassette tape system

- a Fredericks Universal Converter Model 720 (ASCII to Baudot Converter)

was implemented.

Figure (1) is a snapshot of this system which is used primarily as a "back-up" at the present time. This system was shared by the forecasters in their message composition function. Through the help of this system, the single WSFO, Honolulu communicator on shift was able to handle the increased demands placed on him, during this transition stage of the FAA. Incidentally, with knowledge and experience gained from the design and implementation of this system, the author was able to assist the Alaskan Region in implementing a similar system in October 1974.

In January of 1976, WSFO, Honolulu received a computer system with time sharing capabilities. Like similar systems installed in several other WSFO stations, this system was designed primarily for the automatic interrogation of rain gauges and for supplying "back-up" for the upper air reduction program. As a supplement to these two chief functions, a message composition program was decided as one of the top priority projects by the Pacific Regional "Mini-X Committee".

This report describes the field development of a useful, cost effective message composition system. Hopefully this will help others who are involved in planning a similar system.

II. DESCRIPTION

A. SOFTWARE

The basic software package used by ADAS is "IRIS" which is an "Interactive Real-time Information System" designed to support real-time data acquisition, communication, interactive time-sharing and background processing simultaneously. The main processor utilizes Educational Data System's "Business Basic" as the main programming language. At present, all of the programs related to "MC" (as the message composition program is called) is written in Basic. There are three main programs involved in the message composition function plus several related programs. These are:

"MC" -- the basic driver that initializes the program and prepares for the accessing and transmission of the required messages. This program is written in Basic.

"SBPROC" -- a special processor written at WSFO, Honolulu by Roger Davis in "mnemonics" that enables the KCRT's to transmit the completed messages to the computer in a "block" mode at 4800 bauds.

"KCRT" -- this program written in Basic does the actual processing, storage and transmission of the completed message to the converter. It is also programmed to generate fire danger indices as required.

B. HARDWARE

The computer system is made up of 2 major parts; namely:

-- The Daconics Mini-Computer System that includes the Data General's "NOVA" 1220 computer.

-- The Automatic Data Acquisition System designed for interrogating selected rain gauges on a scheduled basis.

To the above were added:

-- Additional computer memory of 8000 locations (total - 32000 word locations)

-- an extra Diablo Series 30 Disk Drives (primarily for copying discs)

-- A Fredericks Model 702 Univeral Converter (ASCII to Baudot)

-- Three Beehive "Super-bee 2" KCRTs

A snapshot of the ADAS computer system is shown in Figure (2).

C. UTILIZATION

The four different sections at WSFO, Honolulu (public service, aviation, marine and weather service specialist) generate approximately 60 messages in a 24 hour day, 7 days a week.

At the present time (Feb 78) all of the weather forecasts, press releases as well as the major warnings are prepared routinely on the "MC" system.

Figure (3) shows the three KCRTs being used by (1) the public service forecaster, (2) the aviation forecaster and (3) the marine forecaster.

III. PROCEDURE

The system was designed for use by personnel with varying degrees of exposure to computers in general, and KCRTs in particular. The process of accessing, preparation/updating, and transmission of messages is simple and straightforward. It consists of (1) logging on (2) accessing the format desired (3) editing the format and (4) transmitting the format to the computer by pressing a single "Enter" key. The computer prefixes and appends all of the necessary teletype function codes required by the different circuits. The completed message together with all of the necessary teletype function codes are then automatically transmitted to the Fredericks Converter at 2400 bauds where it is queued into the converters 5000 character buffer. The converter then transmits the characters onto the teletype paper tape punch where it is punched at approximately 10 characters per second or 110 bauds. Because of the time sharing capability of the computer system and the additional buffer capacity in the converter, several users can transmit their forecasts into the system almost simultaneously without appreciable time delays. The punched paper tapes are then relayed on the respective teletype circuits by the communicator. Figure (4) is a flow diagram of the steps involved and Figure (5) is a snapshot of the final product ... a paper tape of the message.

The program as it exists now is capable of handling 6 different types of formats. These are:

-- Type 1. Formatted

These are formats that have "protected" and unprotected" fields that prevents a user from destroying certain standard information that is part of the format.

