NEEDED WEATHER INFORMATION WHERE IT BELONGS—IN THE COCKPIT

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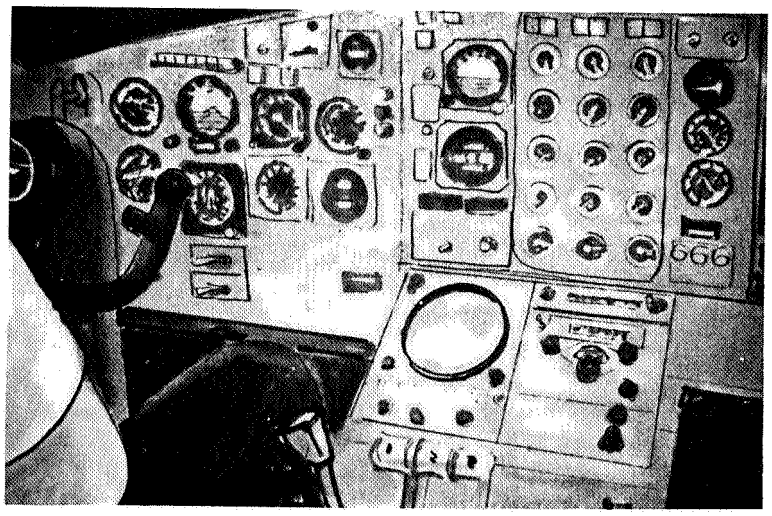
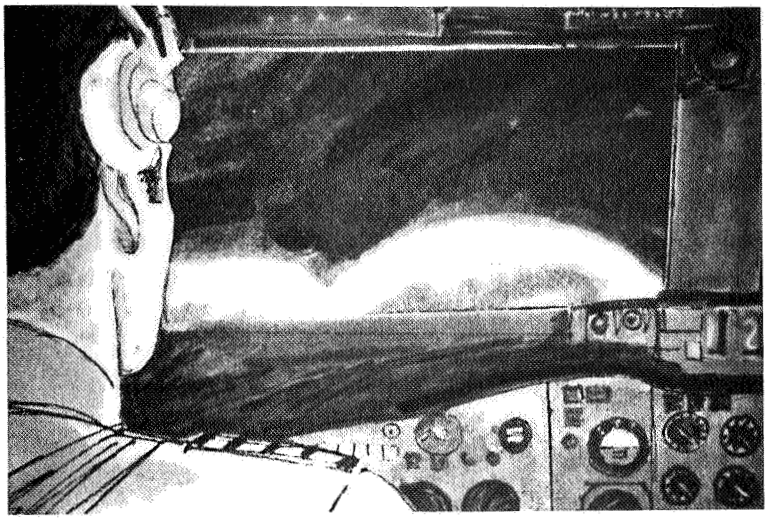
Mr. Gatlin's presentation began with an illustrative slide show emphasizing the sudden and unexpected severe weather encounter. The editors have attempted to reproduce this in print for the benefit of the reader.

Jet engine sounds begin.

Captain: "There wasn't any weather like this in the forecast!"

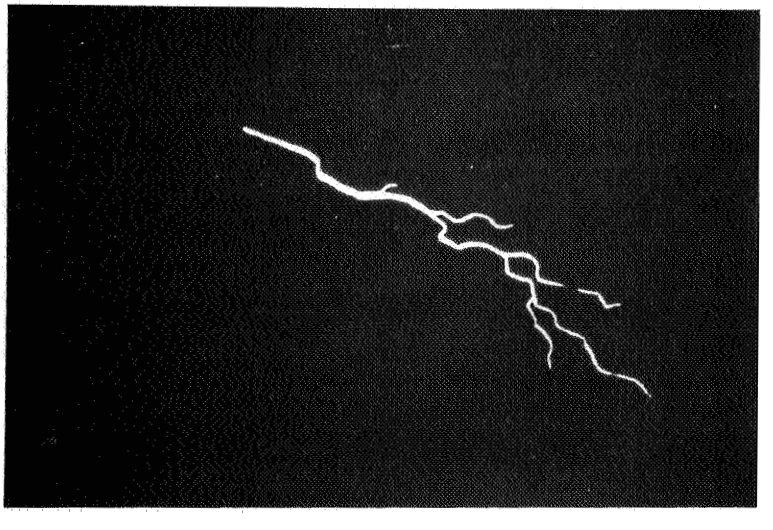
First Officer: "This radar's not painting a very good picture--the controller doesn't have it either!"



