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NATIONAL AVIATION FACILITIES EXPERIMENTAL CENTER ATL--ETC F/G 17/2
EXECUTIVE SUMMARY: NEW YORK CITY PILOTS AUTOMATIC TELEPHONE WEA--ETC(U)
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**EXECUTIVE SUMMARY: NEW YORK CITY PILOTS
AUTOMATIC TELEPHONE WEATHER
ANSWERING SERVICE (PATWAS) TEST**

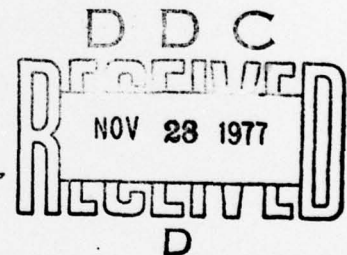
Frank Staiano

Ephraim Shochet



OCTOBER 1977

FINAL REPORT



Document is available to the public through the
National Technical Information Service
Springfield, Virginia 22151

Prepared for

**U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION**

Systems Research & Development Service

Washington, D.C. 20590

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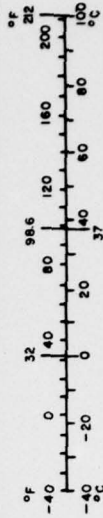
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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH								
in	inches	2.5	centimeters	cm	millimeters	0.04	inches	in
ft	feet	30	centimeters	cm	centimeters	0.4	inches	in
yd	yards	0.9	meters	m	meters	3.3	feet	ft
mi	miles	1.6	kilometers	km	kilometers	1.1	yards	yd
						0.6	miles	mi
AREA								
in ²	square inches	6.5	square centimeters	cm ²	square centimeters	0.16	square inches	in ²
ft ²	square feet	0.09	square meters	m ²	square meters	1.2	square yards	yd ²
yd ²	square yards	0.8	square meters	m ²	square kilometers	0.4	square miles	mi ²
mi ²	square miles	2.6	square kilometers	km ²	hectares (10,000 m ²)	2.5	acres	
	acres	0.4	hectares	ha				
MASS (weight)								
oz	ounces	28	grams	g	grams	0.035	ounces	oz
lb	pounds	0.45	kilograms	kg	tonnes (1000 kg)	2.2	pounds	lb
	short tons (2000 lb)	0.9	tonnes	t		1.1	short tons	
VOLUME								
tap	teaspoons	5	milliliters	ml	milliliters	0.03	fluid ounces	fl oz
Thsp	tablespoons	15	milliliters	ml	liters	2.1	pints	pt
fl oz	fluid ounces	30	milliliters	ml	liters	1.06	quarts	qt
c	cups	0.24	liters	l	liters	0.26	gallons	gal
pt	pints	0.47	liters	l	cubic meters	35	cubic feet	ft ³
qt	quarts	0.96	liters	l	cubic meters	1.3	cubic yards	yd ³
gal	gallons	3.8	liters	l				
ft ³	cubic feet	0.03	cubic meters	m ³				
yd ³	cubic yards	0.76	cubic meters	m ³				
TEMPERATURE (exact)								
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C	°C	9/5 (then add 32)	Fahrenheit temperature	°F



* 1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price \$2.25, SD Catalog No. C13.10-286.

