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AN AIRLINE PILOT'S VIEW OF SAFETY

BY ROBERT N. BUCK†

I. WHAT PILOTS DO ABOUT SAFETY

THE BASIC FACTOR controlling air safety is economy. There are two extremes. One is to make flying so safe that the airline cannot make a profit; the other is to fly for maximum profit disregarding safety.

The total safety effort is to find some point between these extremes where the risks and profits are acceptable. The airline pilot's role is to maintain this in between point, leaning toward safety. The pilot is not always a popular person as he pursues this, but it should be remembered that he has a most objective outlook on safety. His primary interest is to protect the lives of passengers and himself, not to protect a product or bureau. The pilot is personally affected by an accident. An accident to him is not simply a statistic or formal report; it is a tragedy of human suffering which he sees at first hand with full impact—a tragedy which he may be blamed for and blamed unjustly. How does the airline pilot try to improve air safety? He does it largely through his union, the Air Line Pilots Association (hereinafter ALPA).

ALPA spends considerable funds, time and effort on air safety. It supports an Engineering and Air Safety department which employs full time aeronautical engineers. The major work, however, is done by the pilots. Each local council of an airline has an Air Safety Chairman, each airline a Central Safety Chairman and each region a Regional Air Safety Committee. All these efforts are coordinated with the head office engineers. More than 200 people are involved.

The pilots watchdog their airlines on day-to-day safety matters that cover a wide range including maintenance, operational procedures, training, new equipment, and instrumentation. In the event of an accident, pilots of the safety group take part in the accident investigation by working closely with government agencies at the scene of the accident. They also attend the official accident hearings. In 1966 ALPA investigated 27 major accidents plus innumerable incidents.

ALPA has a large group of standing committees also made up of pilots with the engineering staff available for technical help. These committees cover a wide field, some of them being:

- (1) air traffic control,
- (2) all weather flying,
- (3) pilot training,
- (4) airworthiness and performance,

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- (5) noise abatement,
- (6) new aircraft evaluation, and
- (7) airport survey and improvement.

In addition, ALPA members maintain extensive contacts with FAA, CAB, NASA, ESSNA and the military, as well as, technical organizations such as SAE, RTCA, and AIAA. Further, ALPA works closely with international organizations and governments. ALPA annually conducts a safety forum which analyzes committee work, discusses safety problems and gives the pilot an opportunity to exchange viewpoints with industry and government representatives who are invited to attend. The safety forum is of worldwide interest and reputation.

The pilots doing this work do not receive remuneration except to be reimbursed by ALPA for expenses and any pay loss they may incur by missing a flight. Much of the work is done on spare time. Within this pilot group there is considerable background, and many of the pilots doing safety work are aeronautical engineers, lawyers, psychologists and other professionals.

The airline pilot through his union has been accepted by industry and government, and his opinions are valued and sought. For instance, some pilot committees are active with government and industry trying to make all weather flying a safe reality; others work on the same basis evaluating new aircraft designs such as the Boeing 747 and the SST. The pilots' hope is that they may help create a better, safer airplane before it enters airline service and not find themselves living with a bad design after that airplane is in service. Pilots have been a part of the creation of approach lights, runway markings, runway length requirements, crash worthiness rules, training rules, the SST nose configuration for better visibility, the basic T instrument arrangement, fire after crash tests with NASA and United Air Lines, shoulder harness requirement, reverse thrust as an added safety factor in landing and not a crutch for shortening landing distances, lower weather minimums, Doppler navigation, floating seat cushions and many others. These are some of the things the airline pilot does about safety and how he does them, but now let us talk about some of the problems and things he would like to see improved.

II. PROBLEMS AND NEEDED IMPROVEMENTS

A. *The Airport*

Many airports have inadequate runways, particularly under bad weather conditions. On paper these runways are adequate; under actual conditions they are not. Turbulence during an approach plus anticipated wind sheer means extra airspeed to any competent pilot. This uses up runway, and he knows it; but he is using judgment based on experience and knowledge that may be contrary to the exact figure written in a manual which was developed from tests made under ideal conditions on a sunny morning in calm air with a well rested and practiced test pilot at the controls.

