

The first advanced microprocessor application was designed and developed at Tektronix beginning June 1973 and delivered to NAFEC in December 1973.

Tek's first microprocessor-based system used the Intel 8008, 2kB RAM, and 4kB ROM. Graphic images and symbols (similar TV weather forecasts) were entered by freehand via graphics tablet. This information was stored on a Tektronix dual 8-inch floppy disk drive. Later, this weather information could be retrieved by flight routes for display or modification.

This system was built for NAFEC to evaluate a nationwide route-dependent weather information system for pilot flight planning.

The project was initiated by Ralph Thomison, Regional Sales Manager in June 1973, and Mr. Thomison was the project manager and liaison with NAFEC principals. Stephen (Steve) Heitmann developed the application software, and Ray Goolsbey developed the Intel 8008 based computing system which interfaced with 40xx graphic terminals, a thermal printer, a graphics tablet, and a floppy 2-disk drive.

FAA REPORT NO. FAA-RD-76-118, PRELIMINARY EVALUATION OF USER TERMINALS FOR AN AUTOMATED PILOT BRIEFING SYSTEM, Eugene E. Pazera, is all that remains of this ground-breaking project.

The following are excerpts from this report:

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16. Abstract This report describes a preliminary evaluation of various user terminal concepts for an automated aviation pilot weather briefing and flight plan filing system. Terminals embodying differing operational concepts were used by volunteer general aviation pilots in a structured experiment consisting of a series of simulated pre-flight briefings. Four candidate terminals were intended for application as fixed, self-service stations at strategic geographic locations. Four other terminals were provided for personal use from home or office via telephone link. Each pilot experienced extensive use of one of each class of terminal in separate two-hour test sessions and manipulated or observed the operational characteristics of the other terminals for comparison purposes. The remote terminal concept for flight briefing by telephone was found to be a viable, acceptable means for obtaining preliminary flight weather information and filing a flight plan. Comparative performance and pilot preference scores for the candidate terminal hardware concepts were obtained.			
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PREFACE

As part of the Federal Aviation Administration's program for the automation of Flight Service Stations, the present report describes preliminary evaluation of concepts for Pilot Self-Briefing Terminals for obtaining weather data and filing flight plans.

Two general types of terminals were evaluated; relatively sophisticated terminals such as might be used at a Flight Service Station, and simpler terminals such as might be used remotely by a pilot from his home or office.

The assistance of Barbara Kolodziej in the reduction of the data is gratefully acknowledged.

This program is sponsored by the Department of Transportation through the Federal Aviation Administration, Systems Research and Development Service. The Laboratory experimentation and testing reported upon herein represents only a part of the overall FAA program to develop and evaluate pilot self-briefing concepts. In particular, subsequent field evaluations utilizing general aviation pilot participation has complemented this laboratory testing and has provided additional data concerning presentation formats and products for pilot self-briefing terminals. As such, the results presented in this report may not necessarily reflect the final conclusions concerning pilot self-briefing terminals.

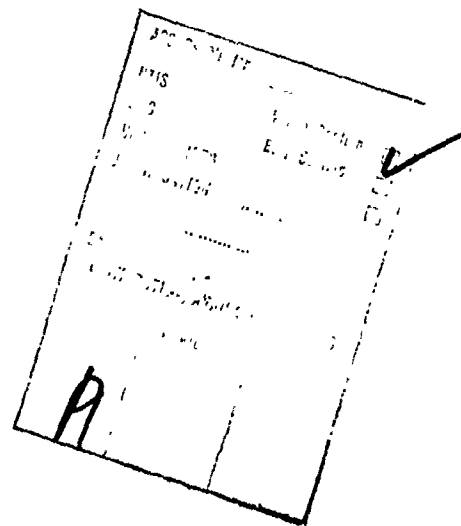


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I. INTRODUCTION

The Flight Service Station system of the Federal Aviation Administration provides a variety of services to airmen which may be grouped under three major headings: weather and NOTAM (notices to airmen) data dissemination, assistance in the filing of flight plans, and emergency assistance. The joint Office of the Secretary of Transportation/Federal Aviation Administration Flight Service Evaluation Team (FSSET), following an in-depth analysis, concluded in 1973 that the greatest improvement in service and cost reduction for the system modernization through the period projected into the mid 1980's could be obtained through automation of certain routine activities.

