Flying SAFETY

- Future ATV Management
- Quick Reactions
- Making Landings Safer
- It Can Happen to You

SEPTEMBER 1991

Air Traffic Control Safety

Tempelhof 1948

THERE I WAS

This incident happened over 20 years ago — a highly stimulating moment for a young 20-year-old flight instructor and an even younger student. It was an equally stimulating moment for a military transport crew. The flying environment of this story is exactly the same today as it was back then. Exactly! If you ever fly your airplane IFR to an airport without an operating control tower . . . this story's for you.

■ My student, Bob (one of my first students since earning my FAA Certified Flight Instructor rating) and I had just finished our training sortie in the venerable Cessna 150. He had already soloed a couple times, and because we often flew later in the day, had several hours of dual night flying already. It was dusk, and I wanted to give him a couple solo touch and go's before turning him loose for solo in the local area.

"Okay, Bob, I probably shouldn't do this since it's getting late, but I'm gonna let you solo again. Only three trips around the pattern. Stay on the radio for traffic advisories on the Unicom frequency 122.8 like we always do. I'm gonna park my Volkswagen by the side of the taxiway so I can flash my headlights at you, or wave my arms, if there's some reason I want you to land and stop. Any questions?" With a hearty thumbs up, my intrepid aviator taxied off for Runway 5.

The airport had one runway — 5-23. It was about 5,000 feet long in those days. There is one IFR approach — a VOR (southwest of the field) with straight-in and circling minimums of 600-1. The final approach course is 026 degrees which gives a 5.8 nm angled final to runway 5 or a good setup for a downwind entry and circle to 23. The airport was serviced by commercial airlines flying F-27 turboprops and an occasional corporate jet aircraft. But largely, it was a bug smasher airport.

Bob completed his checklist and roared aloft behind 100 horsepower. Obedient to the wind direction-indicating tetrahedron (lighted) and the windsock, he flew the established left-hand traffic pattern to Runway 5. Announcing his position on downwind, base, and final as he had been taught at this *uncontrolled* airport, Bob greased his first stop-and-go landing. I was proud. But, I was about to experience an adventure I really didn't need. . . .

As the Cessna 150 climbed out and turned crosswind for Runway 5, I noticed an approaching aircraft, apparently inbound from the VOR. All I could see was a rotating beacon. It was turning downwind for Runway 23 so far out it had to be a big airplane. Commercial F-27, of course. DOWNWIND FOR 23???!!

Great! My student is up there at night (almost) going opposite directions with an F-27. I didn't really want Bob up there with other planes in the pattern, but he could handle it. PLUS, the commercial ground agent would be out on the ramp scanning the pattern and advising the pilot on the company's frequency. No sweat.

continued

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE CHIEF OF SAFETY, USAF

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Bob had established the pattern for runway 5, and that's what the tetrahedron indicated. *Double* no sweat.

To my chagrin, the big airplane seemed to be slowing way out there on "downwind," and his landing lights were on. I fully expected it to maintain pattern altitude, turn a crosswind to fly a left downwind for 5, and follow Bob. Surely the aircrew and Bob were announcing their positions to each other — just like the Airman's Information Manual said to do. *Triple* no sweat.

Uh oh! The big airplane was now definitely descending on a left base leg to runway 23, and Bob was powering back and configuring for his approach to 5. Standing by my VW in the middle of a harvested wheat field with no radio, watching a disaster unfolding and not being able to do anything about it was seriously raising my pucker factor. I flashed my VW headlights but realized that would only divert his attention from what he needed to be seeing ... soon!

Bob was now turning final, landing light on. Couldn't he see the BIG airplane on final, opposite direction, with all those BIG landing lights flooding the sky???!! My heart was pounding. I think I needed a pacemaker. The big airplane kept coming ... the Cessna kept coming. They both just kept coming. I could not believe my eyes!!

Just as Bob touched down, right in front of my Volkswagen, the big airplane, which was now over the opposite threshold, made a BIG noise — a deafening roar as *reciprocating piston engines* suddenly went to max power. That was no F-27 turboprop! Then I almost hit the deck as this aluminum cloud (yes, it was a very big airplane) thundered right over my head ... low ... on its go-around.

A very excited and shaken Bob stopped the Cessna and told me he noticed only the "big #⁹!!* landing lights" coming at him just as he flared. He almost made a high-speed dash and crash off the runway in order to survive before he realized the big plane was on the go.

The noisy aluminum cloud went around, made left traffic for 5, and landed. I stomped down to the parking area to investigate.

It was a Reserve C-54 ... a four-engined DC-4 transport. I climbed aboard and asked for the aircraft commander. He was still upset ... hadn't done a real live go-around like that since pilot training. They were on a Reserve mission carrying a military band.

I asked, "Didn't you hear my student on Unicom 122.8?"

"What's that? We don't have to do that kind of thing ... we had a *clearance* for the VOR approach from Seattle Center!!"

There's the lesson. A military flightcrew, unfamiliar with uncontrolled airports, got an IFR clearance from a *remote* controlling agency to shoot an approach to an uncontrolled airport in clear VFR weather ... and they thought they were cleared to charge into the pattern without checking in on Unicom (now called the Common Traffic Advisory Frequency — CTAF) without reference to the tetrahedron or actual-traffic-established runway pattern. Thank goodness between two pilots, a navigator, and a flight engineer in that C-54, somebody spotted Bob's landing flare and commanded a last-second go-around.

Point to be made: Crews should be familiar with the uncontrolled airport environment — uncontrolled. Preferred ways to do things — by the book — but uncontrolled nonetheless. When breaking out of the weather on a properly cleared IFR approach into that uncontrolled airport, good situational awareness should dictate the crew knows if weather is VFR or not *underneath* IMC. If the bug smashers have VFR weather underneath, they're going to be out there in force. And now, the "big airplane" is one of *them* ... needing to advise position and intentions on the CTAF, ***non-operating*** tower frequency (maybe the FAA shut the tower down for budget reasons or it isn't open 24 hours a day!), on-field Flight Service Station, or whatever is the established CTAF. Preflight planning pays off here. In the case of an IFR approach when the field is actually in IFR conditions, anyone who is out there should be talking to the same controlling agency ... but at an uncontrolled airport ... don't assume anything!

This story had a happy ending and a nice tour of a C-54. The military crew, Bob, and I all learned something that evening. Hopefully, this story will make Air Force crews who frequent the uncontrolled environment chuckle a little bit and think "could that happen to me?" ■

Pilot Induced Hot Start

LT COL DAVID M. BURNETT
Directorate of Aerospace Safety

■ Approaching idle rpm during engine start, the Falcon driver felt an engine rumble and saw the rpm start to unwind. Looking at the fuel master switch, he noticed it was unguarded and OFF. Realizing he'd pooched his "pre-start" and "verify" checklists, he quickly moved the switch to ON in an attempt to catch the engine before it flamed out. This compounded his initial error by reproviding the engine with starting fuel without sufficient rpm or airflow (the jet fuel starter had already disengaged).

The engine continued to unwind, and the crew chief advised the pilot that momentary flames had come out of the tailpipe. The pilot responded by shutting off the throttle and battery without checking the engine temperature, and then exited the aircraft. At this point, the crew chief looked up the tailpipe and noticed parts of the aft turbine blades were still red hot. He told the pilot who climbed back into the cockpit, started the jet fuel starter, and dry motored the engine to cool it below hot start checklist limits.

Engine overtemperature or duration could not be positively determined so the engine was pulled for inspection. Significant damage to the high and low pressure turbine sections was confirmed, and the turbine module was sent in for depot overhaul.

The pilot's errors were many:

- Not turning the fuel master switch on prior to engine start.
- Not catching this error during the verify checklist.
- Turning the fuel master switch on after the engine was unwinding.
- Not monitoring the temperature and the dry motoring to reduce it after abandoning the start attempt. ■

The Future Air Traffic Management System for the United States

The air transport system of the early 21st century will require more than an air traffic control system; it will require a comprehensive system of air traffic management.

MR MARTIN T. POZESKY
Associate Administrator for System Engineering and Developments

This article provides a preliminary description of the concepts and design of the future air traffic management system for the United States. The purpose is to encourage and facilitate community dialogue on system development requirements. This paper was based on the "Concepts and Description of the Future Air Traffic Management System for the United States," *by the FAA, Office of System Development, Associate Administrator for System Engineering and Development.*

■ The air transport system of the early 21st century will require more than an air traffic control system; it will require a comprehensive system of air traffic management (ATM). This paper outlines the needs that FAA anticipates and the system required to meet those needs.

The ATM must accommodate a broad spectrum of users and avionics equipment. Users will include single-engine general aviation aircraft, sophisticated business aircraft, rotorcraft, and the whole range of commercial and military aircraft. The new environment will include advanced subsonic transports, second-generation supersonic transports, and, perhaps, hypersonic aircraft. Vertical flight capability will vastly improve system capacity and must be accommodated fully. Helicopters may serve short-haul routes (50 to 150 nm), while tiltrotor/tiltwing vehicles provide service on short- and medium-length routes (100 to 300 nm). This will reduce pressure on runways and runway approach areas by diverting some traffic to helipads on the airport and to heliports and vertiports at downtown and industrial locations away from airports.

In 1990, Part 121 and scheduled 135 operators flew 29 percent of all flight hours in the United States; general aviation and air taxi operators flew the remaining 71 percent. Clearly, the future ATM system must do more than accommodate nonscheduled users; it must be user-friendly to the entire aviation community. If it is not, American aviation may be threatened at its roots.

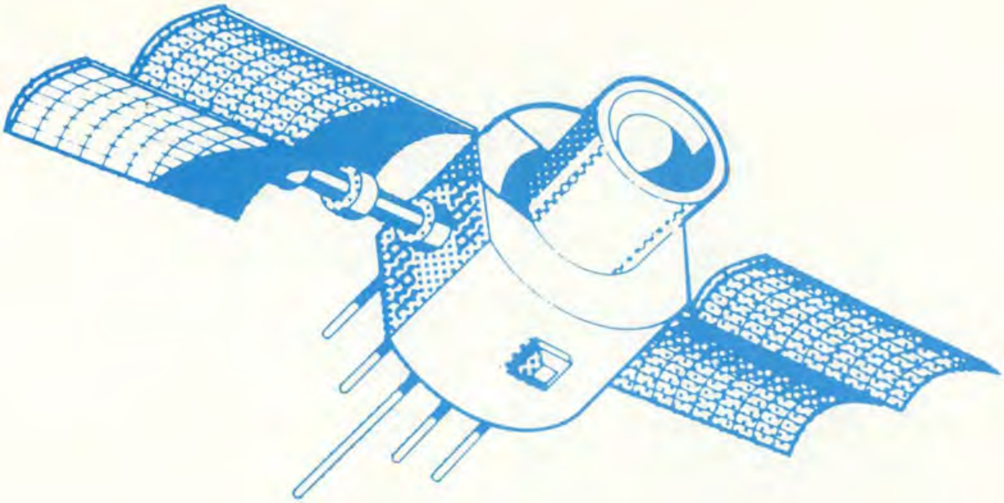
The outline of the system in the early 21st century is fairly clear. Improved information will be a major force, aided by extensive automation, cockpit displays, and real-time information. System capacity will increase substantially with major advances in flow control, reduced horizontal and high-altitude vertical separation, and more use of closely spaced parallel runways. Automation is at the heart of the ATM, with growing dependence on secondary radar surveillance in place of primary radar (radar based on interchanges of unique signals to identify individual aircraft, as in the Traffic Alert Collision Avoidance System (TCAS), rather than radar that responds to an aircraft skin and informs ATC only that *some* aircraft are present at a certain bearing). All these improvements require full understanding and integration of human factors.