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1. Report No. FAA-RD-77-80	2. Government Accession No.	3. Recipient's Catalog No. 11
4. Title and Subtitle EXECUTIVE SUMMARY: NEW YORK CITY PILOTS AUTOMATIC TELEPHONE WEATHER ANSWERING SERVICE (PATWAS) TEST.	5. Report Date Oct 1977	6. Performing Organization Code 12 14p
7. Author(s) 10 Frank/Staiano Ephraim/Shochet	8. Performing Organization Report No. 14 FAA-NA-77-23	9. Report Date Oct 1977
9. Performing Organization Name and Address Federal Aviation Administration National Aviation Facilities Experimental Center Atlantic City, New Jersey 08405	10. Work Unit No. (TRAIS)	11. Contract or Grant No. 131-440-810
12. Sponsoring Agency Name and Address U.S. Department of Transportation Federal Aviation Administration Systems Research and Development Service Washington, D.C. 20590	13. Type of Report and Period Covered 9 Final rept. Aug 1975 - Jul 1976	14. Sponsoring Agency Code
15. Supplementary Notes This is a two-volume report. Volume I (FAA-RD-77-80, I) summarizes the work and presents conclusions and recommendations; volume II (FAA-RD-77-80, II) contains detailed technical data. The Executive Summary (FAA-RD-77-80) presents a compendium of the NYC PATWAS Test.		
16. Abstract An improved Pilots Automatic Telephone Weather Answering Service (PATWAS) was subjected to a year-long test in the New York City metropolitan area. The improvements consisted primarily of the following: (1) user access to three route-oriented briefings, (2) an increase in the number of access lines to PATWAS, (3) more frequent updating of information, (4) the addition of special early morning recordings, (5) capability to request meteorological and aeronautical information from the Weather Message Switching Center for incorporation into the PATWAS message, (6) reduction in the time required for updating, (7) addition of more meteorological and aeronautical information to the PATWAS message, (8) new and more efficient magnetic tape equipment, (9) installation of an acoustic enclosure for PATWAS tape recording, and (10) more efficient organization of the message format. The purpose of the experiment was to test and evaluate the new PATWAS products, schedules, user acceptance, and the effects on the telephone briefing workload at the flight service station (FSS). In addition, the test permitted the gathering of technical performance data which could serve as the basis for a new, consolidated, national system for the mass dissemination of weather information. It is concluded that the improved PATWAS disseminates more weather information, reduces FAA/NWS telephone briefer workloads, is preferred over the basic PATWAS, and is acceptable to the general aviation public.		
17. Key Words Pilots Automatic Telephone Weather Answering Service Preflight Weather Briefing Weather Information	18. Distribution Statement Document is available to the public through the National Technical Information Service, Springfield, Virginia 22151	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 13
		22. Price

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PREFACE

Acknowledgement is given to the following FAA/NAFEC personnel and organizations:

Mr. Louis Delemarre, ANA-230, who fabricated the data collection system for the telephone line utilization of the trial PATWAS.

Dr. Shiu-Ming Cheung, ANA-553, for the valuable assistance in providing the required programming support.

The Data Preparation Section, ANA-245, for their valuable assistance in coding thousands of PATWAS questionnaires.

The Printing and Distribution Section, ANA-524, for the expeditious printing and mailing of the PATWAS materials.

Acknowledgement is given to Mr. George Barboza, SRDS/ARD-440, for his important contribution to the conceptual design of the experiment and invaluable suggestions which served to improve the results of the test.

Acknowledgement is given to Mr. Edward Gross of the National Weather Service Headquarters for his important contribution and encouragement in the conceptual development of the test and to personnel of the National Weather Service, who not only made the experiment possible, but along with FAA personnel, assisted in conducting the test.

The professional skill of Mr. Edward Morin of the National Weather Service at La Guardia Airport is gratefully acknowledged. Mr. Morin and members of his staff helped to develop the product design and schedule and were responsible for providing the required manpower on a day-to-day basis for accomplishing the operational aspects of the test.

Acknowledgement is given to Mr. John Vandenberg of Lockheed Electronics Corporation who accomplished the test design and the analysis of data.

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EXECUTIVE SUMMARY

PURPOSE.

The purpose of this executive summary is to give a succinct account of the evaluation of a trial Pilots Automatic Telephone Weather Answering Service (PATWAS) in the New York City metropolitan area as documented in volumes I and II of the basic report.