Functions readily amenable to automation, such as conducting pilot preflight weather briefings and filing flight plans, account for more than 50 percent of the cost of operating the entire FSS system. Pilot briefings are labor intensive, involving individualized face-to-face or telephone communications at the approximately 300 existing Flight Service Stations. Elimination or reduction of the one-to-one method of briefing through implementation of automated weather dissemination and self-briefing techniques were recommended by the FSSET.

The FSSET group emphasized the need to supply appropriate information particularly to the General Aviation community, since this group accounts for 94 percent of all pilot weather briefings. The near-term approach envisioned by the FSSET included widespread expansion and use of mass aviation weather dissemination through Transcribed Weather Broadcast (TWEB) and Pilot Automatic Telephone Weather Answering Service (PATWAS). It was also proposed that, ultimately, a broad system of automated, self-service stations should be implemented wherein pilots could obtain detailed, selected weather briefings and file flight plans through the use of Pilot Self-Briefing Terminals (PSBT) at some 2500 geographic locations.

Following this latter recommendation, a joint team of members from FAA Headquarters and NAFEC assembled a system consisting of a Tektronix 4012 terminal with storage CRT and keyboard, a Tektronix 4610 to provide hard copy printout, and a Sykes 3220 Cassette Recorder and Playback Unit for program storage. With this equipment, simulated pilot briefings were conducted at several Flight Service Stations. Here it was determined that pilot self-briefing appears to be a viable concept.

Since this original system provided nothing in the way of optional hardware configurations to permit comparative evaluation of relative pilot acceptability of possible options, the U.S. Department of Transportation/Transportation Systems Center (TSC) was asked to develop a variety of possible configurations, and to evaluate them under laboratory conditions. Furthermore, since a large proportion of briefings are presently conducted via telephone, it was determined that two broad classes of terminals should be evaluated: relatively complex terminals such as might be provided at Flight Service Stations or satellite airports, and simple terminals to permit the user to obtain a briefing from his home or office. The use of such remote terminals (RTs) would allow pilots to obtain a preliminary briefing without the necessity for travel to an airport facility equipped with a PSBT.

2.3 TERMINALS

Terminals chosen for evaluation were intended to be demonstrative of alternative I/O characteristics available in current and projected state-of-the-art hardware, or reflecting a user/system interface concept offering a potential contribution toward system cost-effectiveness. Eight terminals were evaluated, four each for fixed (PSBT) and portable (RT) use.

2.3.1 Pilot Self-Briefing Terminals

The terminals selected for PSBT evaluation permitted study of general purpose versus dedicated keyboards, interactive versus burst input, requirements and preferences for hard versus soft copy and for graphic versus textual presentation of information. The individual terminals are described more completely below.

2.3.1.1 CRT Terminal - The CRT Terminal consisted of a pedestal mounted, general purpose, off-the-shelf Tektronix 4012 computer terminal, with an ASCII coded, standard typewriter keyboard, as indicated in Figure 2. The 11-inch bistable cathode ray tube display permitted the presentation of 35 lines of 74 characters each. Beside it was a Tektronix 4631 thermal hard copy printer for optional use, providing 8 1/2 by 11-inch copy. Connection to the computer was via an Omnitec 701B acoustic telephone coupler.

2.3.1.2 Graphics - Graphics capability could be added to the system described above by incorporating a Tektronix 4921 local flexible disc memory. Provision for local storage and transmission of graphic material (weather maps) was necessary because information requirements for vector drawing of pictorial material are much more extensive than for alpha-numerics. By operating locally at 6400 baud, weather maps having the desired detail and stored in flexible disc memory could be drawn in less than 20 seconds as compared with seven minutes at a 300 baud line rate from the central computer.

