# ATLANTA AIR ROUTE TRAFFIC CONTROL CENTER'S INVOLVEMENT IN AVIATION WEATHER

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The basic function of the Federal Aviation Administration's Aviation Weather System is to provide timely, accurate, and operationally meaningful weather information to the National Airspace System and its users. I will discuss weather phenomena which may be hazardous to the aircraft or disruptive to the orderly flow of air traffic as it pertains to my particular area of concern--providing air traffic services in the en route environment on a day-to-day basis.

Perhaps a brief look into the past will set the stage for discussing existing methods of distributing weather information throughout the Air Traffic Control System.

Since the inception of air traffic control, the mission has been "to promote the safe, orderly and expeditious flow of air traffic." In pre-radar days, (prior to the late 1950's) weather information was furnished to pilots by air traffic controllers, normally, only when the destination airport was below the prescribed weather minima.

Obtaining weather information that could adversely affect the flight while en route was the sole responsibility of the pilot. When available, air traffic facilities passed along pilot reports of hazardous weather.

The advent of radar throughout the Air Traffic Control System somewhat expanded our weather advisories. Precipitation areas could now be observed on the radar displays and controllers could forewarn pilots, as well as issue headings which would keep them away from these observed areas. Controllers still depended upon pilot reports, however, to obtain valuable information such as intensity and height of observed cells. In this regard, airborne equipment was much more useful than our own radar system. A pilot could scan cells that affected only his altitude, while a controller looked at all cells within his area of coverage. Many times, a pilot would be given advisories on cells that were thousands of feet above or below him. Because weather data blanked the radar presentation so that an aircraft in an area of moderate precipitation could not be flight-followed, systems were developed which would break up these radar returns, better known as clutter, into smaller blocks. This enabled controllers to track aircraft through precipitation areas, but drastically reduced the amount of weather information and data previously available. In some cases, due to these sophisticated systems, the controller was not aware of precipitation areas which were intensive enough to make flight through them hazardous. But, as it was at the inception, the controller's primary function was to seperate aircraft from each other, and he needed to see them on radar to do so. Although weather flight advisory information continued to occupy an increasingly more important role, it was still considered a low priority item in the scheme of things.

We now move forward almost two decades to the middle 1970's, when computerized systems were installed in air traffic en route facilities. Computerized radar information enabled the controller to adjust the intensity of weather data on his scope. This made it possible for him to track targets through weather without eliminating data. If weather was too heavy, he could temporarily eliminate weather data and then put it back on his scope with the push of a button. Despite these sophisticated systems, weather flight advisories remained an additional service and a relatively low priority item. The air traffic controller still depended upon pilot reports to determine the intensity and height of weather cells, and airborne equipment remained superior in detecting weather at altitude. Neither system had the capability of discerning more than two levels of intensity.

On April 4, 1977, less than a month after your first annual workshop here in Tullahoma, a commercial airline's DC-9 flew into an area of severe thunderstorms over northwest Georgia and crashed after losing power in both engines. The National Transportation Safety Board recommended in its aircraft accident report that the **FAA** expedite the develoment and implementation of an aviation weather system for FAA Air Traffic Control Centers and terminals. The NTSB proposed that this system should be capable of providing real-time display of either precipitation or turbulence, or both, which would include a multiple intensity classification scheme. By this we mean a method of determining several levels of intensities of precipitation or turbulence. The NTSB further recommended that the FAA establish a standard scale of thunderstorm intensity based on the National Weather Service's six level scale and promote its widespread use as a common language to describe thunderstorm precipitation intensity. The Air Traffic Service has implemented the NTSB's recommendation by indoctrinating pilots and air traffic control personnel in the use of this system. As an example, the Atlanta Center was designated the first site for testing the Enterprise Electronic Corporation's weather radar display. The Atlanta Center receives weather radar data from National Weather Service radar sites at Centreville, Alabama; Athens, Georgia, and Tri-Cities, Tennessee. The use of a site at Nashville, Tennessee, is in the planning stage.

The equipment installed in the Atlanta Center consists of a receiver processor and one color TV monitor for each of the three sites. Precipitation intensity can easily be determined from these units by the color coding associated with the intensity levels established by the National Weather Service. This system allows rapid detection of squall lines and storm cells and their movement. Changes in storm cell intensity levels are readily detected and assist personnel in rapid identification of storm system characteristics and peculiarities. Intensity levels within a storm are clearly defined and can be displayed individually or in any combination. This allows any intensity level or levels of interest to be isolated and observed on request. The imagery is presented in six selectable contrasting colors against a black background with full data retention. Locations of thunderstorms and squall lines are pinpointed by utilization of geographical reference points common to those used on the radar scope of the air traffic controller.

This information on the location of the more intense weather cells is a valuable tool in maintaining controller awareness of severe weather conditions that could adversely affect flight. This now-time weather information also aids our flow controllers in re-routing aircraft to prevent sector saturation caused by weather conditions.