BACKGROUND

The rapid growth in general aviation has made it necessary to improve and expand the present system for disseminating aviation weather information to the flying public. It is apparent that the projected growth of the flying public will give rise to a corresponding increase in the demand for general aviation preflight weather briefings. One of the most effective techniques currently being utilized to disseminate general aviation weather information for preflight planning is the telephone-accessed prerecorded PATWAS.

As part of the Near Term Flight Service Station Improvement Program, the Federal Aviation Administration (FAA), in conjunction with the National Weather Service (NWS), conducted the New York City (NYC) PATWAS test. The purpose of the controlled experiment was to test and evaluate trial PATWAS route-oriented briefings, products, schedules, user acceptance, the effects on the telephone briefing workload at the La Guardia (LGA) Weather Service Office (WSO), and the Teterboro, New Jersey (TEB), and Islip, New York (ISP), Flight Service Stations (FSS's), and to gather technical performance data. It was hypothesized that an improved PATWAS in the NYC metropolitan area would produce a decrease in the number and length of person-to-person pilot briefings and provide a significant improvement in the service rendered to general aviation pilots. The trial PATWAS installed at La Guardia Airport WSO provides telephone access to three tailored independent recordings at three different phone numbers. One phone number provides the local New York area (50 nautical miles (nmi) radius) conditions; the second number provides briefing information for routes northbound; and the third number provides pertinent information for routes south and westbound. The number of access lines was increased to minimize busy signals. Other improvements over the basic PATWAS system included new magnetic tape equipment, widely expanded message content, improved message format, more frequent updating of information, and reduction in the time required for updating. In order to meet the pilot's need for the latest available weather information in the early hours, presumably when he is doing his flight planning, two special early morning recordings were made available in addition to those prepared in the morning, afternoon, and evening. These messages were updated hourly, and if conditions demanded, more frequently. The new system contained the capability to request meteorological and aeronautical information from the Weather Message Switching Center (WMSC) for incorporation in the PATWAS message. Software changes were incorporated in the WMSC computers to facilitate automatic text preparation for updating the recordings.

In contrast, the content of the basic PATWAS message was limited to a generalized forecast for New York City and vicinity and a synopsis report. No route information was provided, and the message did not contain hourly weather updates, specific flight precautions, terminal forecasts, or NOTAM's. AIRMET's were not specific, and the message contained only general information on wind, with no specific heights included. The information was not updated hourly, and there were only three recordings a day.

PROCEDURE

Beginning in July 1975, pilots learned of the availability of the new trial PATWAS through an announcement appended to the basic PATWAS recording. The basic PATWAS also remained operational throughout the testing. (The terms "basic" and "trial" PATWAS have been used in lieu of "old" and "new" PATWAS, since the terms "old" and "new" are prejudicial.) Although the number of access lines was increased to virtually eliminate busy signals, the toll-free access areas to the trial PATWAS were intentionally kept the same as the basic PATWAS to allow for relative comparisons. This may account for the inappreciable effect of the trial PATWAS on ISP pilot briefings. In November, publicity brochures announcing the new experimental service were distributed to all pilots registered with the General Aviation District Offices at Farmingdale, New York and Teterboro, New Jersey. Approximately 26,000 pilots were mailed literature and also a questionnaire toward the end of the trial period (July 1975 through June 1976). The questionnaire was designed to measure the degree in which the trial PATWAS satisfied the flight-planning needs of the respondents and to determine if it constituted a significant improvement over the basic PATWAS. Appropriate follow-up efforts were made to obtain an input from nonrespondents to the primary questionnaire. In addition, a supplemental survey of 3,152 volunteer pilots was taken to measure pilot reaction to the trial PATWAS after recurrent use of the system. It was hypothesized that the supplemental survey would provide weightier opinions on the acceptability and effectiveness of the trial PATWAS.

