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THE PRACTICAL PROBLEMS OF APPROACH AND LANDING PROCEDURES FROM THE PERSPECTIVE OF THE AIR TRAFFIC CONTROLLER

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ON BEHALF of the Professional Air Traffic Controllers Organization and the over 16,000 air traffic controllers represented by PATCO, I thank you for the opportunity to participate in this symposium. The subject of my comments is one of the most controversial and, at the same time, important issues facing aviation today—approach and landing, the most critical phase of any flight.

I believe it is timely to present these problems from the controller's perspective. Until recently, the air traffic controller has been the missing link in the evolution of our air transport system. As anyone currently involved in aviation or aviation litigation is aware, how the air traffic controller does his job and the equipment he works with has taken on increased importance.

Before examining one specific aspect of the air traffic control system, it might be helpful to add some general comments. A safe flight is the culmination of the professional relationship between pilot, controller, and some of the most sophisticated electronic devices in the world—along with some of the most antiquated equipment. The Air Traffic Control System demands a high degree of professionalism from both the pilot and controller.

In its job recruitment literature, the Federal Aviation Administration likens air traffic control to a three-dimensional chess game. It states that job applicants must be able to withstand extreme stress and adjust to rapidly changing working conditions. While this may appear to be an example of the rhetorical overkill which plagues all federal agencies, it is one of the few statements ever made by the FAA with which I agree.

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Perhaps the most graphic explanation of the problems associated with air traffic control came from a person who was not a controller or a pilot; he was a senior system's analyst for IBM. At the time of his comments he was in charge of the computer program which IBM hoped would automate the ATC System. This was the same gentleman who had worked on the automation project for NASA which resulted in the successful Apollo moon landings. When asked, since his computers could lead a man to the moon, why it was taking so many years to write an ATC program, he stated:

> In the Apollo program, we had only one spacecraft, flown by highly trained pilots, departing from one known route, to one known destination. In air traffic control, you are asking us to provide a program that will track and analyze hundreds of aircraft simultaneously, flown by pilots of varying skills, departing airports ranging from O'Hare Field to Farmer Brown's pasture, flying different routes, at different altitudes, at different speeds going to different locations. The human mind can cope with that situation; I'm having a hell of a time getting my computers to do the same.

While I would enjoy an opportunity to discuss all the problems and frustrations plaguing the ATC System, tragically, that might take days. Recognizing this, I will now limit myself to only those problems associated with the controller's decision making process during the approach and landing. Many of those problems may be only local in nature; others affect the ATC System nationwide.

One of the major problems facing controllers is the limitations placed on their usable airspace. Air traffic controllers often are likened to traffic cops. In certain ways, I wish this were true. It would be nice to be able to just throw up your hands and say: "*Alright, everybody stop.*" If a certain control technique does not work, you need airspace to affect the recovery. Unlike automobiles, airplanes cannot stop and back up.

Airspace use limitations fall into two main categories: physical obstructions and procedural obstructions. Starting from the ground up, the controller must deal with his local terrain, both natural, such as mountains, and man-made, such as television antennae. At times these may not even be accurately displayed on his control charts. Tragically, this is usually discovered after the fact, as in the crash of TW514 when it was learned that Mt. Weather, the site of the crash, was not shown on the controller's charts.

There are, of course, other airspace restrictions to be considered. Military restricted areas, for example, present two types of problems. First, you must keep your civilian traffic out of their airspace. Secondly, you must be constantly alert to the military pilot who forgets that F-4's do not turn very well at high speeds and ends up flying into your civilian airspace. Many of these military training areas are located in close proximity to, or within, approach control airspace and can be a nightmare to terminal controllers.

International boundaries also present a rather unique problem. For example, the airport at El Paso, Texas, is just a few miles north of the Mexican/American border. Just north of the airport lies the White Sands Missile Range. Stretched in between is a mountain range. When searching for usable airspace, the mountains which refuse to move cannot be reasoned with, and no one knows what is going on at the missile range, so the only option left is control in Mexican airspace. The Mexican and American controllers have an excellent working relationship, and this borrowing of airspace is usually accomplished with little difficulty. If the State Department ever knew how approach controllers change an international boundary, it would have to rewrite five different treaties.

Another airspace use limitation is the air traffic control system itself. Because it is humanly impossible to control all the aircraft that can simultaneously be in a given area, the ATC System is sectorized. Simply put, each controller is given a slice of airspace for which he is responsible. This sectorization has led to the first commandment of air traffic control: Do not take your airplanes into another controller's airspace without prior coordination. Even with the present state of automation in the ATC System, this coordination is at the very least time consuming. It is also one of the prime contributors to ATC System errors. Needless to say, a breakdown in coordination in a system based on communication can be disastrous.