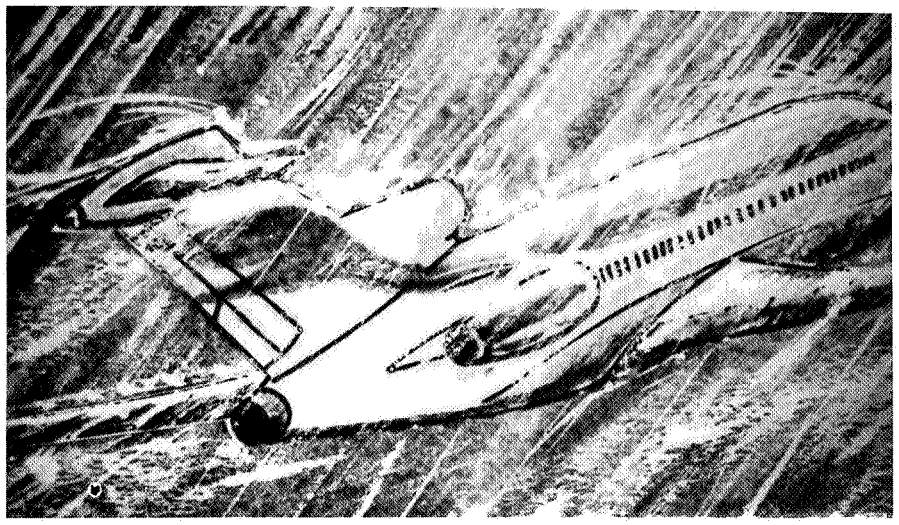


Captain: "We're going to have to go right through. . ."

First Officer: "It looks better there-- let's try **it!**"



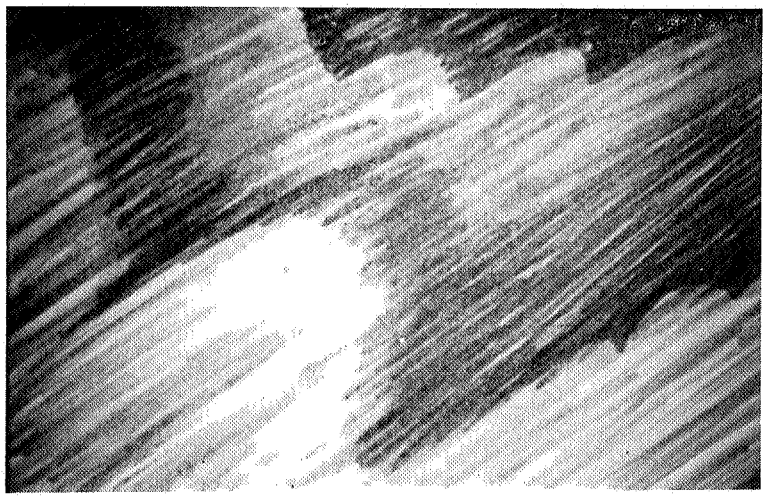
Small lightning flash.



Thunder sound over engine noise.

Rain noise on metal.