RESULTS

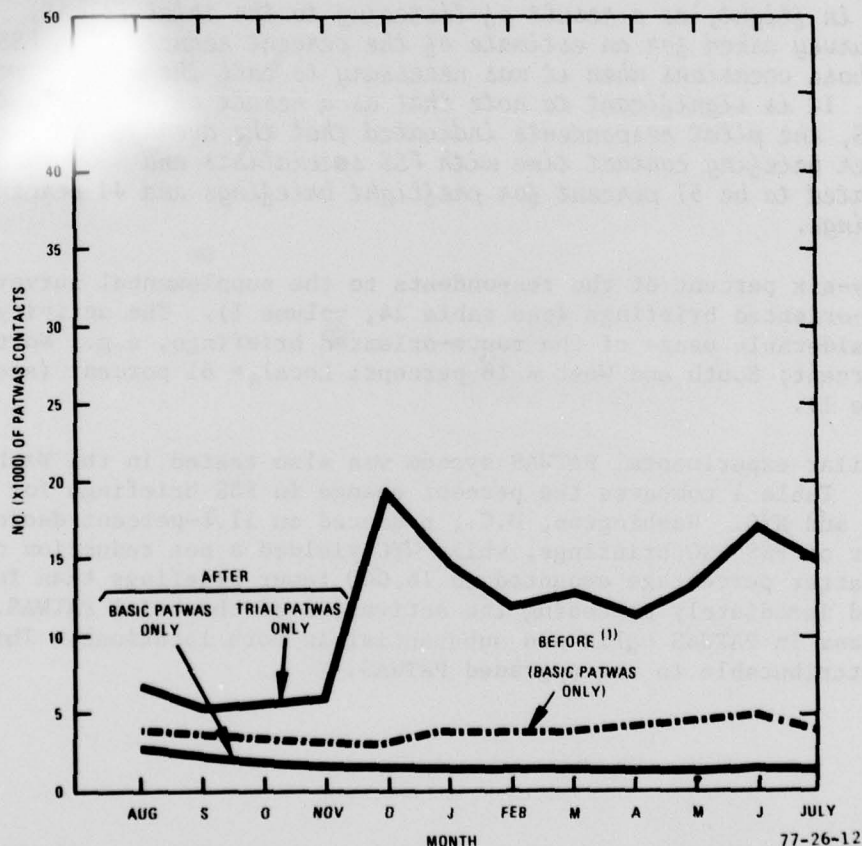
In general, the reaction to the trial PATWAS was highly favorable. The preponderant majority of the questionnaire respondents preferred the trial PATWAS to the basic PATWAS system.

Since the trial PATWAS was activated, the number of requests for weather information from the La Guardia WSO and the Teterboro FSS decreased, while the number of calls to the trial PATWAS increased. The number of itinerant aircraft departures during the test period changed only very slightly from the prior year's traffic. Thus, the increase in calls was not due to increased traffic. The number of pilot briefings decreased by 15 percent at La Guardia

WSO and 10 percent at Teterboro FSS for the year immediately after the installation of the trial PATWAS. The net reduction of pilot briefings for the above-mentioned installations amounted to 10 percent. On the other hand, the pilot briefings at Islip FSS increased by 2 percent for the same period of time.

It is apparent that similar favorable results would have been experienced at ISP if toll-free access had been provided.

From the outset, the trial PATWAS served a substantial portion of the PATWAS calls. The percentage served increased sharply during December following the publicity mailing and has remained at a very high, unprecedented level ever since. Figure 1 depicts the inordinately high number of PATWAS calls after the trial PATWAS became available. On the other hand, the amount of basic PATWAS activity has rapidly declined, falling lower, even in the first 2 full months of trial PATWAS operation, than the level reached in the prior year. A gradual decline began in October 1975 and continued until December, when a minimum service level seems to have been established at an average of 1,435 calls per month.