-- Type 2. "Free Form"

Messages that are composed using "plain language" such as found in public weather forecasts or marine forecasts.

-- Type 3. "Mixed Form"

This type contains both the "formatted" features and the "free form".

-- Type 4. Error Recovery Type

Designation given to a special type that the computer generates when a user accidentally transmits the Type 1 Format incorrectly. The output is similar to the Type 1 Format except the format feature is lost if the forecast is used as a "first guess" for subsequent forecasts.

-- Type 5. Multi-Addressees

In this type, the computer generates several sets of the same messages for relaying to different addressees.

-- Type 6. Special

Several formats require generation of a special mixture of teletype functions and text in a precise sequence for computer processing and further dissemination at the receiving end. Type 6 Formats accomplishes this generation.

Figures (6-9) shows the various types of messages produced on the "MC" system. Except for the forecasters initials which is shown as "XXX", these messages are copies of the actual ones that were transmitted.

IV. REMARKS

A. ADVANTAGES

1. The biggest advantage of a system such as this, of course, is the savings in man-power. It has been estimated that it would have required 2 additional National Weather Service communicators at the GS 5-7 levels to take care of the additional workload, that WSFO, Honolulu was taxed with in 1974. The original "stand-alone" system was instrumental in reducing the "peaky" workloads of the communicators and the advent of "MC" further helped to reduce the workload.

2. Once the system is implemented and the users become acquainted with it, they find that they can prepare their forecasts much faster and accurately than in the "old" way. Less time is wasted on the part of the forecaster in having to explain to the communicator his entries. Needless to say, the communicator finds that the system relieves him of the tedium of punching messages that requires precise alignment of columns and generation of special teletype functions.

3. Utilization of the ADAS computer system to service the message composition requirements of WSFO, Honolulu insures that there is maximum returns for our investment. (Most bang for the buck!)

B. DISADVANTAGES

1. Working with different equipment manufactured by different manufacturers often present problems when an attempt is made to "dove-tail" the separate components into one integrated system. For example, we found that the KCRTs will transmit successfully at 4800 bauds or less but not at 9600 bauds. This was learned only after much "trial and error."

2. During periods when the computer is taxed to do several things together at the same time, such as interrogating rain guages and servicing the forecasters in their message composition tasks, we find that noticeable delays in the "through-put" of messages are present. This is principally because the "IRIS" system lacks a specialized priority system found in other more sophisticated and costly systems. In the "IRIS" system, every user is treated equally...that is, each one is granted equal "time slices" irregardless of whether he is solving a complex mathematical problem involving hundreds of calculations or whether he is simply listing a computer program.

C. SIDE NOTE

1. One good test of a system is to determine how much it is missed when it is not available. At the inception of the system, most of the users were reluctant to use the "foreign" KCRTs to compose their messages. Gradually over the months this attitude has changed to increased acceptance and dependence on it. In the past if the computer was "down" for any reason, the staff would be unconcerned. However, at present, if the computer is not available during the day, constant inquiries are directed to the computer operator as to when the system will be available again.

2. It is felt that whatever measure of success this system has enjoyed can be attributed largely to the following:

- "Low pressure" selling of the system to the staff and relying instead on "pace-setters" within the staff to "sell" the system by using it themselves.

- Simple but effective system that was evolved through incorporating the suggestions of the users and supporting the system by easy to understand, easily accessible and up-to-date instructions.

- Modifying the program and removing "bugs" in the program as soon as uncovered. In other words, by providing close support to the users.

V. ACKNOWLEDGMENTS

Grateful acknowledgment is made of the following personnel for their valuable and continuous help and guidance:

1. Mr. Ed Carlstead
2. Mr. Stan Doore
3. Mr. John Shaffer and Mr. Mike Divilio
4. Engineering personnel both at WSFO, Honolulu and at Pacific Region
5. Staff at WSFO, Honolulu and especially the "pace-setters"!