Though the promise of new technology can lure us into the trap of trying to replace an extensive, complex system in one grand effort, it is impractical. Consequently, the ATM will evolve from the modernization effort now underway in the Capital Investment Plan. While we must remain open to entirely new technology, the future system will be based largely on technology that we understand today. Yet, even with this realistic approach, ATM system designers face very difficult problems in transition and integration.

Outline of the Future System

Human factors are a major challenge in ATM design and development. Information provided to flight crews and air traffic managers, and their tasks, must be consistent with their management and control responsibilities and with the characteristics and capabilities of human beings.

Besides the limits of human performance, the quality of air traffic management depends on the ability of the traffic management plan to adapt rapidly to changing circumstances. Adaptation, in turn, depends on the quality of information about the environment in which aircraft operate. Environmental fac-



tors include winds aloft, winds and wind shear on approach, information on severe weather, the quality of short-term weather forecasts, weather impact on runway condition (rain, snow, and ice), local requirements to contain or distribute aircraft noise, and existence, strength, and transport of wake vortices. The future terminal area/ airport ATM can be no better than the information available to it. The task is to develop and implement better sensors and information transfer (communications) so people and computers can use the information more efficiently.

Other environmental information will come from the increasing number of commercial aircraft equipped with both inertial reference systems and data link communications. These aircraft can automatically communicate wind information and other data about the environment in which they fly and the environmental impacts they bring (wakes, noise, achievable stopping distance on reduced-friction runways, etc.). The future system will use these aircraft data to augment ground-derived environmental information.

If the ATM system is to operate efficiently, a flow management process must distribute aircraft traffic smoothly to avoid unacceptable levels of traffic congestion. Flow management depends heavily on information about the environment, as described above. The system requires real-time flow management to integrate the mass of information and take full advantage of changing terminal area and airport conditions. Sophisticated aircraft flight management systems that adapt to changing situations will be in automatic communication with ground systems; they will be valuable partners in flow management.

Flow management also requires full integration of central and local flow management systems and terminal automation. Both central and local flow control depend heavily on actual and short-term prediction of airport capacity, which, in turn, depends on environmental and airport factors, such as availability of runways and facilities, runway configuration, special noise considerations, wake separation requirements of aircraft in the system, availability of taxiways and holding areas, etc. The future system must incorporate the best data possible on actual and short-term projected airport capacity.

However, the best use of terminal airspace and airports requires an efficient airspace structure that permits planning in the ATM and in the aircraft. Airspace structure should dynamically adapt to changing circumstances to accommodate the capabilities and desires of the aircraft users, aided by data available in the aircraft. The quality of the process begins with the quality of position information available to the system and to flight crews.

In the future system, the basic sources of accurate aircraft position data will be secondary surveillance radar (SSR) and altitude-reporting transponders. Other sources of position data, such as relay of aircraft-derived navigation position (using GNSS, the Global Navigation Satellite System) may come into use if their accuracy, availability, and integrity are adequate, but SSR Mode S transponders will be the standard for high-traffic terminal area operations as a minimum capability on all aircraft of concern.

Accurate surveillance information is increasingly required on the airport surface to support ground control at the busiest airports. The sources of choice for this service include airport surface detection radar augmented by positive identification using the Mode S system, or aircraft transmissions of GNSS position data.

These new technologies and aircraft capabilities promise far more cooperative arrangements than before. For example, the introduction of cockpit traffic displays will involve the aircraft crew in the ATM process in new ways. These and other capabilities require major changes to rules and procedures.

Because separation standards strongly influence the capacity and functioning of the future ATM, development requires reliable, comprehensive models to determine separation standards applicable to new technologies and procedures. Improving the process of procedure development also is an important

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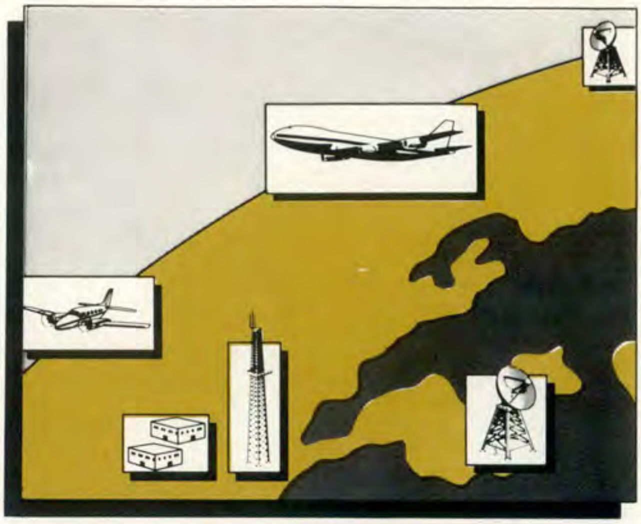


The future ATM can be no better than the information available to it. The task is to develop and implement better sensors and information transfer so people and computers can use the information more efficiently.

initiative, so users considering investment in new technology can have reliable guidance on the operational benefits of their investment.

Automation

As the above discussion might suggest, the largest benefits of the future ATM rest with automation that reduces or eliminates constraints imposed by the limitations of human operators. The flow management component of the ATM will assure that unacceptable levels of traffic congestion do not develop and that traffic is managed efficiently with no unnecessary flow restrictions. System capacity will be used efficiently to accommodate traffic demand. Sophisticated models that accurately predict congestion and delay will formulate effective real-time strategies for coping with excess demand. Users will interface with the flow management process in flight planning to negotiate trajectories that best satisfy their needs within ATM system constraints.

The tactical management process that monitors the progress of individual aircraft also will use automation extensively. When a user determines that a flight-plan amendment is required, a negotiation process will be established between the aircraft's flight management computer and the ground-based monitoring system to define a new trajectory within ATM constraints (e.g., separation standards). These negotiating processes will involve flight crews and air traffic managers to the extent required to keep them well informed and to permit them to exercise their management and their control responsibilities.

Aircraft not equipped with flight management computers will communicate with the ground-based system by data link and voice channels. Automation aids will be available to air traffic managers for negotiating flight-plan amendments and control instructions. Where appropriate, four-dimensional clearances will be used to position aircraft in time to resolve conflicts and to schedule use of scarce runway capacity.

System Operations

GNSS will be the primary means of navigation for terminal, en route, and oceanic IFR flight operations, based on an adequate number of satellites and monitoring provisions to ensure the required level of reliability, integrity, and availability. Category I approach and landing capability will be provided by GNSS, combined with ground-based equipment providing differential corrections to the ranging signals available from the satellites. MLS will provide Category II and III approach and landing capability. Category II precision approach and landing operations will be supported at all airports serviced by air carriers. Category III service will be provided at pacing airports. Area navigation and four-dimensional navigation capabilities will be commonplace in air carrier and business aircraft.

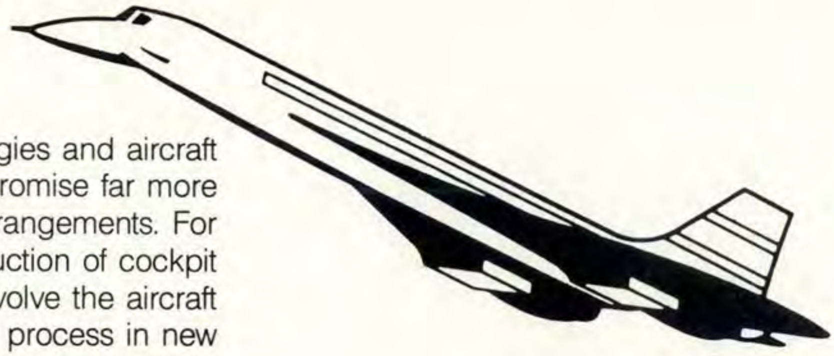
In polar regions, high frequency communications, along with VHF voice and data communications, must remain part of the system for the foreseeable future. In the future, satellite communications will be used extensively over oceans and land areas for both ATM and commercial purposes.

Data link will be commonplace for ATM operations, using Mode S and other high-integrity media to transfer data between the ground and the flight deck. Open System Interconnection (OSI) techniques will be fully developed and incorporated into the aviation data link design to assure integration of satellite, Mode S, VHF, and terrestrial data transmission systems.

Ground-Based Systems

Ground-based ATM surveillance systems also will evolve to rely more on secondary radar and less on primary radar. However, for the immediate future, primary radar must continue to be used in terminal areas to detect aircraft blundering into terminal control areas and as a backup in the event of transponder failures.

High data rate secondary surveillance radars will monitor aircraft approaching closely spaced parallel runways. Surveillance over the ocean and in low density, en route airspace will be provided by satellite-based Automatic Dependent Surveillance (ADS). This surveillance system involves reporting



New technologies and aircraft capabilities promise far more cooperative arrangements. For example, the introduction of cockpit traffic displays will involve the aircraft crew in the ATM process in new and dynamic ways.

to the ground, via satellite data link, the aircraft position as determined by the on-board navigation system. ADS will provide real-time surveillance information in airspace where this information would not be available otherwise.

The need for airport surface surveillance must increase as airports grow in size and operational complexity and the requirement for all-weather operations grows. ATM will meet these needs with primary radars and secondary surveillance techniques using Mode S technology. Mode S techniques will provide aircraft position information and flight identification (e.g., "UA 52") which are essential for automating surface traffic operations.

TCAS will also provide backup separation assurance (collision avoidance) to the ground-based system. In addition, TCAS technology will support a display of traffic information to improve situational awareness in the cockpit and permit the flightcrew to participate more fully in maintaining separations. The collision avoidance capability of TCAS, combined with ADS and improved navigation from GNSS, will lead to reduced lateral and longitudinal separation standards, especially in oceanic areas.

Cockpit traffic displays are likely to be used in various operational scenarios. In terminal airspace, flightcrews may use the traffic display for in-trail stationkeeping on arrival and for separation monitoring on departure to reduce unnecessarily large spacing between aircraft. In addition, the display may be used to monitor the positions of proximate aircraft on approaches to closely spaced parallel and converging runways to facilitate these operations at lower weather minima than would be possible otherwise. In low density, en route, and oceanic environments, flightcrews may resolve local separation problems directly by using the traffic display and VHF air-air communications.

Sophisticated weather models will access extensive data on weather observations to provide the mesoscale, short-term, and long-term weather products required by civil aviation. These products will be distributed in a timely way throughout the aviation community including operators, flight planning services, and ATM facilities.

Improved weather sensors and the integration of weather sensor data will provide comprehensive, timely, and reliable predictions of weather phenomena. New Doppler radar systems optimized for weather detection will use both rotating antennas and phased array technology at major airports throughout the U.S. Real-time weather observations will be transmitted to the ground from appropriately equipped aircraft via data link. These observations will be integrated with ground-based observations from FAA and National Weather Service sensors for a more comprehensive weather picture.

