FAA Attacked over Traffic Control Technology

A near midair collision has stirred up air traffic controllers and congressmen

A few minutes after midnight on 1 November, the pilot of an Air Florida plane heading north over North Carolina took "violent evasive action" to avoid a midair collision with a Delta plane heading south.

The episode drew much publicity and has put the Federal Aviation Administration (FAA) under the gun from organizations representing air traffic controllers, maintenance personnel, pilots, and airline passengers as well as several members of Congress. Specifically, the aviation groups have used it as an occasion to point up the failings of the en route traffic control system and call on the FAA to speed up the introduction of a new computerized system, which is not due to be installed for another decade.

An FAA review of the 1 November incident concluded that it was primarily the fault of traffic controllers at the Washington area Air Traffic Route Control Center (ATRCC) in Leesburg, Virginia. But critics believe it stemmed from a 6-minute computer outage at the Leesburg center, during which controllers had to revert to a noncomputerized backup radar system.

The heart of operations at Leesburg is a large darkened room with rows of radar screens, one for each of 36 sectors—the blocks of airspace carved over the 140,000 square miles covered by the center. The scopes display a sharp, computer-processed image, and each target (plane) is accompanied by pertinent alphanumerics—flight number, speed, and altitude—displayed on the screen. When a computer failure occurs, controllers push a button to replace the narrowband image with the raw broadband radar image. The broadband image is much fuzzier and does not contain any of the data on the flights, so the controllers have to reidentify all the planes under their control. The scope is lowered to a horizontal position, and the controller takes out little transparent plastic tags called shrimpboats on which he writes down in grease pencil the identity, altitude, and airspeed of each plane. The shrimpboats are then pushed across the scopes to track the planes.

This is what the Leesburg people did on the night of 31 October. What then happened, in the busy moments following "transitioning" back to the computerized system, was that one of the Leesburg controllers failed to accept the Air Florida plane when it was "handed off" from the Jacksonville ATRCC. Meanwhile, the Delta plane had been given permission by the Washington center to descend from 31,000 to 29,000 feet, the Air Florida plane's altitude. The potential conflict was apparently not perceived during the moments after the abortive hand-off, when Jacksonville took back control of the Florida plane but allowed it to proceed into Washington airspace. Although both centers had the targets on their radar scopes, their accompanying alphanumerics were not on both scopes. The Leesburg controller did not realize anything was amiss until the Florida plane radioed in, "We just passed traffic. . . ."

The aviation groups claim the confusion was caused by the difficulties of transitioning back to the computerized system, that the backup system is too clumsy for the volume of traffic now being handled, and that controllers are not well enough trained to operate it. They are not mollified by the FAA's plans to install a new computerized backup system, called DARC (direct access radar channel), starting next year, which will replace broadband radar and allow controllers to continue working in a narrowband environment. It will display limited data on the screen. The controllers say this still lacks vital features, such as the ability to display altitudes below 18,000 feet.

What the groups are asking for is that the next generation of computers be introduced within the next 5 years instead of the next 10. At present, the FAA does not even plan to draw up specifications for the new system, estimated to cost about $1.5 billion, until 1985. The system is to have vastly increased data storage capacity, more automated routines, and various new features such as a ground-based collision avoidance system. The computers are also supposed to be susceptible to modifications as new technology becomes available so they will not be outdated as fast as the ones currently in use.

So far, two congressional committees, the oversight subcommittee of the House Ways and Means Committee and the transportation subcommittee of the House Public Works Committee, have seized the occasion to hold hearings on what to do about reducing the danger of midair collisions. Other committees are likely to follow suit in January. Concern has heated up following additional near-miss reports. On 18 November a passenger plane nearly collided with a small plane over the football stadium in San Diego. On 27 November, a 4-minute computer outage may have been related to a potential conflict over Texas when two planes came within 600 feet vertically and 1 nautical mile horizontally of each other. (The separation rule is 1000 feet vertically and 5 miles horizontally.)

The nation is divided into 20 air traffic control regions, which include all the space around and above that controlled by airports. Until the early 1970's the controllers directed traffic using the broadband radar. The narrowband or radar data-processing (RDP) system, installed over a period of years, did not become the primary system until 1974. (Airports use a different computerized system, which has not been at issue in the current fuss.)

The groups attacking the FAA—primarily the Professional Air Traffic Controllers Organization (PATCO) and the Professional Airways Systems Specialists (Pass)—contend that the RDP system is already obsolete and that, with the current backup system and the steadily rising volume of traffic, more disasters are inevitable. For example, one of the controllers at Leesburg wrote in the statements accompanying the FAA report, "Give us a backup system that can handle the volume of aircraft we are now working. The broadband was a good 'backup' 6 years ago, it now stinks. . . . You cannot use broadband when you have 15 to 26 airplanes on radar" (on the same scope). The FAA itself acknowledged that at the time of the incident the traffic was "moderate" for a narrowband operation but that "in a broadband operation this same traffic situation would be considered complex."

PATCO's director, John F. Leyden, has asserted that the RDP system, designed in the late 1950's and built in the 1960's, is decrepit and breaking down with "increasing frequency." Pass has been chiming in with the complaint that maintenance schedules have been

stretched and maintenance staffs under-manned as a result of FAA's "mis-directed economizing." PATCO warns that catastrophes are inevitable if the schedule for putting in the new comput-ers is not speeded up. Complained Ley-den in his testimony, "The FAA's his-torical policy has been to react after, not before, a disastrous event." He cited the fact that radar was introduced after a midair collision in Arizona over the Grand Canyon in 1956, that the Mini-mum Safe Altitude Alert was required in airplanes following the crash of a jet ap-proaching Dulles airport in 1974, and that intensive study of wind shear was stimulated by a crash at Kennedy airport in 1974.