APPENDIX

FIGURES (1 - 9)

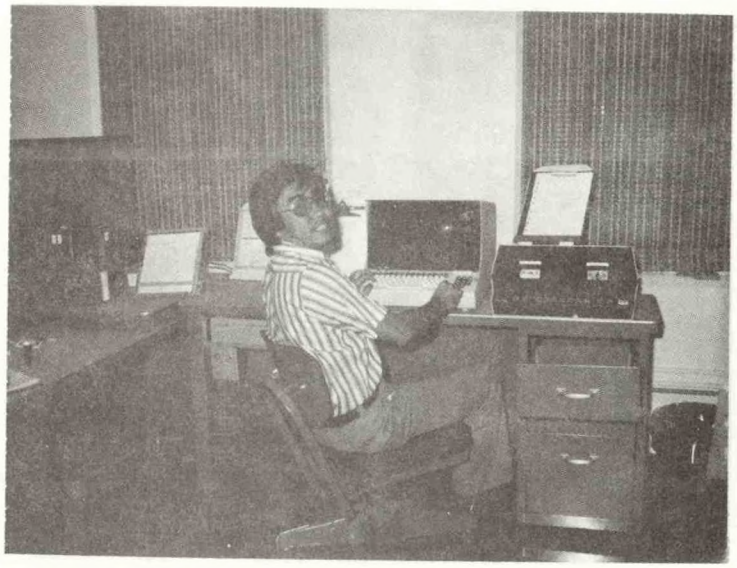


FIG. 1. Snapshot showing the "stand-alone" system used for message composition.

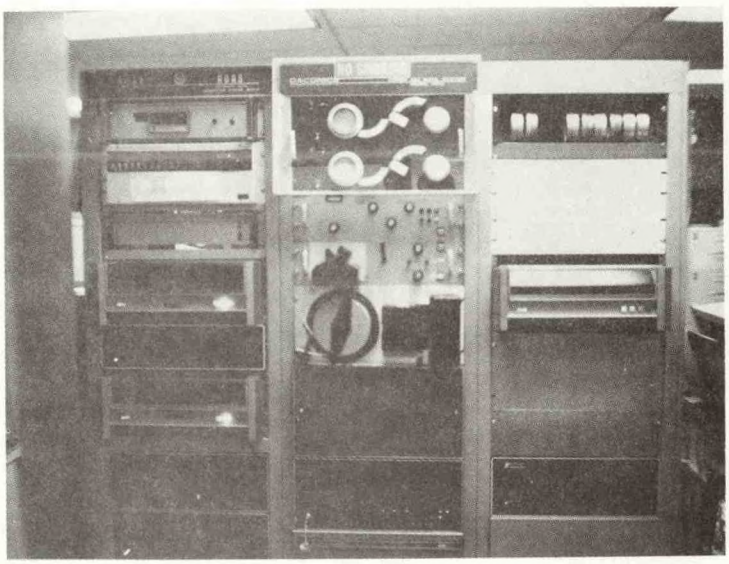
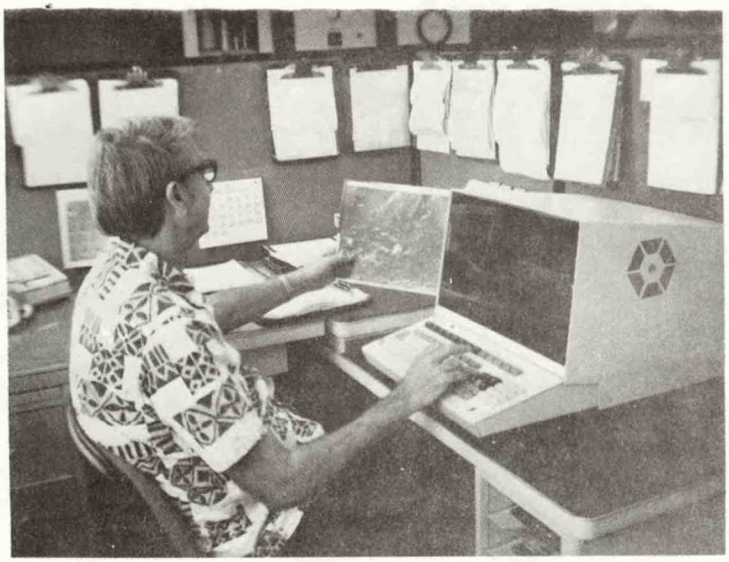
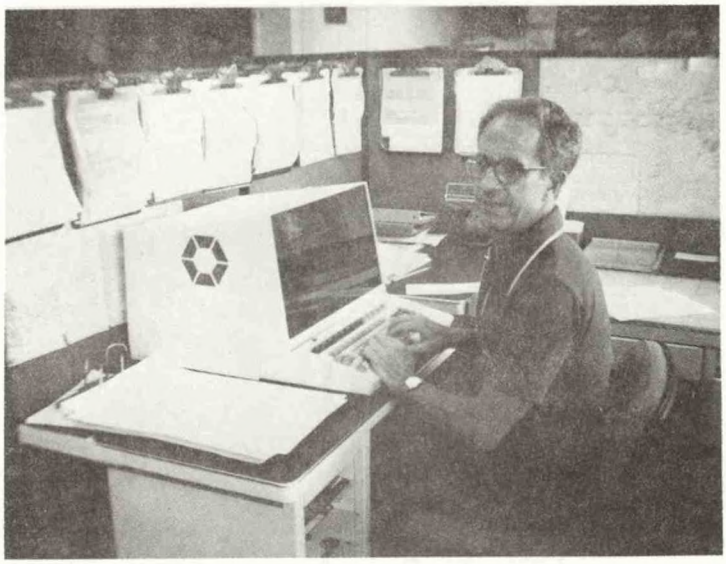