Oceanic, En Route, and Terminal Operations

Flow management will monitor capacity and demand at airports and in terminal, international, and domestic en route airspace. The tactical management process will monitor aircraft movements to assure conformance with flight plans and to identify and resolve problems such as imminent separation violations and aircraft incursions into special-use airspace. ATM will integrate terminal and en route automation to ensure traffic flows smoothly to and from terminal areas. Military airspace requirements will be fully coordinated with the civil ATM system to assure airspace not in use by the Department of Defense is available to accommodate civil traffic demand.

En route capacity will be substantially improved by reducing the vertical separation standard above FL 290 to 1,000 feet. Four-dimensional clearances and the ATM data link interface with flight management computers will be principal tools in assuring ATM constraints are met with the least disruption to users' preferred trajectories. Data link also will transmit weather observations from appropriately equipped aircraft and provide a variety of aviation information to the cockpit, such as weather products and the status of facilities and airports.

Another goal of the system is to make oceanic ATM operations as flexible as reasonably possible to accommodate users' preferred trajec-

continued

System capacity will be used efficiently to accommodate traffic demand. Sophisticated models that accurately predict congestion and delay will formulate effective real-time strategies for coping with excess demand.

tories. Future oceanic operations will make extensive use of Automatic Dependent Surveillance, satellite-based data link communications, GNSS, cockpit traffic display, aviation weather system improvements, and ATM automation, including integration of ATM automation with flight-management computer operations via data link. These new capabilities will permit flexible routing and dynamic modifications to aircraft routes in response to changes in weather and in traffic conditions.

Airport Capacity

Increased airport capacity will be a major objective of the future ATM. Independent IFR approaches to parallel runways spaced as closely as 3,400 feet will be routine, based on high data rate secondary surveillance radars and improved monitor controller displays. This will increase capacity up to 30 percent in IMC conditions at locations with such runway configurations. Improved metering, sequencing, and spacing of arrival traffic will increase single runway capacities in IMC by 25 percent, approaching single runway capacities in VMC today. Independent IFR operations on triple and quadruple parallel runways will be routine.

Many communities may create new capacity by using this new capability to construct closely spaced parallel runways that conserve airport real estate. Automation tools will assist air traffic managers in establishing efficient approach streams for parallel and converging runway configurations. In addition, flight crews will use cockpit traffic displays to electronically monitor other aircraft in the vicinity of closely spaced parallel and converging runways.

Traffic management operations on the airport surface will be aided by surface surveillance radars (initially primary radars, then secondary surveillance techniques using Mode S multilateration techniques) and by automation capabilities that assign taxi routes, monitor the conformance of taxiing aircraft to assigned routes, and alert air traffic managers when aircraft are out of conformance. Assigned taxi routes will fully use airport surface capacity to accommodate demand and to assure that departure sequences effectively use downstream terminal and en route airspace capacities in accordance with flow management strategies.

On the airport surface, suitably equipped aircraft will use cockpit displays showing a map of the airport surface with the assigned taxi route superimposed, including intermediate clearance limits such as hold short points. The display will also show positions of approximate aircraft. GNSS will determine the aircraft position on the map, and TCAS technology will determine positions of proximate aircraft. This display will aid navigation, improve situational awareness, and aid the flightcrew in maintaining separation from other aircraft in all weather conditions.

Data link will be used extensively on the airport surface to deliver predeparture and taxi clearances and to guide aircraft along assigned taxi routes, with flightcrew alerts when aircraft are out of conformance. Signal lights and signs also will indicate the status of runways and taxiways. Data link will provide flightcrews with hard copies of terminal information and alerts of severe weather conditions such as wind shear. Data link will dramatically reduce communications workload and the number of communications errors experienced with today's voice environment.

Development Challenges

Clearly, the future ATM offers major efficiencies and safety benefits. However, design of the future system is a major undertaking. The design process must consider whether alternative designs are operationally appropriate and incorporate a full understanding of related human factors.

Design analysis will require comprehensive, large-scale rapid prototype simulations of each alternative. These simulations will permit horizontal integration of ATM subsystem operations with aircraft subsystem operations, ATM and flight operations procedures, and airspace organization in order to characterize system performance reliably.

An adequate understanding of human factors is required to guide system design and to reliably evaluate simulation results. The FAA has developed a national human factors

research plan to generate the requisite knowledge base. A draft of this plan is being coordinated with the aviation community.

In June 1990, the FAA Research, Engineering, and Development Advisory Committee recommended the FAA seek a National Simulation Laboratory (NSL) in which to conduct rapid prototype simulation experiments to support future system definition and other NAS development efforts. The FAA has since established a small-scale simulation laboratory to develop the design concept for the NSL. The lab will explore appropriate hardware and software architectures, with a proof-of-concept simulation scheduled for early 1992. Current plans foresee initial NSL operational capability in 1995.

Reaching Community Consensus on Development Directions

However, the FAA cannot adequately address system design and development alone. The FAA expects the aviation community to participate, especially in activities at the NSL. The entire aviation community has legitimate interests in identifying alternative designs, evaluating the alternatives, selecting promising designs for further development, and establishing ATM System enhancement goals, including associated schedules. Design features that offer operational advantages for one user group may penalize others. Selecting a future design, therefore, should be a continuing community process based on the best possible understanding of each alternative. All members of the community have a stake in the outcome.

The future system design will reflect the willingness and ability of users and air traffic service providers to make the necessary R&D and capital investments. The aviation community must be convinced to make the necessary investments to enhance system capabilities and must generate the financial resources required before implementation of the future system can occur.

Finally, the design and implementation of the future system in the U.S. must be compatible with ATM developments worldwide. International aircraft should have a single set of avionics; we must avoid using one set of avionics in the U.S. and a different set overseas to perform essentially the same functions. Moreover, if international operators improve their onboard capabilities to exploit ATM improvements in one country, the return on investment will be enhanced if the same improvements are implemented in other countries. In oceanic areas, some service improvements cannot be implemented meaningfully by just one nation. Reduced separation standards, for example, must be implemented in all contiguous regions through which a group of aircraft will travel.

International coordination of ATM system improvements can be a protracted process, consuming time and funding resources. Fortunately, the U.N.'s International Civil Aviation Organization has established the Future Air Navigation System Committee. (Phase II to monitor and coordinate the development and transition planning for the future system.) The committee held its first meeting in Montreal in May/June 1990.

Summary

The future ATM system, based on more extensive automation with currently understood technology, offers major improvements for improving air traffic management services to better meet user needs. The principal opportunities are: Satellite-based communications, navigation and surveillance services; ATM automation, including the integration of ATM automation and flight management computer operations via data link; and new capabilities for sensing and forecasting weather.

The challenge before the U.S. and international aviation communities is to develop an adequate understanding of the costs, benefits, and operational suitability of alternative design and to coordinate a program of ATM improvements that reflect user needs, the willingness of users to upgrade their operational capabilities, and the capital investment resources of service providers. The technologies are identified; the task is to manage their application to improve the ATM process. ■

Courtesy of *Aviation Safety Journal*, Spring 1991, Vol 1, No 2

QUICK REACTIONS

There's one thing which frightens pilots, controllers, and passengers alike — the fear of an aircraft not having enough runway for departure or arrival.

■ On one seemingly uneventful day in the control tower, we became witness to both of these fears within a very short period of time. On a rainy morning in May, with a low cloud layer and poor visibility, four F-16 Fighting Falcons began an instrument approach with 3-mile spacing between each aircraft.

Upon landing, the first F-16 held its nose in the air in an apparent attempt to aerobrake. The pilot did not set the nosewheel down until more than halfway down the runway, still traveling at a high rate of speed.

Considering the potential danger, the local controller raised an additional arresting cable (via remote control device). Now, having three available cables (the last of which is used only as a final resort because it could possibly damage the aircraft), he advised the pilot of its location. It was obvious to us why the pilot did not respond to the controller's transmission as we observed the aircraft hydroplaning.

We guessed the pilot was considering factors such as should he attempt to stop in what little runway remained? Or, should he engage a cable and possibly jeopardize the safety of the three wingmen? The pilot did not attempt to engage the first two cables. His decision was obvious.

As the aircraft passed the last intersecting taxiway (leaving only 1,300 feet remaining and still traveling approximately 40 knots), we observed a bright orange glow from the engine and a large spray of water coming off the runway. The pilot had selected afterburner in an attempt to become airborne. With so few feet remaining, we never believed it possible the aircraft would get airborne or safely clear the highway overpass just off the departure end of the runway. To our amazement, he did.

We then focused our attention on the second aircraft which was now over the approach lights preparing to land. The second aircraft landed in the same fashion as the first and was issued the same cable information. The pilot acknowledged the controller's transmission but gave no indication of his intentions. The aircraft safely engaged the first cable, ensuring a safe landing, thus closing the runway and requiring the remaining airborne aircraft to divert to an alternate airport. We were later informed all three aircraft landed safely.

This situation serves as a perfect example: Although the situation appears routine, a controller must *always* remain alert to any potential dangers which may develop and be ready to react to them quickly and correctly. ■

Adapted from *Air Traffic Control Digest*

IFC APPROACH

The VISUAL APPROACH

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USAF Instrument Flight Center
Randolph AFB, Texas

■ According to the Pilot/Controller glossary, a visual approach is "an approach wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control of an air traffic control (ATC) facility and having an ATC authorization, may proceed to the airport of destination in VFR conditions." We're going to take a look at the factors going into making up that visual approach and the responsibilities of not only you, the pilot, but also those of ATC.

Before we look at the makeup of visual approaches, there are two important points to note. First, you're still on your IFR flight plan — accepting or requesting a visual approach does not cancel your IFR flight plan. Second, a visual approach is a "good deal" because it reduces pilot/controller workload and expedites traffic by shortening the flightpath to the airport.

ATC may clear you for a visual approach to an airport or to follow another aircraft when flight to and landing at the airport can be accomplished in VMC. You must have the airport or the preceding aircraft in sight before the clearance for the visual approach is issued. If you have the airport in sight but not the aircraft you are to follow, ATC may still clear you for the visual approach. However, ATC will retain separation and wake turbulence separation responsibility. When you accept a visual approach clearance and are visually following another aircraft, you are accepting respon-

continued

IFC APPROACH

continued

sibility for maintaining a safe approach interval and adequate wake turbulence separation. If you lose visual contact with the aircraft you are following, let ATC know so they can pick up separation responsibility.

When operating to an airfield without weather reporting service, ATC may initiate a visual approach provided area weather reports indicate the VFR conditions exist at the airport and there is reasonable assurance descent and approach to the airport can be made in VMC. If you accept a visual approach clearance or you request a visual approach, you are saying to the controller, "I can comply with VFR minima and VFR cloud clearance criteria." ATC will advise you when weather is not available at the destination airport.

A visual approach is not an instrument approach procedure (IAP) and, therefore, has no missed approach segment. If you cannot safely land the aircraft for any reason when operating at controlled airports, you will be issued an appropriate advisory, clearance, or instruction by the tower. At uncontrolled airports, aircraft are expected to remain in VMC and complete a landing as soon as possible. If a landing cannot be successfully accomplished, the aircraft is expected to initiate a go-around, remain in VFR conditions, and contact ATC as soon as possible for further clearance (separation from other IFR aircraft will be maintained under these circumstances).