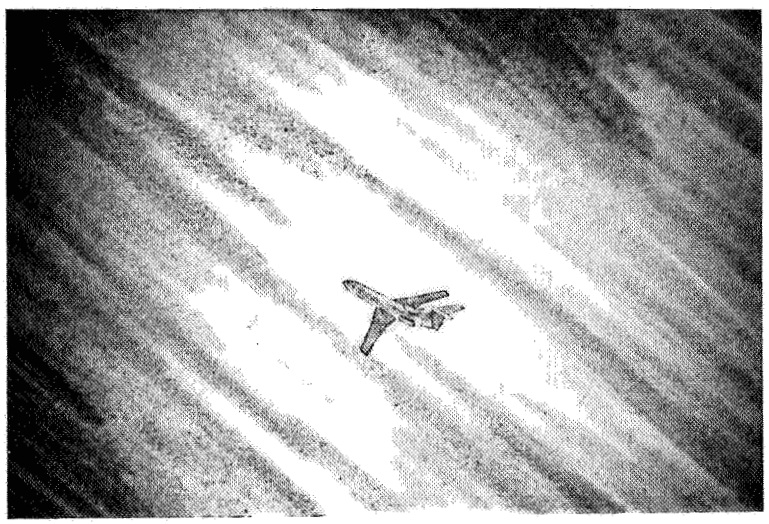
First Officer:
"There's the rain!"



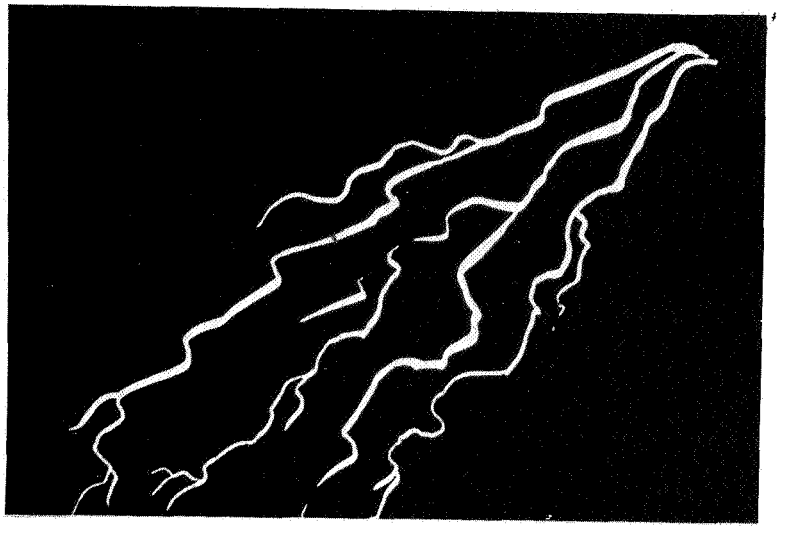
Engine sound loud as scene goes to exterior of airplane.

Captain: "That's hail now!"

Thunder.



Sounds lessen.



3ig lightning flash.

Loud thunder.

Thunder rolling, then silence.

I assume every pilot has had a similar experience and wondered, "How in the hell did I get into a situation like this!"

Or perhaps he has been unfortunate enough to be involved in weather-related accident investigations attributed to wind shear, turbulence, or other hazardous weather conditions--accidents that might have been avoided if the pilot had had needed weather information where it belongs--in the cockpit. So as the Flight Operations overview for this workshop let's look at "Needed Weather Information Where It Belongs--In the Cockpit."

But who says we need any information in the cockpit anyway? Well, for one, the FAA! They proposed a rule in 1976 which was adopted and implemented on December 31, 1977, which says, in effect, "all available weather reports and forecasts of weather phenomena that may affect the safety of flight, such as clear air turbulence, thunderstorms and low altitude wind shear for each route to be flown and airport to be used" must be provided to the pilot-in-command by the airline dispatchers before and during each flight.

Even without the regulations, however, the number of weather-related accidents in the industry testifies to the need for accurate real-time weather being available to the pilot--66 at JFK; New Hope, Georgia, St. Louis; Fiji; etc. All too often the information in the system never reaches the cockpit where it's needed.