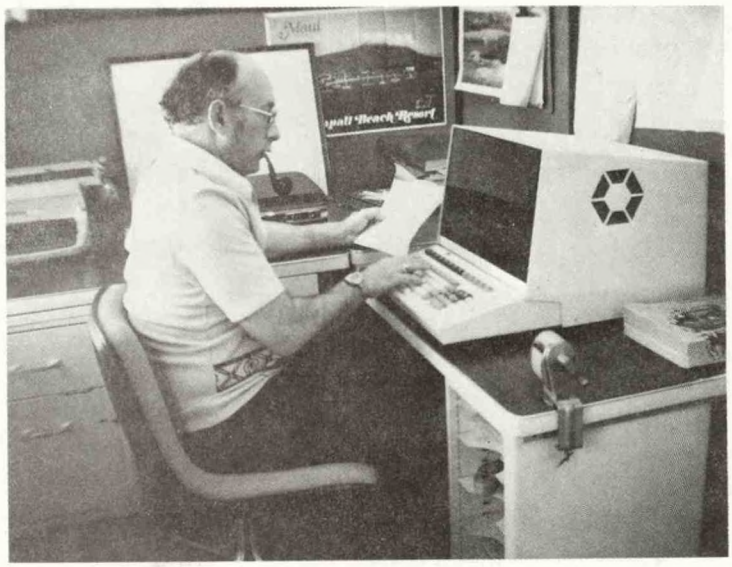
FIG. 2. Snapshot of the ADAS computer system at WSFO, Honolulu, Hawaii



(1) Public Service



(2) Aviation



(3) Marine

FIG. 3. Snapshots of the 3 KCRT's being utilized by the three different sections.