Either the pilot or controller may initiate visual approaches. The visual approach may be requested by the controller to reduce pilot/controller workload and expedite traffic flow by shortening aircraft flightpath to the airport. It is your re-

Air traffic controllers may authorize a visual approach, but it is up to the pilot to determine if it's safe to attempt one under the current weather conditions.

Air Traffic Control Responsibilities

- Do not vector an aircraft for a visual approach unless the reported weather at the airport is a ceiling of better than 500 feet or more above minimum vectoring altitude, and the visibility is 3 miles or more.
- Inform the pilot when weather is not available for the destination airport, and do not issue vectors to that airport unless there is reasonable assurance that descent and flight to that airport can be made in VFR conditions.
- Do not clear an aircraft for a visual approach unless the aircraft is and can remain in VFR conditions.
- Issue a visual approach clearance when the airport is reported in sight or a preceding aircraft has been identified by the pilot.
- Provide separation except when pilots are executing the visual approach and providing their own visual separation.
- Continue flight following and traffic information until the aircraft lands or until the pilot is instructed to change to advisory frequency at an uncontrolled airport.

sponsibility to advise ATC as soon as possible if you do not want a visual approach.

Unless you cancel your IFR flight plan, ATC should ensure IFR separation until landing or until visual separation is provided. Visual separation may be provided by pilots, by the ATC tower, or by both. You are not required to cancel your IFR flight plan to obtain a visual approach.

The term "radar service" includes radar monitoring (flight following), radar vectoring, and radar spacing (separation). At controlled airports, radar vectoring and radar separation cease when aircraft are cleared for a visual approach and instructed to contact the tower; radar flight following could, but would not likely continue. All radar service is automatically terminated, without advising the pilot, when the aircraft is instructed to change to an advisory frequency at an uncontrolled airport.

Remember, clearance for a visual approach is clearance to fly a straight-in. If you want to go blasting up initial, you must specifically make this request and be approved for it by ATC. There is no reason for you to have to cancel your IFR flight plan to fly up initial to get yourself into the pattern. The rules applying to you and the controller are very specific and designed to get your mission and training done safely and expeditiously. ■

Pilot Responsibilities

- As stated before, it is your responsibility to inform ATC if you do not want a visual approach.
- Comply with the controller's instructions for vectors to the airport of intended landing or a visual position behind a preceding aircraft.
- After being cleared to the airport, proceed to the airport or follow the designated traffic and/or charted flight procedures, as appropriate, remaining VMC at all times. Advise ATC if a specific point/method of entry into VFR traffic is desired, e.g., extended base leg, overhead approach, midfield downwind, straight-in approach, etc. VFR pattern variations are at the discretion of ATC.
- Accepting a clearance to visually follow a preceding aircraft is your acknowledgement you will maintain a safe landing interval behind the preceding aircraft, and you are responsible for your own wake turbulence separation.
- You must advise ATC immediately if you are unable to remain behind a designated aircraft, or if you encounter less than basic VFR conditions.
- Radar vectors and radar separation cease when you are instructed to contact the control tower.
- When instructed to change to an advisory frequency at an uncontrolled airport, radar service is automatically terminated without informing you, but your IFR flight plan is not canceled until you cancel it.
- There may be other traffic in the traffic pattern, and the landing sequence may differ from the traffic sequence assigned by approach control or ARTCC.

Land As Soon As Conditions Permit

Civilian emergency and crash rescue personnel take their jobs seriously. Whenever possible, they will train on actual aircraft to ensure safe rescue of crewmembers.

MAJOR ROY A. POOLE
Editor

■ Every pilot is familiar with the basic steps to handle any emergency: "Maintain aircraft control"; "Analyze the situation"; and "Land as soon as conditions permit." But do you *really* intend to land as soon as conditions permit?

If you do, then you must be prepared to land at even a nearby civil airfield. With the emergency temporarily under control, will the civilians be able to help you bring everything to a safe conclusion? Will they have the crash and rescue response capability of your favorite USAF airfield? A *Flying Safety* staff member attended a recent civilian airport emergency response seminar sponsored by Embry-Riddle Aeronautical University and left with some interesting answers to these questions.

The purpose of the 3-day seminar

This aircraft had no time to overfly a good civil airfield in order to reach a military base. "Land as soon as conditions permit" means "land now."

was to bring together experts in the field of aircraft crash rescue management and emergency planning. These people would provide the latest techniques to the airfield managers, firefighters, and rescue specialists who will be meeting the next emergency aircraft at airports around the country.

According to Bill Waldock, an Associate Professor at Embry-Riddle, the number one priority of the "responders" to aircraft emergencies is to save lives. It's a job for which hours and hours of training may never be called upon. "But when the training is needed," says Bill, "crash and rescue can alter the outcome (read, 'save more lives')." For the pilot who has just brought a wounded airplane to a smoking stop, there is no difference between civilian responders and their military counterparts.

During the course of the seminar, the high levels of interest and the intensity of questions from the audience made it plain everyone was serious about their job. Mr. Clayton Scott, the Assistant Deputy Director of Operations at San Francisco International Airport, was a perfect example. When his office began reviewing the emergency procedures of air carriers who operated out of the airport, they took home over 70 manuals.

Those carriers who had only a one-page manual were told to get an adequate plan together or to find another airport. "We asked the hard questions about hazardous materials, fires, fuel spills, etc. We wanted to know exactly who, by name, was going to take action. We were really holding their feet to the fire."

The people like Mr. Scott weren't just looking for a "paper" answer. They found real solutions, like using the luggage loading ramps to quickly get passengers out of doors when no boarding ladders were available. And they practice constantly using thorough checklists to make sure all the bases are covered. The disaster response plan at these civilian airfields may not look like your own OPlan 355-1, but its goal is the same.

For a pilot's point of view, Mr. Bill Weeks, of the Air Line Pilots Association (ALPA), described how his organization assists in the safe conclusion of aircraft emergencies. The first step is to have an ALPA safety representative at every air carrier mishap to be sure the critical details are noted and passed on to other pilots. This program is a lot like the Air Force's safety investigation program. ALPA's commitment to their safety program can be measured in part by the annual safety budget — in excess of $2.3 million.

Some techniques ALPA encourages all flightcrews to use after completing an emergency landing are:

- Set the parking brake
- Retract the spoilers and extend the flaps
- Shut down the engines and turn the **emergency** battery "on" if it doesn't come on automatically
- Aid the passengers in evacuating the aircraft quickly and safely.

A cursory check of USAF post-landing emergency procedures reveals a similar list of priorities.

The members of the seminar were anxious to hear about the differences between civilian and military aircraft during the second day's seminar. A flight safety officer from the Air Force Safety Agency provided an hour-long talk on USAF aircraft. The size of potential fuel spills and cargo amounts gave them a good idea of what they would be facing should a USAF aircraft elect to make an emergency landing on their airfields.

After 3 days of give and take between the responders and the experts, there is no doubt they are ready to handle major aircraft incidents and mishaps, whether civilian or military. The decision to use a civilian airfield to help safely conclude an in-flight emergency will always rest with the pilot in command. Given a suitable airfield serving a moderate-size community, pilots of USAF aircraft can feel pretty confident they will have the support they expect after landing as soon as conditions permit. ■

THERE I WAS

■ There I was, taking a moment to collect my thoughts after 50 minutes or so working heavy traffic in the local control position. I knew what to expect when I came on duty. There were 28 departures scheduled within a 1-hour period. I knew the last 8 or 10 would be ready to go when the first 14 or 15 were back in the pattern. Knowing all this, one would think I wouldn't "sweat the rush" because "I've done this many times before." "It's going to be another day in the hot seat." They'll be here soon. Here they come.

RAPCON calls to give me a heads-up. "Get ready 'cause they're on their way back." This call was probably the best and the worst thing that could have happened. I appreciated the notification because it gave me a better idea of how things would transpire initially. It reassured me RAPCON intended to do their best for as long as they could.

I took another look at the proposed flight progress strips and the flying schedule. I have 14 in my airborne bay, and flight data has 6 which soon will be requesting takeoff clearance. Ground control is constantly taxiing them out — everything is going smoothly. My watch supervisor says, "Guys, it's going to get pretty busy here in a little while. I know we'll earn our money in just a few minutes."

It's too late now to bow to the anxiety of the ensuing situation — the white light is flashing. The first one is 15 miles out. In less than a minute, another white light starts flashing. A pilot calls ready for departure. No problem. My flight data controller is on the ball. I have a release all ready. Off goes the departure in front of the arriving traffic. A second departure calls ready. Before I can answer it, the first arriving aircraft is on my frequency.

This scenario continues to increase in complexity as time goes on. I ask RAPCON for spacing to launch four departures. RAPCON calls back, saying, "I can't give you anything else due to traffic. They're lined up for the next 30 miles. There's targets all over the scope, and I have so many aircraft in my airspace they appear to be flies."

The first six or eight aircraft to arrive get a shot at landing. A few more departures are launched as the five remaining arriving aircraft are joined by four or five more from approach control. Spacing and sequencing is tight now so as not to run out of airspace. The frequency is very congested. I'm living now what I've anticipated for the last 5 or 10 minutes. Four or five more aircraft land, but I can't let my guard down. Two or three more aircraft land. The supervisor projects a lull coming before the second wave gets here. My relief is plugging in beside me. I begin my briefing on what was going on. My briefing is now complete. We switch plugs as she takes control. I listen for a while to make sure I covered everything. My relief has everything under control. I can now relax.

The supervisor tells me I did a good job. I appreciate the pat on the back, but I really must ask myself, "If something had gone wrong in the height of the congestion, could I have detected it and developed an alternate plan?" I felt confident I was on top of the situation and could have provided additional instructions if they were needed. The pilots made things flow smoother by acknowledging my instructions and complying with them in a timely manner.

Another typical day at the office? Maybe. We must approach each traffic situation with the same focus and concentration as was applied in this situation. No matter how much talent and experience you may possess, if you lose the ability to feel and then to control the anxiety and pressure, you will find yourself losing the edge necessary to detect and correct a potentially dangerous occurrence. ■

Making Landings Safer

MAJOR ROY A. POLE
Editor

■ According to the latest info from IFC, pilots flying AC on an IFR clearance in either DOT or ICAO airspace may soon have to choose between INS, GPS, TAC, VOR, ADF, LORAN, and MLS approaches while working with ATC to get a CAT II approach into a FLIP AP/1 identified airfield.

Wait a minute! I know what most of that alphabet soup means, and I thought the MLS approach was a dream which never came true.

Wrong, ADI-breath. Not only is the Air Force expecting great things from microwave landing systems (MLS), but so are nations around the world. You might even say we're behind everybody else. The assumption that MLS is never to be seen probably has more to do with the fact few USAF aircraft are equipped with MLS avionics, and there are even fewer MLS approaches to fly. But this situation is changing.

Since nearly everyone has skipped over section 5-7 in AFR 51-37, *Instrument Flying,* a little review may help. The MLS will provide precision glidepath information and aircraft positioning along any path the designers want. No more 18-mile-long final approaches! If conflicting airports or mountains would prevent a normal-length precision approach, the MLS will enable the course to be curved (sometimes more than once) around obstacles.

