BROAD BAND BLUES

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It's before dawn on a late autumn morning. From western Pennsylvania to Nantucket, from New England to Delaware, the skies are silent. It's quiet, too, inside the New York Air Route Traffic Control Center in Islip Long Island, where those same skies are carved into 56 sectors and swept every 12 seconds by the center's three remote radar sites. They feed their electronic vision of the heavens through a telephone line to the center's computer complex, which spits it upstairs to banks of consoles containing Plan View Displays-flat, black, round screens that the uninitiated might incorrectly call "radarscopes."

Each PVD depicts one particular sector, although each can show a complete mosaic of the center's airspace at the push of a button. This early in the morning, some sectors are devoid of the sharp, yellow slashes and attached data blocks that represent radar-identified airplanes. Unidentified targets. equally as scarce before dawn, show up as star-like dots or crosses, depending on their size and the strength of their radar echo.

Inside the cavernous center control room, dozens of controllers, trainees, supervisors and technicians man their sectors and mentally brace for the morning push. The serenity of the sky, and of the team in Islip huddled to spy on it, is deceiving: as many as 7,000 identified targets alone will transit the New York Center mosaic in the next 24 hours. It's almost six a.m. In another hour, the push will be on.

A controller breaks off his conversation. The staccato movement of the three targets on his screen, prompted by each data revision from the computer, has stopped.

Before he has time to hope the freeze is just a "startover"-an electronic hiccup during which the computer diagnoses its trouble and bypasses it--the controller's PVD goes blank. So does every PVD in the house, and a roar of oaths shatters the predawn serenity. There is an average of one hiccup each day at each enroute center.

But if an outage had to come, it couldn't have picked a better time. Traffic is light and none of the controllers faces a "situation," a traffic problem that requires fast decisions and directions from the person at the PVD.

Each controller's first response is to flip a switch on his console marked "broad band." His blank PVD lights up. this time with a slightly fuzzy, greenish picture. The same sector fixes, airways and holding patterns are etched onto the screen as before, albeit with those indistinct green lines. Now the targets appear as smeared, amorphous blobs. It's hard to tell where they begin and end, which way they're moving, or who they are. There's no data block on this display.

With only three targets, the controller has no trouble remembering the identity of each one. Things will get harder in less than an hour, when more blobs enter the picture. Right now, the controller's hardest job is to guess how long the outage might last, and whether or not he and his hand-off man should pull the screen from its vertical position to horizontal. With that done, they'll be able to deploy their little plastic shrimp boats to label and track each target.

The controller decides to wait. He calls each of his aircraft for an altitude report, and repeatedly switches back and forth between the broad-band mode to narrow band. The screen goes blank with each switch to the primary system. Finally, he decides he must commit himself. He curses at the extra work he faces and slides the screen down.

As his hand-off man prepares the shrimp boats, the controller tries the narrow band once more. He groans. So do all the other controllers at New York Center. The narrow band is back. Maybe, they think, it will last through the morning.

Making the shift from narrow to broad band and back again is one of the hardest tasks the FAA asks its controllers to perform. They resent it and look on radar failures—and the mental and physical gymnastics they require, as symbols of all that's wrong with their employer, their Jobs and the national air traffic control system.

Ever since the FAA installed work-saving narrow-band radar at the nation's en-route centers in the early and mid 1970s, controllers have complained that the equipment is too temperamental and subject to sudden failure.

Now York Center controller Glenn Truesdell, along with the union he represents at New York—the Professional Air Traffic Controllers Organization—is concerned that narrow-band radar failures are a threat to air safety. He says it's a miracle there were no midairs reported at New York Center when it had a three-day outage last November. "The FAA lucked out on that one," he says. "The guys here did really well." What saved the day, he says, was an unexplained drop in traffic. The New York outage was unusually long, although there have been cases in which equipment was down even longer. Indianapolis Center lost its radar data processing for 20 days a year or so after receiving the narrow-band system. Miami was down for 13 days in 1976. The average outage duration at the 20 enroute centers, however, came to less than 14 minutes during the first 44 weeks of 1979. They occurred once each week on average—down slightly from the year before. New York had 34 outages, while the national average per center was 39. Less troublesome startovers numbered 230 in New York: the national average per center was 308 startovers, or about six per week.

The length of an outage isn't so Important, as the controllers tell it. They say it's easier to deal with a three-day failure than a series of brief outages, for then at least they know what their resources are. Two weeks before the New York outage last fall. Washington Center in Leesburg, Virginia went down for five minutes. Just after the system was restored, a northbound Air Florida 737 and a southbound Delta TriStar came within 300 feet of each other over North Carolina. The Delta flight which had been cleared down to the altitude of the 737, took evasive action to avoid a collision.

