Even in the aftermath of the September 11 terrorist attacks and the threat of future hijackings, passengers on domestic American flights are safer than at any time since the birth of commercial aviation in the 1930s. According to a Massachusetts Institute of Technology study based on current accident rates, a frequent flyer would, on average, have to fly once a day every day for 22,000 years to stand a good chance of dying in an airplane crash. Fatal accidents take place once every 300 flight “years,” with 100,000 flight “days” passing between each deadly occurrence. Thus far, 1998 stands as the high-water mark for U.S. aviation safety, with more than 10 million departures from American airports and not one fatality aboard a commercial jetliner.

Nevertheless, there is reason for concern. Although the overall accident rate for commercial aviation has remained about the same for the past two decades, the proliferating traffic projected over the coming decade may be accompanied by a commensurate jump in the number of accidents. The Federal Aviation Administration (FAA) expects substantial growth in passenger enplanements by 2010, to as many as 1.2 billion, a nearly 53 percent increase from roughly 630 million in 1997.
Despite the accelerating growth, even one accident, or one life lost, is too high a price to pay for air travel.

Government agencies like the FAA and NASA work to improve airplane technology and procedures to insure the highest level of safety for passengers and crew. But rules and equipment can only go so far. Because human error continues to play a major role in air mishaps, flight-crew interactions remain a crucial — perhaps the most important — determinant in air safety. In order to stay airborne and take off and land without incident, flight crews must be able to coordinate individual efforts and work together as seamlessly as possible.

Yet flight-crew interactions are not as straightforward as they may appear. Globalization of air travel is leading to a multicultural, multinational mix of crew. As more countries develop their own aeronautical infrastructure, fielding and maintaining air service, diversity seems destined to balloon. With differing ethnic and national backgrounds, pilots’ communicative styles likewise differ. Not all styles are conducive to air safety, however. Recent studies indicate that certain cultures’ approach to cockpit communication actually contributes to aircraft accident rates.

“There’s no question that [aircraft] accident rates vary across cultures and nations — as much as eight times higher in some cases,” says Donald Davis, Old Dominion associate professor of psychology and an expert in the nature of human organization. “If we adopt the notion that cultural differences affect the rate of accidents, that means that maybe there are airlines in the world that are more likely to be less safe. What we’re trying to do as unbiasedly as possible is determine what behaviors matter and how they might be changed.”

AVOIDING ACCIDENTS

While social scientists generally accept the premise that cultural differences tend to affect the performance of individuals and groups, the exact interactions are less clear. Particularly in aviation, few studies have been conducted to assess the influence of culture on flight crews. So Davis will be overseeing a three-year study commissioned by NASA Langley Research Center in Hampton, Va., that will attempt to pinpoint the ways that differing styles impede or otherwise affect cockpit communication and coordination.

The research will examine the interaction of American and Chinese “crews” — Old Dominion students recruited for the project — who will first be “trained” on computer workstations running flight simulations. During subsequent simulations these ersatz crews will be monitored and their performance gauged during a series of on-screen “flights.” Davis is developing measures that should quantify the effects of any outstanding cultural differences.

“If cultural differences get in the way of working together as a team, affecting safety, new approaches need to be developed,” he says. “Authority relationships are less important than training pilots to do the best possible job. Our research may not lead to new instruments and displays, but it will likely lead to new procedures and training.”

Davis says that the effectiveness of flight crews depends on more than the competent performance of each individual. Crew members must be proactive, coordinating individual efforts to yield effective team performance. As with athletics, a group of individuals with superior talent...
may be bested by another group of more modestly talented individuals who work together successfully as a team. Similarly, Davis notes, flight crews that fail to coordinate their efforts as a team will be less effective, no matter how good their technical “stick and rudder” skills.

Aviation accident rates vary dramatically throughout the world, with national airlines in emerging nations in Africa, Latin America and Asia experiencing more accidents than industrialized nations in Europe, North America and the Middle East. Davis points out that while some of the variability is due to national differences in aviation infrastructure, aircraft age and condition, and other issues more closely connected to socioeconomic status, cultural factors help to explain additional variation.

For example, regions with high accident rates also share similar cultural values, such as power distance — the inability of subordinates to question the actions of superiors and recommend alternative courses of action — and uncertainty avoidance, which emphasizes rigid adherence to rules and procedures that reduces the directness and bluntness of communication. Direct and rapid communication, though, is often essential if accidents are to be avoided or critical situations surmounted.

EFFECTIVE RELATIONSHIPS

China Air, the national airline of the Republic of China, or Taiwan, has one of the worst accident rates in the world, with seven crashes from 1986 to 1998, involving Boeing 737s, 747-200s, 777-400s and Airbus 300-600s, resulting in 561 fatalities. In so doing, it has earned a rating of “F” from the Air Travelers Association. While there is no single cause for all these accidents, pilot error has been cited most often.

Based on research focused on Chinese culture, Davis says that a reasonable inference is that the autocratic decision-making style preferred by Air China pilots, most of whom received their training in the Taiwanese Air Force, can be counterproductive during times of crisis. Compared to pilots of other nations, the Taiwanese place the greatest emphasis on rules, order, strict time limits and a preference for finding a single correct answer to any problem. Chinese subordinates are unlikely to question or challenge their superiors, even if they are aware of situation-critical information that senior pilots are not.

In addition to variability in values, attitudes and personality, different cultures don’t perceive, encode, store and process information in the same way. These differences may influence how crew members respond to automation, as in the ways, for example, they rely too much or too little on the information provided by cockpit computers. Likewise, the manner in which crew members respond to threats and work together in teams can affect the ability to recover from equipment failures. Ultimately, variability in reactions to criticism and negative feedback may also impede receptiveness to training and efforts to correct performance.

It may be possible to dramatically reduce cockpit error with introduction of computer-based artificial-intelligence systems that would query pilots in the event of unexpected or unanticipated events. Efforts are under way to simplify instrument design, eventually converting analog dials and gauges to easily readable digital outputs on glass screens. Regardless of the exact technology deployed, Davis believes flight safety must rely for the foreseeable future on an assertive, well-trained human presence on the flight deck.

“In virtually every organization, the ability to create effective relationships is essential,” he contends. “The same is true in the cockpit of an airplane. During critical moments, effective communication can mean the difference between life and death. You can avoid accidents most of the time if you have a flight crew whose members can talk to one another and whose voices are listened to.”