1. For the year immediately prior to trial PATWAS activation
2. Trial PATWAS activated July 24, 1975

FIGURE 1. PATWAS CONTACTS

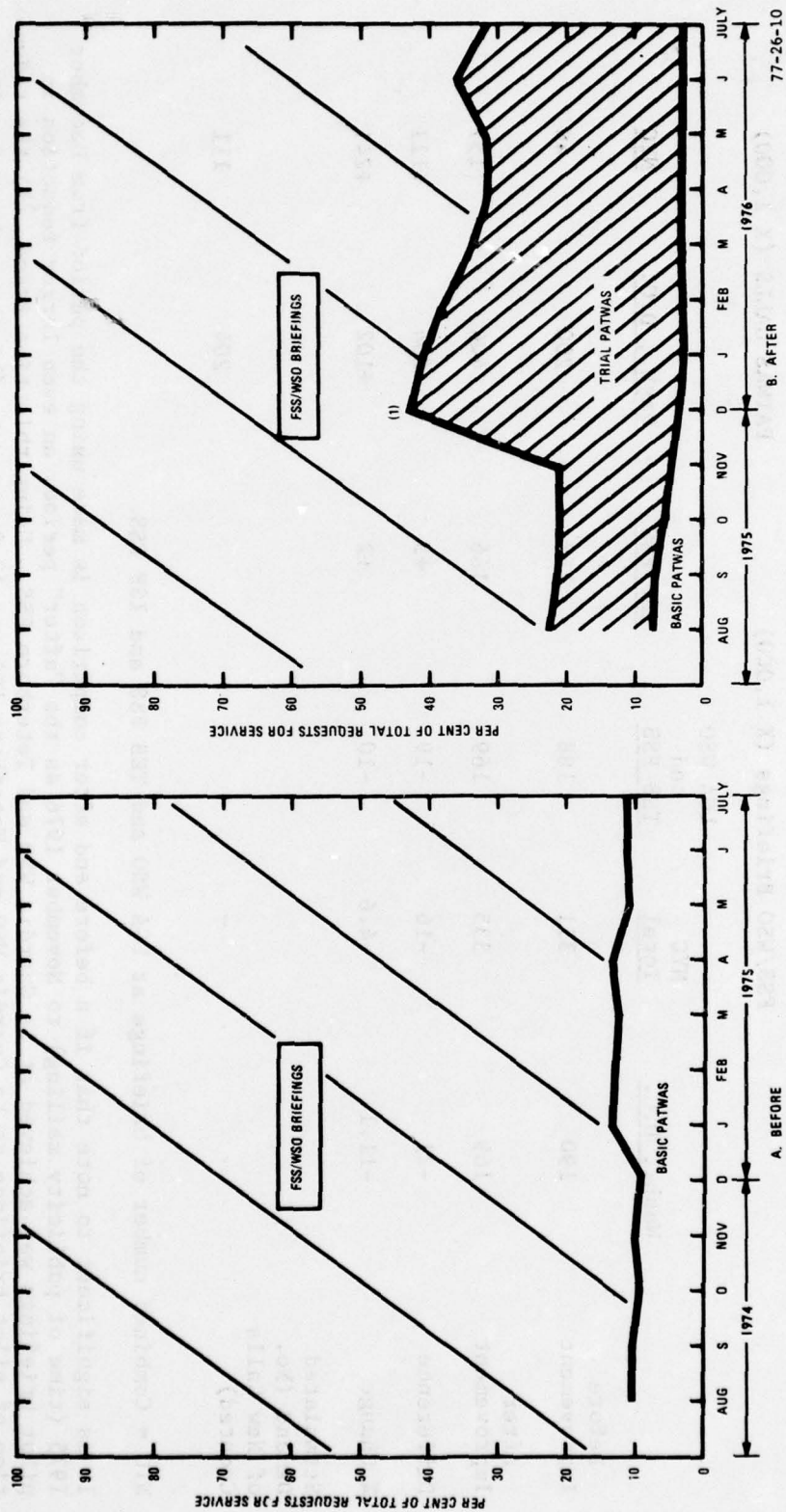
The effectiveness of the trial PATWAS was evident from the fact that it handled an average of 14,218 calls per month or 91 percent of the total number of PATWAS calls during the 8-month period from December through July. The basic PATWAS handled an average of only 9 percent for the same period of time.