That incident which the FAA blamed on the controller while citing the outage as a contributing factor, helped make the issue of radar failures and the safety of the air traffic control system a cause on Capitol Hill for several weeks. The New York failure, plus a couple of near-misses in San Diego, added fuel to the fire. PATCO called a press conference in Washington and declared there had been an ''increasing frequency of breakdowns" in the radar data processing system. Congressmen called for investigations, and two House committees held hearings.

All the fuss left general aviation IFR pilots baffled. The air traffic control system seemed to work fine for them. It did have its breakdowns, in the form of traffic delays and even some near-misses, but very few pilots ever had personal experience with such incidents while flying IFR in a radar environment. If those baffled pilots had read the committee transcripts coming out of Washington, they probably would have remained just as confused. PATCO and PASS—the Professional Airways Systems Specialists, a new union founded with PATCO's help, which is fighting to become the exclusive representative of the FAA's maintenance personnel led the charge up Capitol Hill. in their testimony, they painted a picture of impending disaster: obsolete computers for which spare parts would soon be unavailable; prehistoric equipment that couldn't handle peak traffic demands; deceitful reporting by the FAA of outages and Interruptions; inadequate training of controllers in the use of broad-band radar; corrective fence-mending rather than preventive maintenance; and a cover-up of the whole mess by the FAA.

Noting that a "union fight" was under way with PATCO maneuvering to negotiate a new contract and its partner PASS, struggling to win recognition, FAA Administrator Langhorne Bond firmly denied that the number of outages and interruptions was on the rise; in fact, he said it was on the decline. According to his figures, the average number of weekly outages per center fell from 1.47 in 1977 to .87 in 1979. Their duration dropped from 21.56 to 13.9 minutes. Bond defended the FAA's maintenance, outage reporting and controller-training procedures, and he insisted that there's nothing inherently hazardous in switching from narrow to broad-band radar—only a decline in system efficiency.

"I believe it's a common misconception," Bond said, "that when a failure occurs, many aircraft are pointed at each other and that a lack of immediate action by the controller will result in a midair collision. This is not the case. In the enroute environment, a controller simply does not allow two aircraft, let alone several groups of aircraft to be in such a position that they will require control instructions within the next one to two minutes to avoid a possible midair."

Some bits of information that emerged from last fall's hearings do stand out as touchstones for the baffled pilot who only wants to know what the truth of the matter is. According to the National Transportation Safety Board, no NTSB investigation of any major accident has ever cited radar failure as a cause or factor and according to the FAA. of the 622 "system errors" recorded between 1977 and 1979—incidents in which aircraft had less than the required separation—only 27 occurred during the use of broad-band radar or the transition period from narrow band. That equates to only four percent.

Broad-band radar is simple. Each sector relies on one particular remote radar antenna that sends its signals by microwave to the center. There they are fed into a "green box" that decodes the nondiscrete beacon signals transmitted by transponder-equipped targets. It can handle only 64 codes, the first two digits on your transponder. Except for some newer varieties at some approach controls, broad band can't handle any other data, such as Mode C altitude information. After decoding, the radar transmission is sent in the form of a closed-circuit television picture to the controllers' plan view displays. They show nothing but raw radar information— electronic blips derived directly from the energy echoes sensed by the antenna. There is one enhancement: those targets squawking an assigned transponder code appear as parallel bars that blossom into a blob when the pilot idents.

Broad band was the cornerstone of the national air traffic control system from the late 1950s until about six years ago. Then came narrow band, a reference to the smaller frequency width employed. More data can be packed into these waves and more equipment is needed to decode them. A digitizer takes information from each of the center's remote radar antennas and feeds it by phone line to a brace of IBM 9020 computers at the center. They pick and choose among the radar sites for the best data and create a mosaic of the center's entire airspace, complete with alpha numerics showing aircraft identification, altitude, ground- speed, assigned altitude (once the controller has punched that into the system) and whether or not the aircraft is climbing or descending. The alphanumerics will do lots of tricks, such as flashing when the computer senses a traffic conflict or when an aircraft is being handed off to another sector or center. The computer will automatically Initiate the hand-off, so that the controller needn't talk to anybody.

All of this is fed into a display channel complex, which breaks down the mosaic into sectors by area and by altitude. Display generators then tell the PVDs how to display the information and finally, the controller sees a crisp black-end-yellow Image completely divorced from the raw radar data. He now has a computer-generated representation of everything that is going on in his sector.