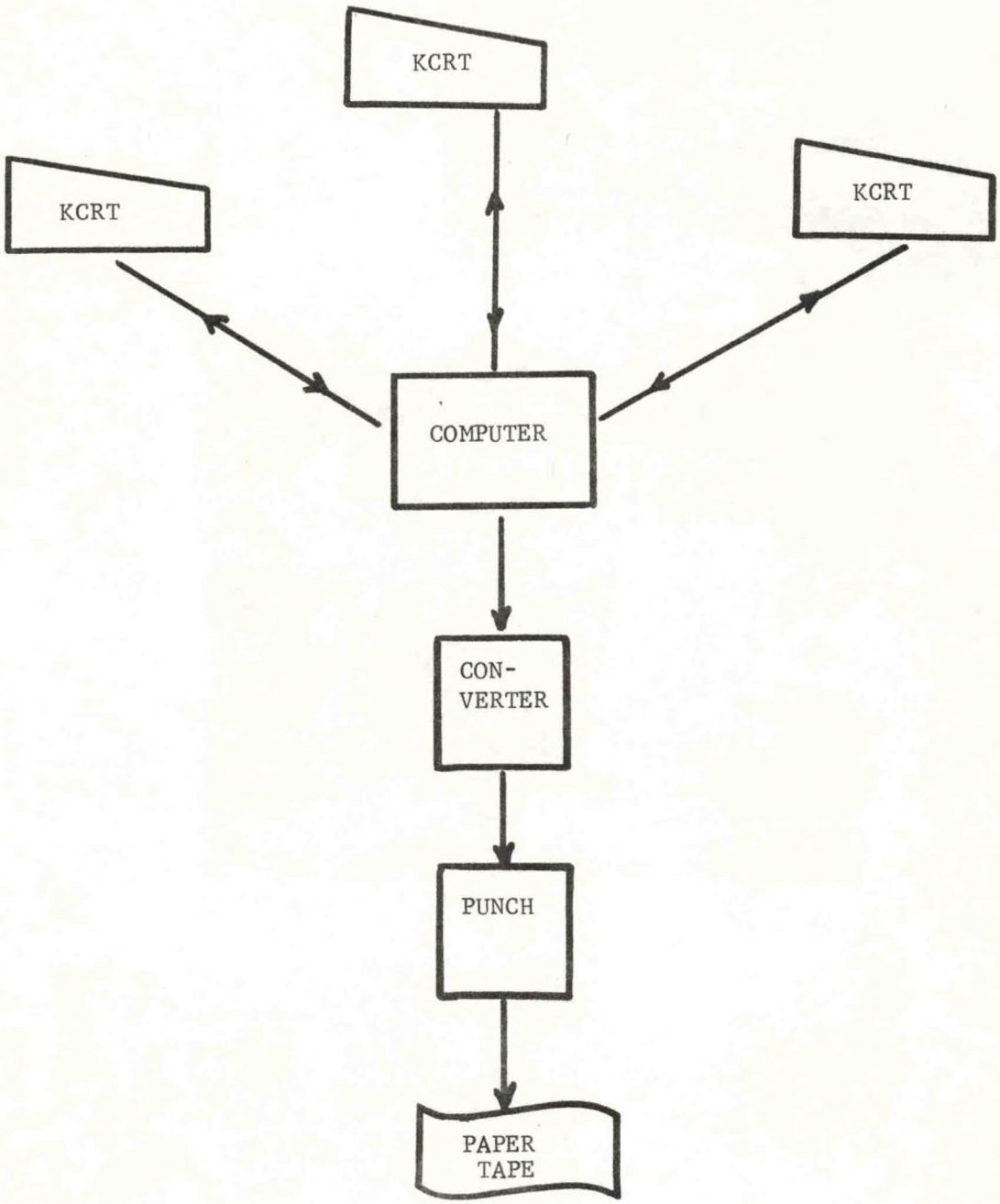


FIG. 4. Flow diagram of the message function at WSFO, Honolulu, HI.

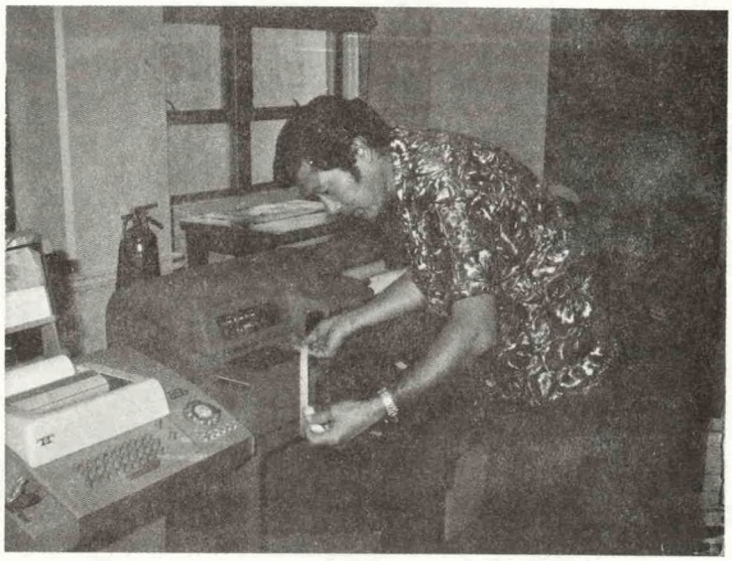


FIG. 5. Snapshot of a paper tape punched from the message composition system.