There are other airspace use limitations which, unfortunately, are not based on flight safety considerations. I cite as the classic example, noise abatement procedures. While blissful sleep may be extremely important to the person living next to an airport, the aerial gyrations that pilots are required to go through to protect that sleep are going to result someday in a person being rudely awakened with a Boeing 747 in their bedroom. If any of you have ever flown into Washington National Airport and wondered why your aircraft made a sudden turn just prior to touchdown, it is because your approach was not truly aligned to the runway. Your approach was down the middle of the Potomac so that you didn't create a noise hazard. Unfortunately, the runway is not quite aligned down the middle of the river. When the weather is good, this procedure presents little problem. When the weather is bad, it can be terrifying. While this is not normally considered a controller's problem, you must remember that any procedure that dictates where an aircraft must be at a particular moment in the approach, limits the controller's flexibility. This is especially frustrating when the procedure is for purposes that have nothing to do with the safety of flight.

The aircraft itself accounts for a portion of the puzzle. The controller must balance the aircraft's technical capabilities, size, and type, to be able to apply the special separation standards that exist between aircraft of different categories.

The speed of the various types of aircraft presents one of the most difficult problems that an approach controller can face. Those of you who have sat outside an airport watching an unbroken string of perfectly spaced airplanes make their approach should stop and consider the degree of skill required to obtain that kind of precision. The air traffic controller must not only turn the aircraft to final position at the precise moment, but must also balance the turn on spacing in relation to the speed that the various aircraft can maintain on the final approach. That beautiful chain of airplanes did not happen by accident.

The pilot himself can present a problem to the approach controller. Needless to say, a certificate from the FAA does not necessarily ensure a proficient pilot. There are few things more frustrating than vectoring a pilot to Runway 35L and having him turn onto Runway 35R. The greatest difficulty presented to the air traffic controller by the inexperienced pilot is not necessarily the mere task of walking him through the approach, but rather the time this consumes which might be better spent elsewhere.

Another subject that deserves special attention is the airport itself. City fathers often build or modify existing airports with little thought to the problems of the tower controller. Quite often they will build a new airport hotel or hangar area which brings great joy to the Chamber of Commerce, and a great pain to the controllers. An example of this would be the Oakland Airport where the FAA spent millions of dollars building a new control tower only to be followed in the construction boom by an airline which built a new hangar for its jumbo jets that was so large it blocked the controllers' view of nearly half the airport. Consequently, the FAA had to build a second tower on the other side of the field.

An even more pathetic example would be the new tower at College Station, Texas, home of Texas A&M. Here the FAA apparently poured the foundation wrong when the tower was built. As a result, when the tower cab was put in place, the ground control position faced the parking lot instead of the airport.

As aviation technology has advanced, few airports have been able to keep pace. In Los Angeles, one of the major runways cannot be used for jumbo jets because it is not stressed properly. This limits a controller's usable airspace just as much as a truck parked on the runway would disrupt approach and landing procedures. This in turn limits his flexibility, and flexibility is treasured above all else by the air traffic controller.

Probably the most unpredictable and, therefore, the most dangerous factor influencing the approach and landing decisions of both controller and pilot is the weather. The approach controller must consider thunderstorms, squall lines, and other meteorological conditions in the approach path, while the local controller must take into consideration the winds aloft, the surface winds, runway acceptance, visibility, and breaking action in determining the arrival sequence.

Not only are weather conditions of major importance, the frequency congestions created in receiving and relaying these reports can by itself create a very real problem. Frequency congestion is one of the most underrated problems facing controllers today. The ATC System is built on effective communication between pilot and controller. Standard phraseology patterns have been developed in an attempt to transmit the clearest possible message while using the fewest possible words. Unfortunately, the standard phraseology only covers a fraction of the situations that pilots and controllers encounter. When a new situation arises, a pilot or controller can launch a long-winded dissertation tying up the frequency for minutes at a time.

Another type of frequency congestion is also common. With rare exception, civilian aircraft use radios in the VHF range; military aircraft use UHF radios. When these transmissions reach the controller, they both come out of the same speaker. Quite often the military pilot will pick up his microphone and hearing nothing, will begin to transmit, completely blocking the air carrier who was also transmitting. If you have had a controller ask you to repeat a transmission that he should have gotten the first time, this is possibly the reason.

No other factor presents more of a problem to the controller than pure volume of traffic. Volume is a direct multiplier of all other complexities. A situation that may be routine under normal circumstances, can become extremely complex with the inclusion of just one or two additional aircraft. Why is volume such an important factor? Because it is a drain on the controller's time—time that he may need desperately to resolve a problem that is rapidly getting out of hand in another part of his sector.

The second commandment of air traffic control is that you must always think faster than the airplanes are flying. Anytime an approach controller is faced with more traffic than he can safely handle, he has only one effective recourse; slow down or stop the traffic flow. This means more work for the controller and delays for the pilots. You may be surprised that I said that this means more work for the controller. Any experienced controller will tell you that the work load involved in putting aircraft into, and then taking them out of, a holding pattern exceeds the effort required just to let them continue their approach. The required coordination alone makes holding aircraft a difficult job.