Many small airports thought they wouldn't qualify for the limited ILS facilities. Microwave Landing Systems (MLS) have changed all that and made landings much safer.

Some of the MLS functions will be displayed on the same cockpit instrumentation we are already familiar with. But the "black boxes" which power the old indicators will need to be changed. Three commercial contracts for full-scale development have been awarded. Each of the contractors will soon be delivering a prototype for development, test, and evaluation. Completion of this phase of the avionics development program should occur in mid-1992.

By January of 1993, a contract for First Article Test will be awarded, with the resulting equipment being installed in F-16, UH-1, and C-135 aircraft. A production decision is planned for April 1995 with equipment deliveries and installation beginning in FY97. Approximately 7,600 Air Force aircraft are candidates for MLS avionics upgrades.

The whole program seems complicated, so "why bother," you ask. First, MLS is scheduled to become *the* instrument landing system by 1 Jan 98 in accordance with International Civil Aviation Organization policy. Secondly, as the current world standard, the ILS is rapidly becoming inadequate to deal with increasing demands for precision approaches at additional airfields.

For example, the current ILS frequency band of 108 to 112 MHz is allocated 40 channels. The Federal

continued

New York Terminal Area Operations

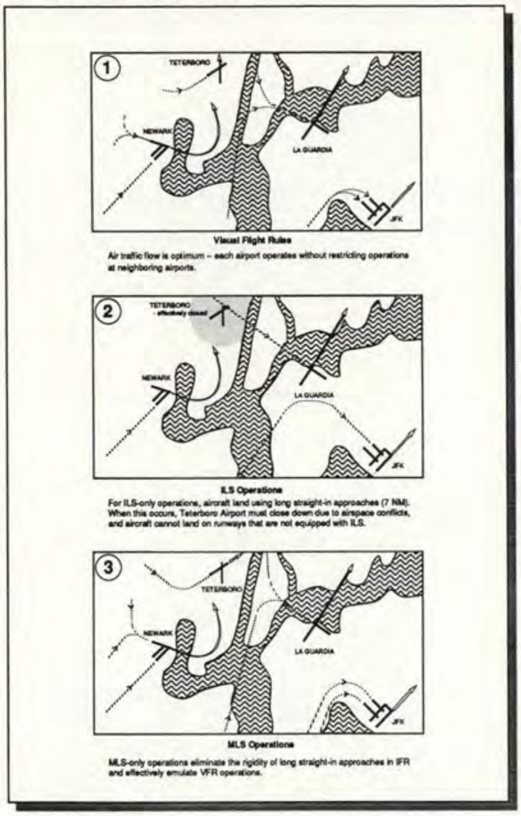


Figure 1

Microwave Landing Systems won't make a dramatic change on the instrument panel. Only the black boxes will need to be replaced.

Philadelphia International Airport (PHL), PA

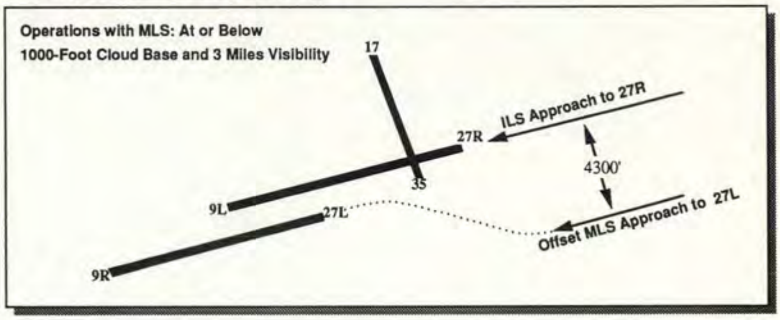


Figure 2

Aviation Administration (FAA) has estimated a need for 600 new precision approaches at runways in several major metropolitan areas. Given the number of available ILS channels, Dallas-Ft Worth will need 20 more channels than are possible with the current ILS, and the New York-Philadelphia-Washington D.C. area will need 23 channels which don't exist. Remember, these are no longer "nice-to-have" instrument approaches, but they are approaches which will improve the safety of flight at 600 more runways. The MLS has 200 channels available to solve these multiple precision approach problems.

The MLS is also able to solve the problems of air traffic flow in complex terminal areas. The current ILS requires a 7-nautical-mile final approach straight segment. At some airports, an ILS cannot even be set up because of siting problems like deep water bays or steep mountain sides. Figure 1 shows how an MLS can allow nearby airfields to gain a precision approach which otherwise would not have been possible with the ILS. At some locations, nearby airfields are not the problem — increasing the capacity of the main runways during instrument conditions is. Figure 2 shows how an airport such as Philadelphia International Airport can use both of its long runways with the help of the MLS.

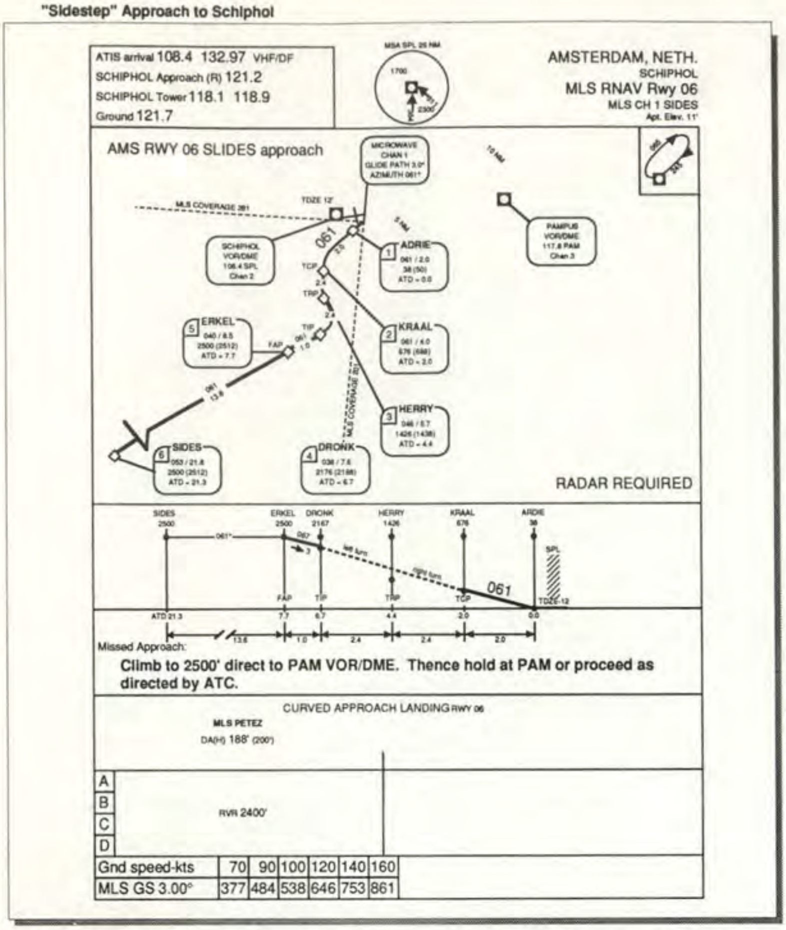
During the course of MLS development, a few questions have been raised, usually by the eventual users of the system, the pilots. One of their first concerns was the ability of wide-body aircraft to fly the curving approaches characteristic of MLS.

To answer this question, the FAA had airline pilots from the U.S. and foreign air carriers fly MLS-curved approaches and departures in two wide-body flight simulators. The majority of the simulations were flown in the Netherlands National Aerospace Laboratory where the implementation of MLS is a top priority. The pilots flew 320 approaches, and all were completed with a successful landing. Crewmembers found there were no significant differences in the workload associated with MLS versus ILS approaches. The results of the approaches indicate MLS approach accuracy was equal to, or better than, conventional ILS straight-in approaches.

Additionally, many pilots were aware of the capabilities of Global Positioning Satellites (GPS) and wondered why precision approaches using GPS wouldn't be an easier way to go.

Well, yes, instrument approaches *could* be flown using GPS, but there are a few problems to solve, none of which would be "easy." A differential ground station would need to be installed near each air-

"Sidestep" Approach to Schiphol



MLS approaches can have any number of curved segments to help avoid obstacles or nearby airports. Pilots of wide-body aircraft had no problems flying this approach.

port to improve satellite accuracy. A continuous data link capability between the ground station, the satellite, and the aircraft's navigation systems would have to be created to provide corrections to the system. A new, sophisticated GPS receiver would need to be developed to perform carrier tracking and processing of differential corrections. A monitoring and pilot warning system to detect accuracy errors would need to be developed. And finally, more satellites would need to be launched (with American and Soviet military permission to use them) to meet the increased need for signal availability.

"So what's the next step for MLS?" you ask.

In addition to testing and evaluation activities in a number of countries overseas (see "MLS Around the World"), two MLSs were installed earlier this year. One was commissioned at Chicago's Midway Airport and the other at John F. Kennedy Airport. The Department of Defense's goal to replace all ILS and PAR systems should begin at Air Force installations by 1997. Some military aircraft which contain commercial avionics are already beginning to receive modifications which will enable them to receive MLS signals. By 1993, a contract should be awarded to provide an additional 3,900 modified units for Army, Navy, and Air Force aircraft.

The benefits of the MLS are clear. The ILS is unable to meet the growing needs for additional, safer precision approaches in the coming years. The MLS will reduce weather-related delays and increase capacity at major metropolitan areas. The MLS provides the means to fly safer, curved approaches into more airfields in even wide-body aircraft. You might even say MLS means "microwave landings are safer." ■

MLS Around the World

The world's standard bearer for aviation, ICAO, has set 1 January 1998 as the implementation date for microwave landing systems. Countries around the globe have seized on this new system for its safety and efficient movement of increased traffic.

■ **Australia** has procured a developmental MLS ground system for use in operational evaluation. By 1998, at least 15 major airports will be equipped with MLS.

■ **Canada's** Toronto Island Airport has two MLS systems installed at opposite ends of runway 8/26. By 1998, Canada will have 40 MLS systems in service.

■ **France** has installed an MLS capable of the most difficult Category III performance. In the French Alps, an MLS approach has shown even steep mountain terrain can be safely avoided with a curving MLS precision approach.

■ **Japan** is developing ways to use the accuracy of an MLS approach to provide guidance to an adjacent runway without an MLS transmitter. Japanese companies are also developing low-cost receivers for general aviation aircraft.

■ **The Netherlands** has been conducting one of the world's most comprehensive flight simulator evaluations of MLS procedures. The country's first MLS will be installed in 1992 at Schiphol Airport in Amsterdam.

■ **The United Kingdom** is conducting operational demonstrations of MLS which have resulted in TERPS data for pilot performance when making steep MLS approaches. By 1995, London's Heathrow airport will have a fully operating Category III MLS.

■ **The USSR** will have 17 Category III MLSs installed by 1995. In addition, Aeroflot aircraft will be equipped at the same time for national and worldwide capability.

Many other countries are either actively developing and evaluating MLS; or, they are watching carefully the development of systems around the world which will most effectively meet their needs.