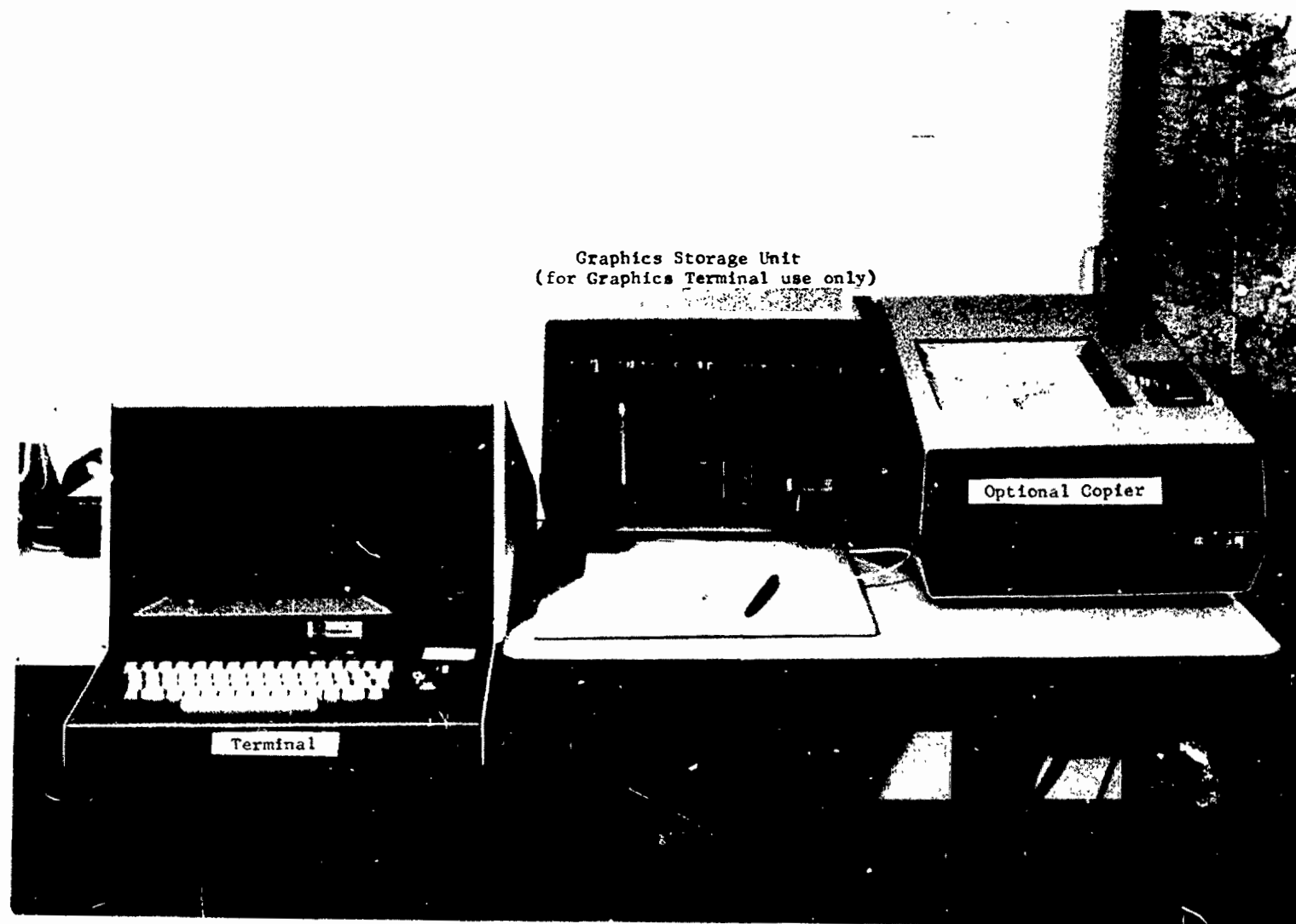


Figure 2. CRT and Graphics Pilot Self-Briefing Terminals