The basic reason for wanting added runway length is the difficulty in stopping on wet or icy surfaces. One of the most startling experiences a pilot may have is to apply brakes on a jet transport as he rolls down a wet runway and find that the airplane just is not stopping. It is the same helpless feeling one has on ice in an automobile in a skid. During these trying periods of slick landings we do not have any measurement telling us what to expect in the way of runway braking coefficient when we land.

The same problems makes V_1 , the go-no-go speed of takeoff, a theoretical and impractical number that is valid only on paper or a clean, dry runway. The obvious solution to short runways is to make them longer, but this is difficult economically and socially. Another way is to make airplanes land slower. It is to the credit of some manufacturers that new model jets land slower than previous ones; the Boeing 707 series is an excellent example. But this is not always the case—landing speeds of some new airplanes are shockingly high. The future promises more of the same, and I speak specifically of the supersonic Concorde.

The pilots' fears of high landing speeds are based on experience as they live with fast landing airplanes that are made to "fit" short runways by gimmickry and procedures written in manuals. The pilots have been successful in getting some runway length increase, but these are not sufficient with today's aircraft, particularly with lower weather minimums coming into use.

Other problems cause the airport to be a place of hazard. Constant construction of taxiways and buildings makes taxiing an airplane something like running a gauntlet. At night, with confusing and inadequate lighting, taxiing an aircraft within a few feet of a three foot drop off in pavement is frightening because slipping into this ditch could cause a structural failure, leaking fuel and fire.

The ground based vehicles on airports which service fuel, food, maintenance, and baggage have become a multitude. Familiarity again breeds contempt as the vehicle driver zips closer and closer to the airplane. I had a commissary truck attempt to bluff me or play "chicken" as I taxied a 707 toward a gate at Kennedy. The truck won the contest as I stopped to allow him passage.

It is of considerable concern to know that most airport fire fighting equipment is off in some distant corner far from the action and that precious time will pass in the event of an accident before the equipment can be on the scene. It seems basic that fire and rescue equipment should be adjacent to the active runway road to save decisive seconds should an accident occur.

B. Air Traffic

We need a collision avoidance device as soon as possible. The effort being put on its development is not strong enough. The device is needed because traffic control is not infallible, mistakes are made, and the magic of radar does not take care of all conditions. Any airline pilot can tell you of

times radar did not see an airplane that passed close by. The need for collision avoidance equipment is obvious, and its creation should be a priority item. No matter how stringent and restrictive the rules may be, or how good radar and computer technology become, an anti-collision device will be a necessity.

Air Traffic Control's primary job is to keep airplanes from running into each other, but its job is to move traffic quickly, too. At first this last point may seem an economic requirement only, but it is a safety requirement also. One of the key hazards in air traffic control is trying to move traffic faster than the system will allow. This is the time controllers are pressured into fast, furious and error-susceptible action. It means jamming airplanes too close together with one still on the runway as the next one is about to land. It means fast radio chatter with repeats of instructions being overlooked and misunderstood. Traffic will not be at its safest until the traffic flow presented to the system can be absorbed expeditiously. The largest single requirement to make this possible is more runway space. If a runway can accept 40 airplanes an hour and 50 arrive it is obvious that traffic will back up and dangers will increase. Better airports, more runways and more airports are an important part of safety.

It is possible, when more runways are built, to have special ones for General Aviation. With their own aids and entry-exit routes they can operate into major terminals safely. Zurich, Switzerland, a busy international air terminal, has a flying school operation on the airport working side-by-side with airliners. As an airline pilot, I have never been conscious of its presence—the little airplanes have never been the slightest problem. It is well organized and planned.