Ironically, the group that usually screams the loudest about holding delays, is the group that causes most of the delays—the airlines themselves. Their scheduling practices can call for five or six aircraft to be using the same runway at the same time. You do not have to be a journeyman air traffic controller to realize that this just will not work. I realize that the airlines schedule their flights for the times that their customers want to depart. I have no instant solution. However, I wish the airlines would be more aware of the controllers who are forced to live with a problem that, in most cases, the airlines created.

There are, of course, many other factors involved in the controller's decision-making process during the approach and landing. What I have done until now, is to present a variety of the recognizable factors. What is not often examined are the many human factors with which air traffic controllers must deal.

For example, it is part of the controller's job description to perform on-the-job training (OJT) to developmental controllers. The controller has had only minimal, if any, training as an instructor, may have no inclination to the task, and may not even be a great controller, but that makes no difference. It is part of his job description. In providing training to an apprentice controller, you must let him work using his own techniques as much as possible after he reaches a certain degree of proficiency. Quite often this means permitting him to work himself into a potential problem to see if he will recognize it and affect a timely recovery. I do not mean to infer that the instructor would allow two aircraft to get dangerously close, but this is where the problem lies. The trainee must be allowed to go as far as possible before the instructor takes the position himself. There is very little argument among journeyman controllers that OJT instruction is their most difficult job.

There is one other human factor that deserves a closer look. FAA statistics show that most controller's errors occur during periods of light-to-moderate traffic. What the statistics do not show is the reason why. The reason given is usually generalized as inattention. This sort of oversimplification is a disservice.

Volume of air traffic in an approach control facility can fluctuate wildly. The controller can be blessed with long periods of serenity, only to be later inundated to the point of panic. These traffic peaks can produce wide emotional swings. After working a major inbound rush, the controller can be left emotionally drained. It is extremely difficult to prepare yourself mentally to work the three or four aircraft that can trickle in after a major influx. It is these three or four aircraft that statistics show are involved in most system errors.

Now I would like to engage in a little oversimplification myself. The problems that controllers encounter during the approach and landing fall into two main categories:

1. Those that affect a controller's flexibility.
2. Those that add an additional work element requiring the expenditure of precious time.

These two categories can be further broken down into those that are brought on by the system and those that are human factors.

System generated problems receive the preponderance of attention during accident investigations because they usually have an identifiable cause and solution. It is my opinion, however, that the real cause of most system errors has a foundation in the many human factors. These factors have been almost ignored by our present accident investigation system. Until this realization is dealt with, the ATC System will remain an imperfect art form.

Before closing, I would like to step away from the approach and landing problem and briefly address myself to two other areas of concern. The first is the NTSB hearing. The National Transportation Safety Board is charged with determining the probable cause of aviation accidents. Its hearings are not for the sole purpose of preparing a legal position for pending litigation. I have attended NTSB hearings in which the only missing elements were a lady sitting in the corner knitting a French flag, and a guillotine waiting in the courtyard.

I realize that members of the legal profession may have a great deal of interest in the facts developed during an NTSB investigation. They must realize, however, that the purpose of the hearing is to determine probable cause and not to provide a course in flying or control to attorneys.

The second issue is probably the most heated controversy facing the ATC System today—the question of "go-no go" authority. PATCO has taken the position that, assuming they had the proper equipment and training, controllers should have the authority to deny take-off or landing clearances during periods of adverse weather. Actually, this recommendation was first made by the NTSB in April of 1974, but was later rejected by the FAA.

While there were many factors to be considered in the adoption of our position, basically they all have at their root the desire to provide additional safety. Most accidents result from an error in judgment. Judgment is affected by many factors, not the least of which is economics. Pilots can be under subtle but very real pressure to complete their flight on time. Delays result in frustrated passengers, cancelled flights, and general confusion. All of these can be directly equated to dollars and cents. The air traffic controller is not burdened with this economic consideration. Taking economics out of the list of those issues affecting judgment should result in increased safety.

As I stated earlier, I realize this is the most contentious issue in the ATC System today. The other parties to the issue have raised some very valid points in opposition to our position. However, I object to generalizations stating that controllers are trying to erode the pilots' authority by placing themselves in the cockpit. It appears that prior to a crash, the industry wants to keep the controllers out of the cockpits; after the crash, there is usually a mad rush to bring them into the cockpits.

SUMMARY

The problems that controllers encounter during the approach and landing procedures fall into two main categories: 1. those that affect a controller's flexibility; 2. those that add an additional work element requiring the expenditure of precious time. These two categories can be further divided into those that are brought on by the "system" and those that are related to human factors.

Traditionally, the "system" generated problems have received the preponderance of attention during accident investigations because they usually have an identifiable cause and solution. Experience has taught us, however, that the real cause of most errors has a foundation in the many human factors. These factors have been almost ignored by our present accident investigation system. Until this realization is dealt with, the ATC System will remain an imperfect art form.