LESSON LEARNED

SSGT B. KEITH BARGE
GCA Watch Supervisor
1928th Communications Group
MacDill AFB, Florida

The lessons remembered the longest are usually the ones learned the hard way. As an air traffic controller, and a watch supervisor with 6 years of experience, I can honestly say I've seen some hard lessons learned and have learned a few myself.

■ One of the main things I've learned is never become complacent in the performance of your duties, no matter how trivial they may seem. No matter how busy you may be, take the time to do the job right. Never assume — we know what that can lead to. A job taken seriously is a job well done.

An example of becoming complacent and overlooking details occurs when you allow yourself to become so wrapped up in normal job-related distractions you half do a task, and it comes back to haunt you later. This happened to one of our watch supervisors when he released the local emergency frequency to maintenance for a preventive maintenance inspection early in the morning. Later that same day, when the frequency was returned to the controllers, they were too busy to do a full check of the equipment. Only the receiver side was checked.

Well, after the watch supervisor and his crew were relieved, the oncoming crew was contacted by an emergency, transient F-15 aircraft on the local emergency frequency. The arrival controller heard the aircraft fine, but the aircraft didn't hear the controller because the transmitter didn't work. It would be an understatement to say there was some confusion.

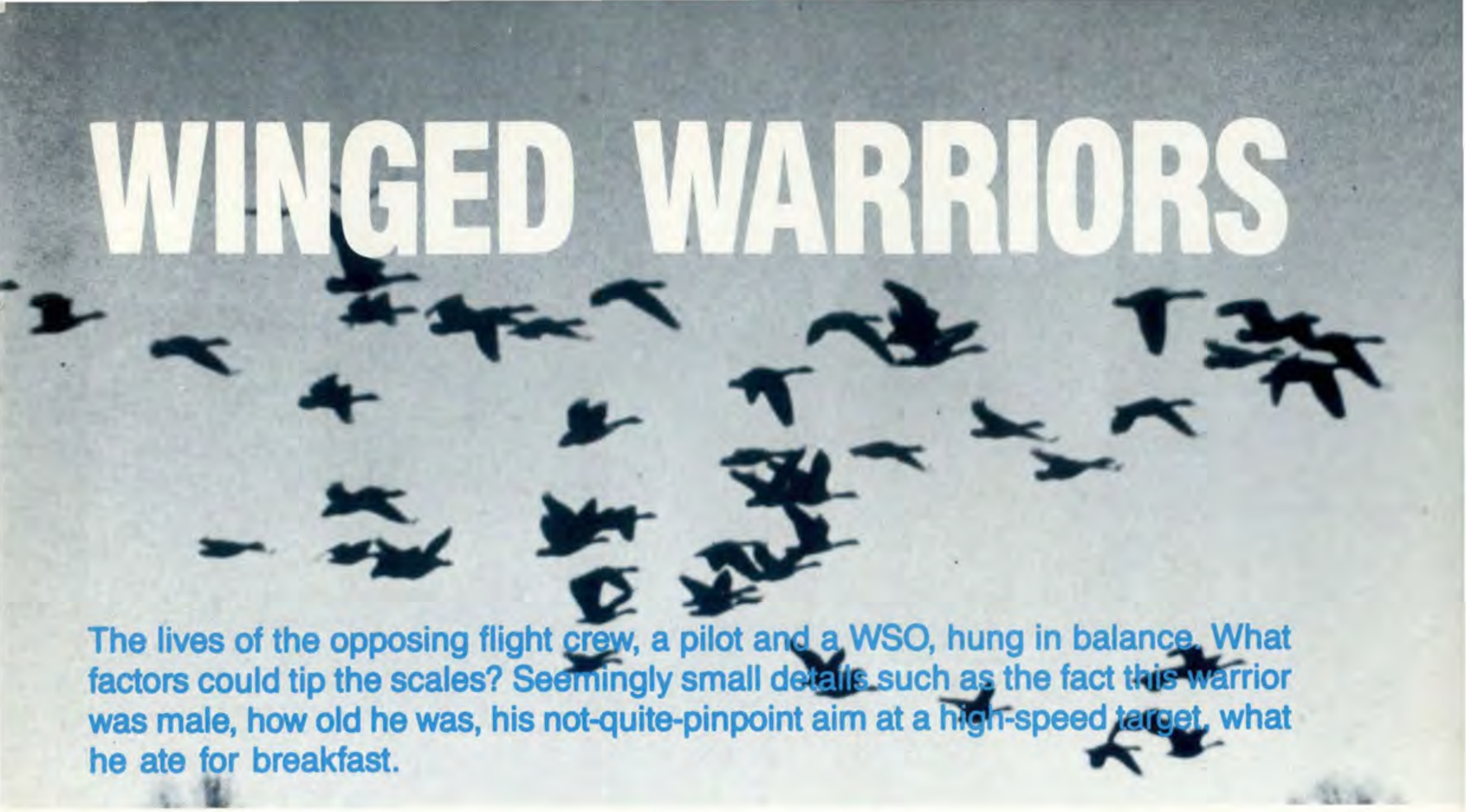
Several times the arrival controller attempted to contact the emergency aircraft on the local emergency frequency, but with no idea the transmitter wasn't working. The pilot of the aircraft finally realized the controller was unable to hear him and returned to the approach control frequency. A civilian controller at Tampa International Airport had to work the F-15 into MacDill AFB.

The problem with the bad transmitter wasn't fully realized until the emergency aircraft was safely on the ground. We can only speculate as to how severe the problem might have been had the pilot not had the presence of mind to return to the last assigned frequency. The watch supervisor who didn't do the complete check was cautioned that such lack of duty performance would not be tolerated in the future.

As a controller, our job can be very hectic at times, and as a watch supervisor, they can get even worse. But you can't let the little day-to-day distractions get you into trouble. As a watch supervisor, that's what you get paid for. It's the responsibility we accept when we take the job. We must learn to appreciate the people who work for us and the maintenance personnel who support us.

Under no circumstances must we get to the point where we are so comfortable with ourselves and those who work with us that we neglect performing our assigned tasks. No matter how small or mundane they may seem to us, there's a reason for them. A minute lack of attention to detail can take away an edge which could make all the difference in the world.

It's been said, in some circles, controllers are an arrogant breed of people, but never has it been said they are stupid. Simply put, complacency is equivalent to stupidity. We have a job to do, and sometimes it means making decisions which could mean the difference between long delays or short vectors, life or death. Let's take our jobs seriously. Safety of flight depends on us not being complacent. If we *are* to earn the right to be somewhat arrogant, then we must bear the burden of being as close to perfection as possible. Being complacent is being less than perfect. ■



WINGED WARRIORS

The lives of the opposing flight crew, a pilot and a WSO, hung in balance. What factors could tip the scales? Seemingly small details such as the fact this warrior was male, how old he was, his not-quite-pinpoint aim at a high-speed target, what he ate for breakfast.

DAVE HARPER
Air Force Safety Agency

■ Orville was a herring gull, highly trained, and sent on a suicide mission — to bring down a military aircraft. As a terrorist, he chose his target well: An F-15E Strike Eagle — a bird of immense power and vastly superior abilities. But he knew a weakness.

This opponent has been bred from a family of air superiority fighters, accustomed to flying far above Orville's own favored environment. But mission changes now send the F-15 down low in *his* home territory at eye-blurring speeds. And while most major components of those aircraft have been refined to accommodate this new role, its canopies remain unchanged, designed to resist large enemy birds only at lower takeoff and landing speeds.

If he could hit the transparency during a high-speed, low-level run, there was a good chance of bringing this metal monster down.

About 40 percent of the frontal transparency area is canopy, the balance being the windshield. Orville would have no trouble penetrating the canopy at typical Strike Eagle/Herring Gull speeds, and there was even a good chance he could make it through the windshield (designed for only medium-speed bird impact resistance).

Perhaps he could gain the status of his cousin, Franklin Gull, renowned in the kingdom for his solo attack on a formidable B-1B bomber. By exploiting a vulnerability in that sleek machine, the old bird brought down a $200 million aircraft and cut short the promising lives of three dedicated humans.

He spotted his prey in the distance and positioned himself. Moving at 540 knots, concentrating on low-level flight 500 feet off the deck, the crew began a climb after noticing increased bird activity. Just 2 seconds later, at 800 feet, he appeared.

He zeroed in on the gleaming transparency and caught it to the right of center, lower than he had hoped, down on the windshield. He hit just hard enough to fail the windshield, leaving an 18-inch by 5-inch hole, but he lacked additional energy to do further damage.

Headquarters analyzed the failed mission. The gull they had sent weighed 2½ pounds. If they had sent a more mature male, one carrying more weight, he could have succeeded. (Females are lighter.) Or if their bird had been a better aim and hit the canopy. At 540 knots, the canopy will hardly slow a 2½-pound bird.

Someone mentioned the gull had skipped breakfast the morning of the mission, and the engineering staff started calculating. Breakfast — only 2 extra ounces of fish, just one rather small herring might have tilted the scales. A 2.63-pound bird striking at 540 knots could penetrate the windshield and still maintain an inside-cockpit velocity of 120 knots. A 2.63-pound mass loose in a cockpit and moving at 120 knots could do a lot of damage. Breakfast — such small details.

There will be other attempts — different birds, different speeds, different impact points. But as long as aircraft development and evolution leave zones of vulnerability, they can count upon periodically bringing down those flying intruders of which the humans are so proud. ■

Editor's Note: The above story is a creatively embellished account of an actual bird strike. The technical details contained within are accurate.


IT CAN
HAPPEN
TO YOU

I had totally forgotten about the sweeper. I had blocked out the fact the "Runway Closed" sign was down, and now I was being asked to explain to this pilot why I tried to kill an entire crew.

■ It had been a night not unlike hundreds before. My crew and I had just watched a tanker land when the aircraft's pilot reported a possible rabbit strike on the runway. My counterparts took the usual action of notifying Base Ops who, in turn, contacted the sweeper. The sweeper arrived and requested onto the runway via Taxiway X. It received the usual spiel, "Proceed on the runway via Taxiway X, report when off."

With this, the sweeper entered the runway at the departure end where the rabbit strike had reportedly occurred. The ground controller and I put the "Runway Closed" signs down. As I looked over at the arrival board, I found that it was empty, as was the departure board. "It's going to be another quiet night," I thought to myself.

This appeared to be just another night of boredom in a tower which I had grown accustomed to — busy in the day and dead at night. I've been working in this tower for about 2 years now, and I thought I'd seen everything.

The norm was that when flying was down and things got dull, you'd grab a book or accomplish some paperwork that was due. The latter was what I decided to pursue, so I grabbed my backpack and pulled out some TERPS stuff which was pressing. It was either do it now or do it on my day off, and days off for a controller are sacred.

Anyway, I was in the middle of drawing out a departure on an AF Form 1923 when, out of nowhere, comes the "DING" of the flashing white light. The RFC controller relayed the call sign — a tanker from another base diverting due to weather. I steadied the light and went on about my business finishing the work at hand.

The ground controller turned on the runway lights for me and then asked if he could smoke a cigarette outside on the catwalk. I said, "Sure, no problem." His trainee was busy studying the assigned ground control training tasks for the night, so I called Base Operations to see if they knew about the inbound aircraft. As I suspected, they didn't, so I informed them of the inbound and went about my business again filling out more information on the TERPS form.