Figure 2 shows that the percentage of weather information requests served by FSS/WSO personnel decreased since the trial PATWAS went into operation. The left side ("A. Before") shows that before trial PATWAS activation, FSS/WSO briefings satisfied approximately 88 percent of the requests for weather information. (This percentage and all other "Before" numbers are for the comparable period in the year immediately preceding trial PATWAS activation.) The right side ("B. After") shows that after trial PATWAS activation, briefings satisfied an average of approximately 64 percent from December on.

The supplemental survey revealed that 63 percent of the pilot response indicated that it was unnecessary to contact the FSS for preflight weather information after listening to the trial PATWAS. Sixty-seven percent of the returns indicated that it was unnecessary to contact the FSS for weather information while in flight, as a result of listening to the trial PATWAS. The supplemental survey asked for an estimate of the percent reduction in FSS contact time for those occasions when it was necessary to call the FSS for weather information. It is significant to note that as a result of listening to the trial PATWAS, the pilot respondents indicated that the average reduction in FSS weather briefing contact time with FSS specialists and WSO personnel was estimated to be 51 percent for preflight briefings and 44 percent for in-flight briefings.

Ninety-six percent of the respondents to the supplemental survey preferred the route-oriented briefings (see table 24, volume I). The activity data reflected a considerable usage of the route-oriented briefings, e.g., North and East = 21 percent; South and West = 18 percent; Local = 61 percent (see table 26, volume I).

A similar experimental PATWAS system was also tested in the Washington, D.C., area. Table 1 compares the percent change in FSS briefings for Washington, D.C., and NYC. Washington, D.C., produced an 11.1-percent decrease in the number of FSS WSO briefings, while NYC yielded a net reduction of 4.6 percent. The latter percentage amounted to 16,000 fewer briefings than for the 1-year period immediately preceding the activation of the trial PATWAS. The percentage increase in PATWAS calls was substantial in both locations. These increases are attributable to the upgraded PATWAS.



NOTE: 1. PUBLICITY MAILING BEGUN IN NOVEMBER AND COMPLETED IN DECEMBER 1975.

FIGURE 2. DISTRIBUTION OF RESPONDING TYPES OF SERVICE BEFORE AND AFTER THE TRIAL PATWAS ACTIVATION

TABLE 1. EFFECTIVENESS OF PATWAS AT TWO LOCATIONS

	FSS/WSO Briefings (X 1,000)			PATWAS CALLS (X 1,000)		
	<u>Wash., D.C.</u>	<u>NYC Total</u>	<u>LGA WSO and TEB FSS</u>	<u>ISP FSS</u>	<u>Wash., D.C.</u>	<u>NYC</u>
Before Improvement	190	351	188	163	200	46
After Improvement	169	335	169	166	404	157
Difference	-21	-16	-19	+3	+204	+111
% Change	-11.1	-4.6	-10	+2	+102	+241
Stimulated Demand (No. of New Calls Created)	-	-			204	111

NYC = Combined number of briefings at LGA WSO and TEB FSS and ISP FSS.

It is significant to note that if a before and after comparison is made using the period from December 1975 (time of publicity mailing) to November 1976 as the "after" period, an even larger reduction in pilot briefings was achieved at La Guardia WSO and Teterboro FSS. Using this time frame, (a) the reduction of pilot briefings at La Guardia WSO and Teterboro FSS was 12.9 percent, (b) the number of calls to PATWAS increased by 130,000 or 283 percent, (c) the number of pilot briefings at Islip increased by 3 percent.

Trial PATWAS activated July 24, 1975.