As a result of our success with the color weather radar program, the FAA recently awarded a $7,000,000 contract for the remoting of numerous National Weather Service radars to Air Traffic Control Centers throughout the country.

The next major improvement in our capability to relay weather information to the pilot in flight was the establishment of the Center weather service unit. This unit, staffed by National Weather Service meteorologists, is responsible for collecting, interpreting and disseminating pertinent weather information. These units were placed in most of the control centers within the past year. For the first time, controllers had immediate access to experts in meteorology.

The controllers' response to the Center meteorologists has been very satisfactory. Information provided to controllers is extremely useful because of its quality and timeliness. The controllers are able to relate this information to the air traffic picture easily, because the meteorologists have done a fine job in learning the language of air traffic control and tailoring their briefings accordingly.

The controllers appreciate the value of this weather data for increasing safety and improving flow control. They are also convinced of the pilot's appreciation for this improved quality of weather information, because of the enthusiastic response of the pilots to the program.

A special training course has been established at the FAA Academy to teach weather coordinators the basics of meteorology. Weather coordinators provide the necessary link between the meteorologists and the controllers since they themselves are fully qualified controllers who are knowledgeable of the entire control area and its special requirements.

We have a vast array of additional tools and communication sources sufficient to stagger the controller of yesteryear between the observation of weather cells on air traffic and weather radar displays and the observation and reporting of the cells by the airborne pilot. It sometimes appears staggering to us when we try to understand terms such as: WFMU, AWANS, GOES, **SAMOS**, TIPS, NADIN, ETABS, DABS, EFAS, etc. Just one of these--EFAS, En route Flight Advisory Services--is a rapidly growing service better known as "Flight Watch:" While this is primarily thought of as a service for pilots flying under visual flight rules, more and more pilots flying under instrument flight rules are providing observed weather phenomena for our use and for relay to the Plight Watch positions located in many FAA Flight Service Stations. The Center weather coordinator and meteorologists continually share their information with Flight Watch personnel. This constant exchange of observed weather data has removed Center meteorologists from the forecasting business and has made "now-casters" of them. With a high degree of accuracy, controllers are provided information as to trends and severeness of weather areas within radar coverage.

So, what's in store for the future? The FAA's Aviation Weather System preliminary program plan takes us to the mid-1980's and includes methods to detect the location and intensity of turbulence--another giant step forward.

Current plans call for modification of the existing Air Route Traffic Control Center radars to generate and report the range, azimuth and up to eight levels of weather intensity. Data associated with any two levels can be selected and forwarded to the controller's radar scope. This broad range of intensity levels will improve the output interpretation in terms of possible hazards to aircraft.

Additionally, the plan calls for progress in the following areas:

1. Remote National Weather Service weather radars to each center weather service unit.

2. Complete analysis and limited field experimentation of automated weather data distribution functions.

3. Complete installation of satellite receivers at center weather service units, Flight Service Stations and the Air Traffic Control Systems Command Center.

4. Provide an automatic weather data processing and display system at the Air Traffic Control Systems Command Center.

5. Upgrade the weather message switching center for more rapid distribution of surface observations, SIGMET's and AIRMET's.

6. Interface the center weather service units and the FAA Systems Command Center directly with the National Weather Service automation of field operations and services.

Our near-term goals, stretching to 1984, are:

1. Develop and begin to implement, in conjunction with NWS and **USAF**, a new Doppler weather radar to display turbulence.

2. Apply automated voice response techniques for updating weather advisory broadcasts.

3. Begin implementation of automated weather distribution functions.

4. Implement the National Airspace Data Interchange Network (NADIN) for all intra-FAA weather data communications.

5. Improve handling and dissemination of pilot reports through automation.

6. Implement for the ATC System, a zero to thirty-minute thunderstorm forecasting servce.

This leaves our long-term goals--from 1985 and beyond:

1. Complete the implementation of Doppler weather radar systems.

2. Install color radars for improved display of traffic and weather information.

3. Implement direct address beacon system (DABS) for direct flow of weather information between in-flight aircraft and the Aviation Weather System [AWES).

4. Provide large numbers of pilot access devices and automated voice response systems for direct pilot access to the expanded **FSS** system data base.

Future research with improved satellite data will undoubtedly result in new concepts and a better understanding of the relationship between satellite data and the dynamics of the atmosphere. In the past ten years, the weather forecast accuracy has increased from approximately 50% to 75%. A pilot requires 100% accuracy and that is the objective in the future.

A completely computerized collection and reporting weather system is not beyond reason. FAA is presently working on a system that will transmit instructions to a display in the cockpit, thus eliminating, or at least reducing, verbage between the pilot and the controller. This direct flow of timely and accurate meteorological information between the computer and the cockpit is indeed a challenging goal, but one which, I believe, will be attained.