ZCZC FFF
JJ PHZHZQ
021900 PHNLYM
ENROUTE WINDS ON R/L TRACKS FOR 12 HOURS EFFECTIVE WITH DTG.

THSDS FT 33N 140W/PHNL			30N 140W/PHNL		27N 140W/PHNL	
	140W/150W	150W/PHNL	140W/150W	150W/PHNL	140W/150W	150W/PHNL
40	25035	23050	30025	23035	36025	28030
35	25030	23045	30020	23030	36020	28025
30	25030	23045	30020	23030	36020	28025
20	22025	22025	21020	23020	16025	24020

RJTT/PMDY/PHNL VIA 33.5N 160E				
	160E/170E	170E/180W	180W/170W	170W/PHNL
40	27125	31120	30090	24080
35	27125	31120	30090	24080
30	27125	31120	30090	24030
20	28065	32065	31050	23040

PGUM/PWAK/PHNL					
	150E/160E	160E/170E	170E/180W	180W/170W	170W/PHNL
40	11015	30020	31040	29065	25070
35	11015	30015	31035	29060	25070
30	11015	30010	31030	29055	25065
20	11015	07015	34020	32035	25025

PGUM/PKWA/PHNL					
	150E/160E	160E/170E	170E/180W	180W/170W	170W/PHNL
40	12025	10025	03010	32030	27045
35	12020	10020	03010	32025	27040
30	12015	10015	03010	32020	27035
20	09015	08015	03010	31015	26020

NFFN/PHNL OR NSTU/PHNL					
	05S/EQ	EQ/05N	05N/10N	10N/15N	15N/PHNL
40	24020	18015	20015	24030	25035
35	24020	18015	20015	24025	25030
30	24015	18015	20015	24020	25025
20	13010	13015	16015	18010	24020

NNNN
FCSTR XXX DTG FEB 15 78/ 953 HST

FIG. 6. Sample of a type 1 and 4 message format.

FZHW PHNL 151500
NATIONAL WEATHER SERVICE 5 AM MARINE FORECAST FOR TODAY AND TONIGHT.

PART A. HAWAIIAN WATERS OUT 100 MILES.

THERE ARE NO WARNINGS OR ADVISORIES.

RIDGE NORTH OF HONOLULU.

WINDS OVER COASTAL WATERS EASTERLY 15 KNOTS SEAS 4 FEET.
OFFSHORE WEATHER. FAIR.

CHANNEL WINDS AND SEAS.
ALL MAJOR CHANNELS EAST NORTHEAST 20 KNOTS SEAS 8 FEET. OTHER CHANNELS AROUND LANAI VARIABLE 15 KNOTS SEAS 4 FEET.

OUTLOOK FOR THURSDAY. WINDS EAST NORTHEAST 20 KNOTS SEAS 8 FEET.

PART B. WATERS WITHIN 1000 MILES OF HONOLULU.

WARNINGS. NONE.

FORECAST.

RIDGE 28 NORTH 145 WEST 25 NORTH 165 WEST AND 24 NORTH 176 WEST. WINDS 10 KNOTS SEAS 2 FEET WITHIN 250 MILES OF RIDGE.

SOUTHWESTERLY WINDS 25 KNOTS SEAS 10 FEET NORTH OF RIDGE.

EASTERLY WINDS 20 KNOTS SEAS 8 FEET SOUTH OF RIDGE.

FEW THUNDERSTORMS SOUTH OF 08 NORTH BETWEEN 150 WEST AND 170 WEST.