When the amber light flashed, which indicated the aircraft was 7 miles final, I didn't even look up. I was on a roll, and I'd have this stuff finished tonight, I thought. "DING," the green light flashed. Four miles from touchdown. I glanced out the window, only looking at the approach end of the runway. I acknowledged the light and gave the clearance to land without ever looking at the "Runway Closed" sign right in front of me.

I put my head back down, working on a project which I should have put aside until the aircraft landed. But my concern was "Finish this tonight. Nothing's going to happen. I've pushed these buttons hundreds of times and never had a problem."

As the aircraft got closer, I heard the roar of the engines, so I looked up to watch it touch down. No problem. Another one down and safe. As I watched the aircraft roll down the runway, it slowed down enough to make me think maybe it could make Taxiway X. When the pilot called on landing roll, I replied, "IF ABLE, TURN LEFT NEXT TAXIWAY, CONTACT GROUND 275.8 WHEN OFF THE RUNWAY." The aircraft acknowledged, and I put my head back down in my work.

Then, to my surprise, the aircraft called me up again. "Tower, what's this truck doing on the runway just ahead of me?"

Now, I've never been one with nothing to say, but, at that moment, I was speechless. Maybe it was because my heart was in my throat, or maybe because my jaw was on the floor, or maybe it was because I had no explanation for what had just transpired.

I had totally forgotten about the sweeper. I had blocked out the fact the "Runway Closed" sign was down, and now I was being asked to explain to this pilot why I tried to kill an entire crew. Due to no fault of their own, several individuals could have been hurt or even killed. A sweeper operator who was called out in the middle of the night and a flightcrew who had diverted here for the night almost paid the price for my negligence and lack of concern for the responsibilities entrusted into my hands.

This incident has made me reevaluate my own actions towards the performance of my duties. I didn't put forth the effort I should have. Up until now, things had always come easy for me. I was considered the best controller in the tower, and I assumed things like this only happened to other controllers. It's other controllers who have trouble when things get hectic, not me. Something like this is not supposed to happen to me — but it did! I bet you think it can't happen to you, either. ■

Once Again, Thanks For Your Support!

AND THE WINNER
FOR THE MAY 1991
DUMB CAPTION CONTEST IS . . .

SSgt Brian K. Koontz
42d Flying Training Squadron
Columbus AFB, Mississippi
39701-5000

Ah Ha! Quite by accident, we nearly snuffed out every entry by the United Organization of Dumb Caption Writers of America (UODCWA). Last month's Dumb Caption Contest Thing picture was missing one critical element for the UODCWA — a person to ridicule. With nobody to make fun of, they were hopelessly mired in moronic mediocrity.

Obviously, this month's winner, SSgt Brian K. Koontz, doesn't play by the UODCWA rules. His keen??? insight, and somewhat "twisted" sense of humor earned him the coveted "Cheap Little Prize."

Our congratulations go out to SSgt Koontz and all the Honorable Mention contestants who have taken one step forward to Dumb Caption greatness. Remember, your path to greatness begins with your first entry, so send one in today for this month's contest.

Honorable Mentions

Aircraft at far left = (1), aircraft in center = (2), and aircraft at far right = (3).

1. **(1) Excuse me, pardon me, cutting through . . . Got places to go, people to see . . . pardon me, look out, coming through . . . etc, etc.**
SSgt Brian K. Koontz, 42d Flying Training Squadron, Columbus AFB, Mississippi

2. **(2) Boneyard? They never told *me* boneyard! They said, "new jet engines and base of choice!"**
Lt Col Bill Stroud, HQ TAC/DOS, Langley AFB, Virginia

3. **(2) I just flew in from Berlin, and boy! are my arms tired! No, wait! Take my wife. Please!**
SrA Nate Johnson, PSC Box 2136, Holloman AFB, New Mexico

4. **(2) And she said "Blah, blah, blah." (3) Gooneybirds!! Just turn your back on 'em for 1 minute, and they start gossipping.**
Chuck Woodside, SA-ALC/LAKD Kelly AFB, Texas

5. **(2) Yeah, right! They're really gonna buy the C-54 backing up into us . . .**
Jim Burt, Academic Training, NAS, Corpus Christi, Texas

6. **(Someone singing on the runway edge) . . . Allemande left with your left wing . . .**
Yvonne LaGrange, AMARC/IM, Davis-Monthan AFB, Arizona

7. **(2) " . . . an' the 131s going to United, I'm going to a commander in IDAHO, and, well, ya' remember the general you dripped fuel on? You're gettin' sent to Peru!"**
TSgt Cline Lowe, 119th Consolidated Aircraft Maintenance Squadron, North Dakota Air Guard, Fargo, North Dakota

8. **(1) Shouldn't we get to know each other a little better before we get this close??**
SrA David R. Staton, Logistics Plans, Wurtsmith AFB, Michigan

9. **(2) Would you believe it?? Parking lot attendant to pilot in just 2 short years!**
Jim Burt, Academic Training, NAS, Corpus Christi, Texas

10. **(1) C'mon, Gertie, relax! I told you there's nothing here in the graveyard to be afraid of!!**
Yvonne LaGrange, AMARC/IM, Davis-Monthan AFB, Arizona

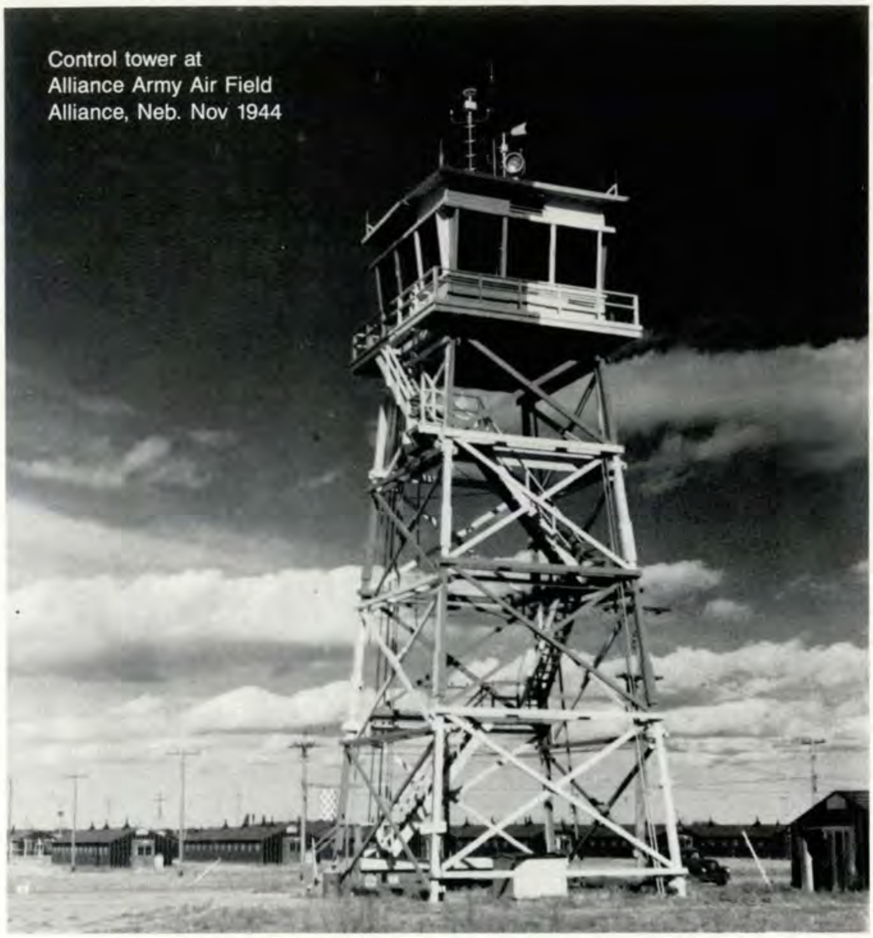
It All Began With AACS

Our roots as air traffic controllers started in the late 1930's with the formation of the Army Airways Communication Service called AACS and affectionately dubbed "double A.C.S."

Adapted from *Air Traffic Control Digest*

■ The initial cadre of AACS personnel were all air traffic controllers responsible for NAVAIDS, control of air traffic, and mapping out the "highways in the sky" which evolved into today's jet routes, VRs, and Victor Airways. Just prior to World War II, these brave men flew from point to point, city to city, and from country to country establishing aircraft "highways in the sky" which became key air transportation routes that were essential in establishing and maintaining the logistics tail during the war.

One of the most significant events involving AACS personnel happened in the Hickam Army Airfield control tower on December 7, 1941. You've all probably seen the movie, "Tora! Tora! Tora!" and read "Day of Infamy" about the stream of B-17 bombers en route from CONUS to Hawaii on the morning of December 7th. These aircraft entered Hawaiian airspace right about the same time the Japanese started their attack. A US Army Air Force major manned the Hickam tower during the attack on the field and provided ATC service to the recovering B-17s. For his heroism, the Major was awarded the Silver Star and later commanded Pacific region AACS units. Last fall, our coveted Save Award was named in honor of this man, Lt Gen Gordon Blake.


Control tower at Alliance Army Air Field Alliance, Neb. Nov 1944

AACS developed the "highways in the sky" in Europe also. AACS established the first allied control tower during the Normandy invasion using a glider fuselage, pilot's seat, and glider nose. AACS personnel established and carried out the tradition of first in, last out, throughout the war. Our predecessors always displayed professionalism and sacrificed a great deal during the war to obtain maximum mission results.

In the Pacific, the 7 AACS Wing was formed in 1945 with now Col Blake in command. In August, his organization quickly set up the allied control tower in Atsugi, Japan. It became the world's busiest airport that month with a takeoff or landing every 2 minutes. After the war's end, AACS personnel became a mainstay of the Japanese occupation forces. Through the organization of aircraft movements, development of "highways in the sky," and by advocating the need for all weather and round-the-clock ATC service, AACS established the requirement for combat Air Traffic Control in the eyes of the operator. Further contributions of this nature were made during the Berlin Airlift and Korean War. AACS later transitioned into Air Force Communications Service, which later became the Air Force Communications Command.

It is this kind of dedication to duty and professionalism which has served as the standard for the air traffic controllers throughout our existence. ■

OPS TOPICS

Phantom Glidescopes

■ It would be nice to believe that once you've captured the glidescope portion of an ILS approach, your most serious worry would be caused by an "off" flag in the window. Nothing is ever so simple, though.

According to a story reported in the NASA newsletter, *Callback*, two pilots and a tower controller discovered there's always an unexpected way to ruin your instrument approach.

The first pilot had pulled up to the "hold short" line awaiting clearance for takeoff. That clearance was delayed while another aircraft was completing the last portion of the ILS.

The airborne pilot noticed the glidescope deviation was getting worse, despite an otherwise smooth approach. Soon, the glidescope was directing a descent gradient far in excess of what was planned. It was time to go around.

By now, the tower controller had a clue to the bad glidescope indications and cleared the holding pilot for takeoff. It seems the aircraft on the ground had entered an "ILS critical area," and the sheer size of the aircraft had obstructed the glidescope signals. Once out of the area, the signals were back to normal.