CONCLUSIONS

The following major conclusions have been drawn from the New York City PATWAS experiment:

1. The trial PATWAS produced a substantial decrease in the number and length of FSS person-to-person briefings.
2. Route briefings were very popular with the users, and any national design should incorporate route-oriented PATWAS recordings.
3. The general aviation public expressed satisfaction with all aspects of the trial PATWAS.
4. The trial PATWAS was responsible for disseminating an unprecedented amount of weather information for preflight planning to general aviation pilots in the NYC metropolitan area. The automatic text preparation capability and the Hazeltine 2000 Request/Reply Terminal Subsystem proved to be extremely effective in both performance and manpower savings.
5. Large numbers of users expressed the desire to reach PATWAS through a toll-free telephone number. Requests for toll-free access constituted the most frequent comment received from the respondents to the questionnaire. Seventy-nine percent of the pilots who requested toll-free access to PATWAS resided in the counties outside the toll-free areas. The largest number of requests came from Suffolk County, New York, which is outside the toll-free area.
6. In our opinion, continual improvements to PATWAS will provide better service to the flying public and have a positive effect on flying safety and comfort.
7. The trial PATWAS is superior to the basic PATWAS for flight planning.
8. During non-VFR weather, it was necessary to commit the services of one person full time to the preparation of trial PATWAS recordings.
9. The trial PATWAS information-gathering, recording, and playback equipment worked efficiently.
10. The "barge-in" connection was acceptable to the users (i.e., connection to the message at some point other than the beginning). However, from an operational standpoint, the "barge-in" connection tends to increase the line hold time and therefore is not cost effective. It should be noted that the users have not been exposed to an alternative connection as the basic PATWAS also provides the "barge-in" connection.
11. The speech and recording techniques of the speakers on both the basic and trial PATWAS recordings could be improved.
12. The full potential of PATWAS for disseminating weather information has not been realized as yet.

RECOMMENDATIONS

The following recommendations are divided into two groups: those that can be achieved through operational changes and those that have research and development implications.

OPERATIONAL.

1. Eliminate the basic NYC PATWAS and replace it with the improved trial PATWAS on a permanent basis.
2. Provide an expanded toll-free access for NYC PATWAS to include ISP FSS area.
3. Provide periodic publicity for the improved PATWAS.
4. Make the following changes to the NYC PATWAS message:
 - a. Provide local time in addition to Greenwich mean time.
 - b. Provide information on cloud tops when feasible.
5. The speaker assigned to record aviation weather briefings on PATWAS should be screened for articulation and pronunciation problems prior to selection. He must be able to speak clearly, distinctly, and in a well modulated manner at a rate between 100 and 120 words per minute. He must be able to control his delivery for articulatory error, loudness, and rate. Deficiencies in any of these areas will adversely influence the quality of the communication. A quality control system should be established to help ensure adequate speech proficiency. Additional training in the preparation of mass-dissemination recordings should be made available to maintain speech proficiency.

RESEARCH AND DEVELOPMENT.

1. To fully exploit the far-reaching potential of PATWAS as an aid to flight planning, a system with the following enlarged capability is needed:
 - a. Noninterrupting fast-time updating of weather information.
 - b. Multiple message storage.
 - c. Accessing message at beginning.
 - d. Multiple message availability on any telephone line.
 - e. One telephone number access.
 - f. Automatic message composition.
 - g. Centralized message composition.
 - h. User selection of specific message segments.

The existing PATWAS system, utilizing cartridge tapes and magnetic drums, can be improved by changes in message content and format and by furnishing more telephone lines, as evidenced by the NYC PATWAS experiment. These improvements, although important, are nevertheless narrowly limited in scope and thus do not provide any far-reaching benefits for FSS modernization. On the other hand, a

national mass-dissemination system based on digital technology has the potential of reaching, in our opinion, more aviation users with better products and at no increase in personnel.

2. Develop a national system design for improving the mass dissemination of aviation weather information.

3. Give the pilot the option of filing a flight plan through PATWAS. This would provide one-call service.