NNNN
FCSTR XXX DTG FEB 15 78/ 940 HST

FIG. 7. Sample of a type 2 message format showing "plain language" entries.

```
ZCZC FFF
GG NFFNYM NSTUYM NZAKYV ASRFYM ASSYQF ASSYPA NTITYM PHNLXHAO
152030 PHNLYM
FHPA1 PHNL 152100
ROFOR VALID 0024 FOR ROUTE NFFN TO PHNL OR NSTU TO PHNL FROM
05 SOUTH

01600 410010 10005 4180M05 10010 4300M31 17015 4340M41 17020
 4390M53 17025
01105 410010 10010 4180M05 99005 4300M31 19015 4340M41 19020
 4390M53 19025
01110 410010 11010 4180M07 29015 4300M30 25025 4340M40 25030
 4390M51 25035
01115 410008 10015 4180M10 31015 4300M30 27040 4340M39 27045
 4390M50 27055
01120 410005 08015 4180M12 33020 4300M30 38080 4340M39 28085
 4390M50 28095
DESCENT WIND 4180M12 33020
SIG WEA. FEW CB TOPS 450 EQUATOR TO 05N.

NNNN
ZCZC FFF
GG KSFOPA KSFOXHAO
152030 PHNLYM
FHPA1 PHNL 152100
ROFOR VALID 0024 FOR ROUTE NFFN TO PHNL OR NSTU TO PHNL FROM
05 SOUTH

01600 410010 10005 4180M05 10010 4300M31 17015 4340M41 17020
 4390M53 17025
01105 410010 10010 4180M05 99005 4300M31 19015 4340M41 19020
 4390M53 19025
01110 410010 11010 4180M07 29015 4300M30 25025 4340M40 25030
 4390M51 25035
01115 410008 10015 4180M10 31015 4300M30 27040 4340M39 27045
 4390M50 27055
01120 410005 08015 4180M12 33020 4300M30 38080 4340M39 28085
 4390M50 28095
DESCENT WIND 4180M12 33020
SIG WEA. FEW CB TOPS 450 EQUATOR TO 05N.

NNNN
FCSTR XXX  DTG FEB 15 78/ 936 HST
```

FIG. 8. Sample of format containing both types 3 and 5. Shows two sets of forecasts containing both "formatted" data and narrative entries addressed to two users.

```
ZCZC
HNL Z FI
HNL 151806 25 SCT 50 SCT 0615..
ITO 151806 20 SCT C50 BKN BRF C15 BKN 4RW. 21Z 20 SCT 50 SCT..
KOA 151806 CLR. 22Z 30 SCT C60 BKN 2610..
LIH 151806 20 SCT 50 SCT 0710..
LNY 151806 NIL..
MKK 151806 20 SCT 50 SCT 0615 AMDS NOT AVBL AFT 04Z..
MUE 151806 NIL..
OGG 151806 25 SCT 50 SCT 0615..
NNNN

FCSTR XXX  DTG FEB 15 78/ 943 HST
```

FIG. 9. Sample of a type 6 message format. This type requires special sets of teletype functions at the beginning, at the end of each line, and at the end of the message.

NOAA Technical Memoranda NWS

No. 9 Tropical Numerical Weather Prediction in Hawaii - 1971. E. M. Carlstead. March 1971. (COM-71-00494)

No. 10 Climatology of Rainfall Probabilities for Oahu, Hawaii. A. N. Hull and Jon Pitko. April 1972. (COM-73-10242)

No. 11 A Cirrus Climatology for Honolulu. Clarence B. H. Lee and Wesley Young. April 1974. (COM-74-11244)

No. 12 Straight Line Wind Variability Over Selected Stations on Leeward Oahu. Michael J. Morrow. July 1974. (COM-74-11669)

No. 13 Forecasting Hurricanes in the Central Pacific. Paul Haraguchi. October 1975. (PB-248-371)

No. 14 Trade Wind Speed Estimation at Selected Stations on Oahu Using Honolulu Wind Observations, A Pilot Study. Michael J. Morrow. February 1976. (PB-251-685)

No. 15 An Experiment in the Production of "POP" Forecasts Using a Statistical Model. G. Hirata. September 1976. (PB-260-926)

No. 16 Forecasting Floods in Hawaii (Excluding Hawaii Island). Paul Haraguchi. January 1977. (PB-265-939)

No. 17 An Operational Swell and Surf Program Using the N.W.S. Automatic Data Acquisition System (ADAS) Computer System. E. M. Carlstead. May 1977. (PB-269-650)