The most vocal congressional critic has been Representative Bob Whittaker (R-Kans.) who, with Representative Sam Gibbons (D-Fla.), the oversight subcommittee chairman, accused FAA of covering up the extent and signifi-cance of computer outages.

The FAA's official term for a comput-er foul-up lasting less than 60 seconds is an "interruption"; anything longer than that, whether 2 minutes or, as recently happened in the New York ATRCC, 2¹/₂ days, is an "outage." The FAA regards many of the short interruptions as rou-tine. They can occur when a component malfunctions and a backup takes its place or when the computer is temporari-ly saturated with incoming data. Some of these interruptions last only seconds, and since the narrowband system is up-dated in pulses, every 10 to 12 seconds, they may go unnoticed by the controller. In longer stoppages, the image on the screen may freeze, or the data may be lost altogether. According to FAA testi-mony, both outages and interruptions have decreased in the past 2 years. Last year the 20 centers experienced a weekly average of 8.15 interruptions, and this year the average was 7. Of these, 15 to 20 percent were outages with an average duration of 13.9 minutes.

FAA administrator Langhorne Bond defended his agency vigorously at the House hearings, asserting that the en route traffic control system is "safe and getting safer." He acknowledged that the equipment is well behind the state of the art, but pointed out that when new equipment is phased in it must be phased in "perfectly, without any failures. It's a problem for us to know when to freeze technology and move it into our sys-tem." But he insisted that instances when computers appeared to be saturat-ed from heavy traffic were the result of adjustable "program anomalies" and that the current system can adequately

handle the load until the new one is in-troduced.

To the accusations of Pass that main-tenance was being given short shrift, he shot back that the organization had en-couraged "shameful featherbedding" and that in fact the solid-state electronics that are replacing "tube-type" equip-ment in computers requires very little preventive maintenance. A Pass official counters that anyone who knows about solid-state equipment knows this con-tention is "ridiculous."

The dispute over the reliability of the computers should be seen in the overall context of the incidence of midair colli-sions. Since 1972 there has been only one involving a carrier, the San Diego di-saster in which a Boeing 727 collided with a small plane in September 1978, and this occurred in terminal-controlled airspace. The statistics on near midair collisions (NMAC's) is more unsettling. The official FAA count for 1978 is 484, with 12 involving carriers. However, ac-cording to statistics collected for the FAA in a project conducted by the Na-tional Aeronautics and Space Adminis-tration, computer outages have played a negible part in the near misses. In the past 2¹/₂ years, 90 percent of the NMAC's occurred at altitudes below 10,000 feet, and most of these were in terminal-controlled airspace.

It is not altogether clear who can be relied on to give a disinterested evalua-tion of the conflict between the FAA and the aviation groups. The FAA, which is subjected to intense pressures from the groups it regulates and is hampered by budgetary and procedural restrictions, is not renowned as an agency of swift and decisive action.

On the other hand, the critics may be exaggerating the computer problem as part of an effort to gain public prestige and leverage for future labor negotia-tions. (An official at the Leesburg center told Science that some of the controllers were "upset" at PATCO's statements, which seemed to imply that controllers were too rabbity and incompetent to per-form their jobs effectively in case of an outage.) One thing is certain—all the groups that bear professional responsi-bility for air safety want a system in which that responsibility is minimized in the event of an accident.

Whether or not the aviation groups are crying wolf, the attention they have aroused in Congress and among the fly-ing public should at least cause the FAA to take a harder look at its operations and to accelerate its programs for safety and upgrading of facilities.

—Constance Holden

Appropriate Technology and the Too High Outhouse

Appropriate technology is more than just a pretty phrase—it's here to stay. Congress has written AT pro-grams into the budgets of several agencies, and this month an AT re-search project won public recognition through receipt of the uncoveted Golden Fleece award.

Appropriate technology differs from he other kind in being labor-intensive, accessible to its users, frugal of scarce resources, unintrusive on the natural ambience, and manageable by the individual or small groups—an assembly of virtues epitomized by the bicycle as opposed to the Concorde, the windmill as against the nuclear power plant.

The National Science Foundation this month announced a $1.8 million program for grants in appropriate technology. The Department of Ener-gy's AT program is running at $12 mil-lion in the current fiscal year, and the National Center for Appropriate Tech-nology, located in Butte, Montana, has a budget of $3.7 million from the Community Services Administration.

It was the Department of Energy's program that attracted the attention of Senator Proxmire's argonaut-watch-ers. The Senator cited the depart-ment for its award of $1200 to a Mis-souri inventor who proposes to build an aboveground, aerobic, solar-as-sisted composting toilet. "Even with the energy shortage, the country isn't going back to the outhouse," steamed the Wisconsin senator.

Proxmire has nothing against ap-propriate technology as such. What helped the department win the Fleece was that it had overruled a committee of Missouri citizens who had turned down the composting toilet idea. The department seemed captive to a stereotype of Missourians as Ozark hillbillies who needed nothing more than a better outhouse, Proxmire's staff decided.

The department's regional office in Kansas City, which funded the proj-ect, is unrepentant. The composting toilet would indeed be suitable for ru-ral Missouri, says a DOE official, be-cause the state's 13 million private septic systems often contaminate drinking water supplies. A second