C. Crash Survival

The possibility of fire following a survivable crash is one of the airline pilots' worst nightmares. The awesome size of passenger loads on present jets and the coming of bigger jets does not make it any better. For example, a jet transport which never left the ground was involved in an accident. Relatively minor damage was done to the airplane as it hit an object while rolling at less than 50 miles per hour. Probably not a person was injured; many never knew there had been a collision. Yet, 47 people lost their lives in a horrible holocaust when fuel, which spilled, ignited. This is the kind of thing that makes taxiing on airports with construction or wildly driven vehicles a dangerous operation.

Another problem is emergency evacuation methods developed to get passengers out of airplanes. The record is bad because the chutes do not do the job. Escape chutes do not work or exits are blocked by fire or damage. Believing that the emergency evacuation equipment and procedures will do the job is ostrich thinking of the worst kind. The only way to prevent this problem is to prevent the fire. There are wonderful technological advances that are more than a dream; they are within our grasp. Work is being done on inerting, jellied fuels and fuel containment that

promises the answer, but work advances slowly. This is a project that should have tremendous effort—it demands a crash program of the utmost importance. Certainly the jumbo jets, air buses and SST's should not go into passenger service until the job is done.

D. Legality

There is a trite but true expression in flying that when a problem cannot be solved technically it is done by putting another page in the manual as a procedure or a regulation. This has created a multitude of rules, regulations, and procedures that almost inundate the pilot.

There is a section in the pilot's manual called the "Operations Specifications." It deals with how the pilot can fly routes, under what conditions he can make a bad weather approach and so on. These are FAA generated. In many manuals there are an equal number of pages which attempt to interpret the FAA rules; they normally add to the confusion.

There are 9 different ways to make an instrument approach to Kennedy Airport, 11 at Chicago, 9 for Los Angeles and more or less the same for other airports. Each procedure has different rules or conditions. How these differences are interpreted is often a lengthy discussion in an office between pilots or the FAA and pilots. In action, however, a pilot may be flying in bad weather and because of weather or radio aid changes, may have to make a judgment as to what is legal and what is not in a few moments. If he errs, there is little compassion; the rule's ambiguities are no excuse.

It seems that each time there is an accident or incident a new rule is created to cover the problems, and it is piled on top of rules already in the books. Most of the rules become a part of the FAA's responsibility automatically so that an FAA inspector can pick up a pilot for the smallest infraction with the pilot facing possible federal action.

Pilots do not like to break rules. They do not plan to disobey, but it is almost impossible not to do so. Couple this with constant surveillance by FAA and you can see that the pilot sits on a nervous perch. Most lay people think this is good, but, of course, it detracts from safety. When a pilot has to make an immediate judgment, it may not be the best judgment because it is tempered by consideration of what may happen to him if what he thinks is best happens to be illegal. The obscurity of the rules make a clear-cut picture of what he may and may not do difficult.

There is an area often referred to by pilots as legal blackmail. It begins with an item in the regulations called "emergency authority." It simply means that a pilot can break any rule he wants if he thinks it best for the safety of the flight. This is a platitude the FAA throws over the entire problem like a net. The trouble with emergency authority is that a pilot must follow up his action with an explanation, in writing. It is obvious that he does not want to do this, not because he is afraid to explain his action, but rather because he is fearful that his explanation will become a hunting ground for other rules infractions, and it is likely that he will

wind up having a violation filed against him for something outside the original reason for his use of emergency authority.

Where is the danger? It is not in the bold action required by a drastic emergency; any pilot would risk personal exposure to FAA for the sake of safety. But it is the borderline problem—the time when a situation is not an emergency but when it may become one—that causes trouble. The more timid pilot may allow his better judgment to be overshadowed by the fear of legality. For example, the mandatory noise abatement procedures fall in this category. There are times, because of wind, turbulence, and other weather conditions, when it is not a safe operation to follow those procedures. What happens if the pilot does not comply? He receives a note from the chief pilot asking for an explanation as to why he made so much noise. We have now returned to the problem that pilots are fearful of writing letters. The tendency is for the pilot to fly closer to the safety edge than his best judgment says he should so that he may avoid writing a letter and possibly exposing himself to charges.