In addition to an extra set of hold short lines (to be used during marginal weather), many fields will have signs posted, and the tower folks will advise taxiing aircraft to avoid obstructing glidescope or localizer antennas. Every little bit helps, and so can you, by taking care to avoid these critical areas when your fellow pilots may really need them. ■

It's Not Over 'til It's Over

■ Did you ever have one of those flights where everything started out nice and routine, and little things began to pile up? You know. You take off on a training mission and end up declaring an emergency?

These missions usually start with a rough, but not unexpected, departure from your home base. Of all the days to keep you at 4,000 feet, departure control picks the day when you've got a long cross-country leg ahead. The buildups along the route aren't really thunderboomers yet, but you're not taking any chances, so a few extra miles are spent deviating around the taller clouds. The en route center controllers put you in a holding pattern while the destination approach folks try to find a hole for you.

Approach is very busy with thunderstorms popping up all over the place, and local jets scrambling to recover before the weather shuts the base down. Finally, they find a place for you, and you let your student head down the TACAN approach. Of course, a rain shower hits the missed approach point at the same time you do, and the runway is nowhere in sight. Oh well, you needed to grade the student's missed approach skills anyway.

Your fun meter is dropping almost as fast as your fuel gauge. You decide a PAR is the only safe way out of this mess. And just to be sure, you announce your minimum fuel status. Hmmmm, with all those local jets trying to get in, you decide "emergency fuel" is a better call. At least now you'll get some priority.

Lined up on final with the frequent, "On course, on glidepath" calls bringing you down, your emergency situation is over.

continued

continued

Yeah, the ILS went full-scale, but you can't see what the student has done with the switches up front, and now is not the time to bother a student. At 200 feet above the ground, you break out of the weather and find yourself looking for a missing runway.

The PAR controller tells you it's 12 o'clock and a mile. Panicking, you swivel your head like an unbalanced gyro until you pick up the runway. It's at 7 o'clock and 5 miles! With the help of a massive adrenalin rush, you manage to maneuver to the runway and taxi clear after landing. When the fuel truck leaves, your calculations show a total of 150 *POUNDS* were remaining at shutdown. Since you started this nightmare with 3,700 pounds, luck seems to have been the only reason you're not a statistic.

Turning to the student, at least one thing can be salvaged — learning from your mistake. Of course, you realize the controller confused your jet with one of the local jets. But you also admit to not sorting out the deflected ILS, and to thinking your emergency was over once you were on PAR "final." In the future, once you declare an emergency, "it's not over 'til it's over." ■

Good News and Bad News

■ The good news is, the crew made the correct decision to route abort the low level when they encountered IMC. They began by putting airspace below them while climbing toward cloud tops around 10,000 feet, and they leveled off at 10,500 feet.

The bad news is, a commuter airline was level at 11,000 feet directly in front of them. An abrupt pushover by the fighter ensured clearance from the commuter (while providing an impromptu FOD check of their cockpit).

When the dust had settled, the fighter crew had a chance to talk to the safety shop and figure out how they could get a little bit more separation next time. Number one on their list of suggestions? When you've got to abort a low-level route for IMC, you've got yourself an emergency (at least until you get in touch with Center); therefore, turn your transponder to 7,700 and let the folks on radar clear a path for you. ■

Midair Collision Avoidance

Adapted from *Air Traffic Control Digest*

■ Many of our Air Traffic Control Officers (called CATCO) are taking giant steps to improve flying safety from within the air traffic control career field. First, their controllers handle a large number of civil aircraft within their area of responsibility — not much different than many other USAF ATC facilities. Second, a lot of HATRs/NMACs are being filed, and most of them were between military and civil general aviation traffic — again not much different from other USAF facilities in which most HATRs/NMACs filed involve civil users of our airspace.

Additionally, they wrote talking papers for all the base flying organizations describing all the airspace activity going on around their base and nearby airports. This included ultralight activities, glider operations, balloons, paradrops, proposed airport expansion, airline activities, etc.

They joined the Flight Standards District Office (FSDO) accident prevention specialist and attended over 50 safety seminars where they talked about IFR and VFR traffic patterns and wake turbulence. They went with the base flying safety officer to airports in the surrounding area to talk with fixed base operators and pilots, and to pass out MACA pamphlets and framed sectionals of their bases. Monthly safety articles from the CATCOs were included in the FSDO newsletters. Did it work? You bet it did. The results were a significant decrease in HATR and NMAC reports; in other words, a safer airspace environment for all users.

The key to the CATCO's success, and the success of any MACA program, is to educate the airspace users. This doesn't mean just those on base, but everyone who may fly through your airspace. The best way to do this is to get all the airspace users educated on how a particular operation works and how they can receive better and safer air traffic service.

We know every CATCO gets involved with the MACA program and are making efforts to improve operations. It's a tough job but well worth the effort. Keep up the good work you've done making the skies safer. ■

FSO'S CORNER

Colorado Springs MACA

MAJOR DALE T. PIERCE
919th Special Operations Group
Duke Field, Florida

■ Having tendencies toward being a natural scrounge, I frequently pick up whatever flight safety materials are not tied down. Recently, while passing through Peterson AFB, Colorado, I was living up to my reputation when I picked up the local MACA pamphlet. As many fliers already know, there's a lot of air traffic over Colorado Springs.

The cover of the pamphlet caught my eye. It shows a larger-than-life view of a C-141 closing in on the 6 o'clock of a small civil aircraft. The Bugsmasher pilots are obviously having the time of their lives gawking at the sights and are most assuredly oblivious to their imminent demise. The title reads, "When you fly in Colorado Springs . . . LOOK OUT FOR THE UNEXPECTED!!!

The first page of the pamphlet is an introduction from the host-base safety officers from the Air Force Academy, Peterson AFB, and Fort Carson (Butts AAF).

The next section shows the air traffic area around Colorado Springs as employed by the Air Force Academy. The chart depicts sky diving, glider, and T-41 training areas. The summary adjacent to the chart provides corridor information, alert area information, common Air Force Academy flight profiles, and operating hours. The best part is the list of suggestions for transiting the area with a minimum of conflict. The list is short, to the point, and understandable.

Peterson AFB is also Colorado Springs Municipal Airport. Large commercial and C-130 aircraft share the runways with other aircraft that are in and out all day. For example, as the home of HQ Air Force Space Command, C-21 traffic is common. In addition, the airfield is frequented by C-5, KC-135, T-37, T-38, and C-141 aircraft. Finally, both the Academy and Peterson AFB have aero clubs. For Peterson AFB, the TRSA is depicted with the ATIS frequency, on half of one page.

In the centerfold, you can examine the Rocky Mountain Low Altitude Tactical Navigation Area. Generally, the area is south and east of Colorado Springs for about 80 miles. The legend provides the user's telephone number at Peterson AFB, type aircraft using the area, speed, routes, altitudes, and time of use.

The Peterson AFB airfield diagram on the next page is out of the letdown book and faces a quick-reference list of local frequencies.

The next page shows the types of military aircraft frequenting the area. Each is provided with a short brief including size, performance characteristics, and climb and approach speeds.

Fort Carson (Butts AAF) is just south of town and has its own air-to-ground live fire range (R-2601). The field and associated training areas are shown in Fort Carson's section of the pamphlet.

Finally, there is a page depicting local emergency medical air evacuation routes. The arrival is called MERCY ONE.

All this activity is associated with three airfields located within a 10-mile radius. Incidentally, there are four more smaller airfields within that same 10-mile radius. In an environment like Colorado Springs, the MACA program has to be a good one. The Colorado Springs MACA pamphlet is good evidence the local military safety offices are trying their utmost to make their MACA program topnotch.

If you would like a copy of the COS MACA Pamphlet, call me (Dale Pierce) at DSN 872-5378 (TAWC). ■

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UNITED STATES AIR FORCE

Well Done Award

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Mishap Prevention Program.

MAJOR **Forman Meachem** Aircraft Commander	MAJOR **Patrick Hathaway** Copilot	MAJOR **John Perkins** Copilot
SMSGT **William McBride** Flight Instructor/Engineer	TSGT **Edward Melendez** Flight Engineer	SSGT **Charles Pearson** Flight Engineer
SSGT **Patrick Schoettmer** Loadmaster/Instructor	SSGT **Anthony Bartolomeo** Loadmaster	SSGT **Charles Watson** Loadmaster

■ On 9 March 1990, Major Meachem's C-141B departed Howard AB, Panama. The right main landing gear inner strut failed on takeoff, and the assembly, with the wheels, departed the aircraft. The aircrew observed the striped flag on the right landing gear position indicator (unsafe condition) and did not retract the gear.

Major Meachem chose to continue to a base with both a wider and a longer runway than Howard's. En route, the crew jettisoned cargo to reduce aircraft gross weight, and reduce the possibility of injury to passengers in the event of cargo shifting during the landing.

Major Meachem made an uneventful approach at Robins AFB, Georgia. The aircraft touched down on the left main landing gear approximately 2,000 feet down the runway. The pilot maintained the aircraft track left of centerline. He initially maintained right wing high and gradually lowered the right wing prior to losing aileron authority. At approximately 90 knots, Major Meachem began braking. This was followed by the no. 4 engine contacting the runway.

Approaching 8,500 feet, friction from runway contact with the no. 4 engine ignited residual fuel and fluid from damaged hydraulic and fuel lines. The copilot discharged the fire agent to the no. 4 engine. However, the fire indication continued, and the copilot selected "alternate" and then discharged the no. 3 fire bottle to the no. 4 engine. At this point, the fire went out.

The aircraft came to a stop approximately 9,500 feet from the approach end (2,500 feet remaining) with the no. 4 engine on the runway centerline. All passengers and crewmembers egressed without injury.

WELL DONE! ■

Front row from left to right: Major John Perkins, SSgt Anthony Bartolomeo, Major Forman Meachem, Major Patrick Hathaway.

Second row from left to right: SMSgt William McBride, SSgt Charles Pearson, SSgt Patrick Schoettmer, SSgt Charles Watson, TSgt Edward Melendez.

WRITE A DUMB CAPTION CONTEST THING

We can't believe it! On at least one copy of the July "Dumb Caption Contest Thing," we saw a big, fat thumbprint. We were sure thumbs that fat could only belong to Byron Q. Lackluster, President and Preponderant Obfuscator of the United Organization of Dumb Caption Writers of America (UODCWA). Despite weeks of excruciating examination of the thumbprint by the country's leading whorl experts, the thumbprint could not be linked to Byron.

In fact, the experts told us this particular thumbprint could not even be found in the national records. Perhaps the perpetrator is from a foreign country. Hmmmm. Hello? Mr. Al Takriti? Why don't you stop by our offices for some free glazed donuts?

It's clear the battle's not won, and the rotund ruler of the UODCWA is not going to fight fair. So don't give him a chance — send in your entry to this month's contest right away. In fact, send in lots of entries . . . quantity will always defeat the sad quality of the UODCWA.

Hold this page up to a sunlit window. Place a piece of thin writing paper over it and carefully trace the entire picture. Then, add your own incredibly original dumb caption. Or, you could photocopy the page and add your original incredibly dumb caption. (Wait a minute. Did we say that right?)

Send your entries to **"Dumb Caption Contest Thing"** • *Flying Safety* Magazine • HQ AFSA/SEDP • Norton AFB CA 92409-7001