The FAA categorizes weather as hazardous when it is dangerous to aircraft, passengers, and crew and is generally associated with:

- Thunderstorms
- Turbulence (clear air--mountain waves)
- Icing
- Wind shear
- Ceiling and visibility (deteriorating)
- Wind (sustained 30 knots or greater)

Routine weather is categorized as:

- Air temperature
- Dew point
- Atmospheric pressure
- Cloud height and cover
- Wind direction and velocity
- Peak gusts
- RVR
- Precipitation
- Altimeter settings
- Winds and temperatures aloft

To comply with the FAR's, a pilot as stated must be provided with available hazardous and routine weather information before and during flight to permit planning and execution in a safe and efficient manner, and the airline dispatcher (even many, many miles away) is to furnish it.

Today, the airlines' means of providing weather information to the pilot is involved with computerized flight plans and weather packages. As an example, one of our major airlines *has* a direct communications link between the FAA Weather Message Switching Center in Kansas City and the airline's reservations computer. Weather information is stored in the computer and is available for immediate display and/or reproduction to Dispatch, Meteorology, and any other location having a CRT or a direct

link to its central computers. In addition, another direct link from the National Meteorological Center at Suitland, Maryland, provides wind and temperature aloft forecasts.

This stored information is used to provide Flight Dispatch a computerized flight plan along the FAA preferential route before the crew arrives at the airport, and if the preferential route is longer by six minutes or more, another minimum route or minimum cost plan will automatically be provided.

On his arrival, the pilot reviews posted weather information that contains past, present, and forecast weather conditions. But more importantly, attached to his flight plan for review and use will be a computerized weather package. This package is sometimes called "The Command Weather Document." This document is specifically tailored for each flight, providing NOTAMS, field conditions, hourly sequences and forecasts for that particular route, thereby eliminating all extraneous information. It is possible, however, for the pilot to request additional weather on the CRT or hard-copy printouts. It is also possible and desirable for the pilot to receive verbal briefings from the dispatchers or meteorologists when weather conditions call for it.

At this point the pilot has been given access to all the available weather information in the system and should be able to conduct a safe flight insofar as weather is concerned. Perhaps we should take a closer look at where all this information comes from, how it was collected and distributed, and whether it is currently valid concerning flight safety.

The current Aviation Weather System is a collection of functionally independent elements employing primarily a slow (100 WPM) and medium (1200 WPM) speed teleprinter distribution network coupled with a slow-speed electrowriter system which is used to transmit both weather and airport data. Basically, the system can be considered slow, labor intensive, and not capable of meeting the demand for timely and accurate weather information needed by the airlines to operate in the National Airspace System. As an aside comment at this time, it should be pointed out that the airlines are closely following developments and planned implementation dates of the Automation of Field Observations and Services (AFOS) Program by the National Weather Service, which will provide the graphic forms via CRT. However, cost of installation, equipment, and needed change-over circuitry are only a few examples of a myriad of questions to which airlines must have an answer before adopting a position for or against AFOS. As of now, airlines are working closely with segments of NWS in order to ascertain firm dates for reduction of some of the current facsimile circuits known more familiarly as Forecast Office Facsimile (FOFAX) and National and Aviation Meteorological Facsimile Network (NAMFAX). Additionally, it is of paramount importance that information be made available on NWS means to meet stated airline requirements for receipt of weather data from the satellites.

Returning to the real world of today, meteorological data is collected by the National Weather Service, Federal Aviation Administration, Department of Defense, air carriers, and contract observers; and this data includes surface observations, upper air soundings, and radar. The FAA is responsible for 35%of this information as well as the distribution of PIREPS while the National Environmental Satellite Service is the source of all available satellite weather information.

After all this data has been processed through the National Meteorological Center and the Air Force Global Weather Central, it is distributed to the users by the FAA through the Weather Message Switching Center and by the National Weather Service using facsimile for graphic weather information.