PATCO and PASS charge that these computers were obsolete before they were commissioned. The FAA admits that the modified IBM 360s—relabeled 9020s for the FAA—are indeed first-generation solid-state equipment developed in the early 1960s. "It takes several years before a decision is made on which equipment to purchase." comments Gerry Thompson, head of the FAA Air Traffic and Airways Facilities branch. "It takes another five to seven years to install it, so obviously we can only reach out so far when we make our commitment"

Smaller, faster computers are available today, but the FAA says that doesn't mean the 9020s are obsolete, falling apart or in need of immediate replacement. There are few things to wear out in solid-state equipment but there are plenty of components— a lot more than went into the broad-band system—and therefore a lot more that can go wrong.

The first couple of years with narrow band were the worst for outages. The FAA launched a campaign in 1976 to reduce the rate. Through constant refinements to the software—the programs developed at the National Aviation Facilities Experimental Center in Atlantic City that tell the computers what to do—the outage rates and their durations started dropping. In 1978, there was an average of 48 per center. The latest average is 39. Interruptions or startovers also declined. Because of this Improved reliability, the FAA told the centers to reduce from four to two-and-a-half the number of hours they routinely shut down the system each night for maintenance.

"We're still concerned about outages," says Thompson. "There are a lot of people working to reduce the numbers further. The system's performance is improving; it's working better than ever before."

If that's so, why are the controllers and the system specialists in an uproar?

The FAA thinks controllers are simply spoiled by the narrow-band system and hate switching over to broad band. "The transition is a complex time that controllers would prefer to avoid," says Bob Thome of the Airways Facilities branch automation division. "They got aggravated, and I can't fault them for that I think PATCO senses a rolling issue to pull the troops together in this."

PASS President Howard Johannssen responds that union politics have nothing to do with it. The other union Involved (Federal Aviation Science and Technological Association) also testified before Congress on this issue, and their testimony was almost identical with PASS's, says Johannssen. That argument might be a little shaky: both unions are competing for voters and, like candidates on the campaign trail, they might be expected to say what the voters want to hear. And complaints about radar outages certainly are a sweet sound to the voters— In this case, the controllers and the system specialists.

That doesn't mean the controllers are insincere In their concern over safety. Glenn Truesdell and Mike Russell, another PATCO representative at New York Center, honestly believe the system is dangerous and will eventually lead to disaster. On a recent tour through the center control room, they demonstrated the transition to broad band with one of the PVDs. Just as Tmesdell dropped it to the horizontal position, the screen blinked and the images suddenly shrank to a totally unusable picture.

"The faith you used to have in the system is no more." explains Russell, a 10-year veteran in New York. "Last summer was a horror show. I was scared to death every day, and it exhausted me. Now. in the winter, traffic isn't as heavy and things aren't as critical. But I don't really want to be around here when the summer rolls around again."

Truesdell and Russell say that |just knowing the system is going to fail is stressful; transitioning to broad band when the failure comes is cumbersome, distracting and potentially dangerous; and even when it works, the broad band has all kinds of quirks—including jumping data bocks.

While their sincerity is obvious, their complaints don't support PATCO and PASS'S contentions that the air traffic control system is falling apart. Russell and Truesdell complain, for example, that their jobs are harder because pilots don't cooperate with controllers the way they used to; the efficiency of the system has spoiled them, say the controllers—thus undermining their own claims of impending catastrophe. Inevitably, the conversation turns to job gripes and union issues. "These are a decent bunch of guys who don't want to go out on strike." says TruesdelL

Controllers are hard-working professionals who carry tremendous responsibility. They resented it when the FAA launched a program called "Project Professionalism" some years ago to Improve controller attitudes, and they resented it more when the FAA recently dropped its promise of immunity for those controllers (and pilots) willing to report system errors and their circumstances. And they especially resent it when the FAA blames them for air-traffic conflicts that might be linked more appropriately to equipment problems. The near-miss in Washington Center last fall is a case in point "Blaming the controller was the easy way," says Dennis Reardon of PATCO. "How do you argue against human frailty? The FAA does say it associates the incident with radar-processing failure. But a person develops dependencies—then they nail him for it and blame it on human failure."

Controllers see themselves as squashed in the middle between the FAA. which they believe will sacrifice controllers to protect itself, and the airspace users—particularly the airlines--who they say have no understanding of the stresses of air-traffic controlling. Sensitive to their tremendous responsibility, and sensing they're out in no-man's land without any protection, they consider radar equipment failures the ultimate indignation.

Radar computer failures are no doubt a tremendous burden on the controller. But It's hard to believe they represent a critical throat to the safety of American air travelers. They do represent a chasm in the working relationship between the FAA and its air traffic control employees.