Pilots are not asking to be relieved of the responsibility of explaining their actions. What they would like are more realistic rules written for pilots, not lawyers, and above all, honesty in writing rules and procedures so that they are possible to comply with and not just ways of covering a problem. Most pilots, because of this overall rule condition, consider the FAA a police organization and most FAA inspectors as police officers. Fear of the FAA is the primary insecurity of most airline pilots. Because of the rules, regulations, and procedures, the FAA and industry have become basically procedure conscious. They check carefully to see that each procedure is followed to the letter or number, but unfortunately this does not always reveal if the pilot being checked is a good or a bad pilot. This overemphasis on procedures reveals only whether the pilot has a good memory plus ability to use stick and rudder. It does not tell what judgment he will use under all conditions or how he will combine experience and knowledge with the mechanical skill of flying. It is the weakness in today's training and checking. It becomes a serious problem as we expand quickly and move pilots from novice to copilot to captain at a rapid pace. The jumble of rules aggravates the problem.

E. The Human Factor

Fatigue, discomfort, difficult working conditions in the context of poor lighting, heat and ventilation, as well as poorly located controls, all contribute to reducing safety. Pilots are not always clear eyed, rested, and alert. At sunrise a pilot is sleepy; the sun's rays slam into his eyes, and poor eye shades do not help. The pilot is dehydrated from the excessive dryness of a pressurized airplane; his body kinks from the uncomfortable seat. Below him stretches an endless white cloud blanket. He will soon enter it and make an approach and landing with a 100 foot ceiling. He is not in the best condition to make a landing.

Simply stated, not enough consideration is being given to these many

items which detract from safety. The cockpit of one of the most popular jet airliners provides an illustration. The pilot's seat does not line up with the control wheel thus causing the pilot's hands on the wheel to be actually at one side of his body. There is only a small misalignment, but enough to shock an orthopedist. The pilot's left arm and shoulder is cold because of a lack of heat near the window; his right side is too warm. The seat is uncomfortable with poor padding that has been worn-down from use. He cannot see important instruments because the control wheel hub hides them. The instrument lights reflect badly in the windows and reduce his chances of seeing traffic outside. If he dims the lights enough for outside vision, the important airspeed indicator is in shadow and difficult to read. These things are not listed as pilots complaints. They are listed as items that affect safety.

There is excellent work being done on human factors, but somehow it does not get into the final design of the cockpit; the man we depend on for the safety of the flight does not benefit from the work. Also within the scope of human factors are short landings. These have occurred with alarming regularity. One cause is the pilot's attempt to land short on an inadequate runway. He wants to get on the ground as soon as possible, but wind sheer or sensory illusions can result in a premature touch down. It is useful to dwell on this. In the last 150 feet of descent a pilot does not have adequate information. The ILS glide slope deteriorates somewhere below this height.

It is practice not to put Visual Glide Slope Indicators on runways equipped with ILS. The theory is that the ILS guide slope is sufficient. This concept is in error. The pilot loses radio glide slope as he approaches the ground. As he comes out of the clouds his attention is necessarily outside; he is looking at the runway and not the instruments. At this point, in the confusion of lights and a rain smeared windshield, he has no glide slope reference. It is not difficult to get too low. A good visual glide slope is needed on all runways to help in the final visual part of a bad weather landing.

This is a typical item in the human factors realm—just one of the items that make us wonder how many accidents called pilot error should have been called human factor or system error instead.

III. PILOT SAFETY OUTLOOK

Management, industry, and government sometimes say that pilots obstruct air progress in that if it were up to the pilots, no advances would be made because of their ultra conservatism. This is a fallacious statement. What the pilots have done, at times, is to prevent a headlong rush motivated more by profit than by safety. Pilots know that progress is necessary. They are anxious to see it; they have helped make much of it in the past. But their responsibility for operating aircraft safely must come first.