This system is time consuming, and although it fulfills the FAR requirements, it does not adequately contribute to safety of flight from hazardous weather conditions. In fact, since upper air data are collected only every 12 hours, the inadequate number of observations leads to errors in the winds aloft forecasts used for flight planning and consequently to less than optimum fuel consumption.

After takeoff, airborne radar weather reports from other flights and air traffic control become the prime source of weather information en route and during approach and final landing. Unfortunately, controllers in the Air Route Traffic Control Centers (ARTCC's) and approach control obtain their weather information from the same source as the airlines, which is not timely enough for real-time decision making by the pilot or controller. In an effort to help decrease the time between when the hazardous weather conditions are observed and when they are received by the pilot of the aircraft concerned, the FAA, in collaboration with the NWS, activated Center Weather Service Units (CWSU) at 13 ARTCCs throughout the country during late 1977 and early 1978. Additionally, the NWS instituted the Convective SIGMET program with FAA broadcasting Convective SIGMET information over its Visual Omni Range/ Transcribed Weather Broadcasts (VOR/TWEB) outlets. During the initial testing of the Convective SIGMET program it became apparent to the airlines that the requirement to plot locations of data on significant weather on charts within the cockpit was both burdensome and time consuming and still was not close enough to real time to be useful. Subsequently, following meetings with ATA, airlines, and other segments of industry, NWS and FAA have revised the program, thus eliminating the detailed cockpit plotting requirement specified earlier. We are watching closely both the CWSU and the Convective SIGMET programs,

PIREP's are a source of real-time hazardous weather conditions. Since hazardous weather is subject to rapid change, immediate dissemination of PIREP's is an absolute necessity; however, the majority are not transmitted beyond the receiving facility, and those that are transmitted take so long over the antiquated communications system that they are of no value to the user.

Since airport and air route surveillance radar are optimized for aircraft detection and have limited capability to detect and display storm intensity variations, it does not provide accurate or sufficient definition of weather areas for controllers to provide reliable vectoring or advisory services to the pilots.

The National Weather Service operates a network of weather radar stations east of the Rockies to detect and observe severe weather. They are not collocated with FAA radars and except for special projects are not remoted to FAA ATC facilities. Data from weather radars is used by the National Severe Weather Forecast Center in Kansas City where a radar summary chart is constructed and transmitted by facsimile. Again, this valuable information is not available to the pilots for real-time decision making.

In fact, the only real-time information avaiiable to the cockpit is from the FAA control towers which provide wind, altimeter settings and RVR on final approach. Even the Automated Terminal Information Service (ATIS) is subject to providing obsolete information when controllers' workloads are heavy and weather conditions are changing rapidly.

What weather information is needed in the cockpit? In flight planning we need current winds aloft. Observations every 12 hours are inadequate; we suggest that such observations should be made every six hours.

En route and in the terminal areas the pilot needs real-time hazardous weather information and he needs it directly from the observers.

As discussed, the current Aviation Weather System has the information, but it is not available in the cockpit on a real-time basis.

Currently the FAA has developed an Aviation Weather System Preliminary Program Plan designed to improve their capability for providing hazardous and routine weather information to pilots and controllers. The plan is very comprehensive and the FAA should be complimented for its thoroughness. It identifies the problems and proposes solutions, and when it is implemented our Aviation Weather System will have efficient air operations. For this reason we wholeheartedly support this program and all the technological improvements in the plan with one exception. Although the technological capability will be available, the plan is in the future and we need something now, particularly real-time hazardous weather information in the cockpit.

As long as the flight dispatcher is held responsible for providing en route hazardous weather to the pilot and until the FAA assumes some responsibility for real-time information to the cockpit, all the programs, technological improvements, and money spent will not achieve their full potential in providing safe transportation to the traveling public!

Before I close I want to mention my indebtedness to Captain J. E. Frankum, Vice President - Flight Operations, Trans World Airlines for some of the material I have used and for his assistance in this preparation.