

## Aviation Security in the United States: Current and Future Trends

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### INTRODUCTION

The past year has witnessed the most significant changes in direction and emphasis yet to affect aviation security in the United States. Although the principal triggering event for this new emphasis and importance was the catastrophic loss of TWA Flight 800 off Long Island, New York, on July 17, 1996, many other events had laid the groundwork that

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made this trigger so powerful. And the irony is, as you know, that the FBI now believes that TWA 800 was not a terrorist act.

The change to which I refer is really a "paradigm shift," wherein it is now acceptable in the United States for politicians and even representatives of industry to agree that the baseline security level in the United States should be upgraded, and upgraded considerably. Prior to TWA 800, no such consensus existed. In fact, many argued that there was no need for increased measures, and some thought that the then-current measures were more than what was required.

The upgrade in aviation security will take the form of a deployment of greatly improved equipment and the institution of greatly improved security procedures throughout the system. This massive improvement began in 1997 and its implementation will, we anticipate, continue for a number of years until a new plateau of security is achieved.

How is it that a possibly irrelevant event has produced so much change in the way aviation security is regarded in the United States? For comparison: following the bombing of Pan Am Flight 103 over Lockerbie, Scotland, in December 1988, although major changes were accomplished in the way the Federal Aviation Administration handled security and organized itself—placing local security managers at major airports, raising the status of security in the agency hierarchy, and conducting background checks of certain airport and air carrier employees—few major changes in the set of baseline security measures within the United States were evident to the traveler. Further, there was no consensus on applying further significant measures, such as the installation of trace equipment for checking some carry-on baggage, as was done in a number of other countries. In general, it was felt by many skeptics that the threat of a major terrorist action against aviation security in the United States was virtually nonexistent. Indeed, there remain today major players in the field who hold this view, although such a strong expression on the subject is not frequently made in public.

As I noted, several other events had come together at about the same time to enable this tidal change to occur. First, several major terrorist events within the United States, beginning in 1993, made it clear to the American public that the existence of two large oceans no longer guaranteed the absence of major international terrorist acts on our territory. These attacks are well known, and include the World Trade Center bombing and the murders at the headquarters of the Central Intelligence Agency, near Washington, D.C. Since these events, there have been continuing indications of terrorist activity, including a plot to bomb several major targets in the New York area. Even though aviation has not yet been specifically attacked at home, the history of terrorist attacks on civil aviation (including U.S. targets) overseas makes it clear that such a possi-

bility exists and must be guarded against. Further, the revelation in early 1995 of the plot by Ramzi Ahmed Youssef to destroy a large number of U.S. civil aircraft in Asia demonstrates that U.S. aircraft may still be targets of international terrorists. Concerns were heightened by the realization that Youssef had previously been in the United States.

The existence of a serious terrorist threat within the United States impelled the Federal Aviation Administration to convene an outside advisory panel composed of representatives from other Government agencies, air carriers and airport authorities, and various citizens and professional groups, with the purpose of recommending improvements in baseline aviation security measures. In fact, by coincidence, this Baseline Working Group was formed only hours before the crash of TWA 800. The Working Group's recommendations were passed on to the White House Commission on Aviation Safety and Security, formed shortly after the crash, and had a major impact on its first and final reports. Many of the White House Commission's recommendations (over 30 dealing with security issues) have been given the force of law and financing by ensuing congressional action. In this article, I will describe what is being done now as a result of some of the more salient and specific recommendations.

A second piece of the groundwork for the major change in aviation security was the recent emergence of successful new security technology, both in explosives detection and in other areas such as human factors and aircraft container hardening. The existence of an approved explosives detection system, the CTX5000, manufactured by InVision and certified by the FAA in 1994, made it conceivable that effective technical measures could be taken to block the introduction of explosives aboard aircraft. Indeed, at least two other corporations, L 3 Communications and Vivid Technologies, are seriously engaged in developing certifiable explosives detection systems. Further, the rapid development and improvement of trace explosives detectors raised the possibility of redundant technical measures to check baggage for explosives, based on a totally different technical approach. As a side note, trace explosives detectors may also soon be available for checking passengers for explosives on their person in a rapid and not very intrusive fashion.

Combined with the apparently successful bombing of a U.S. aircraft, practically within sight of New York City, the situation in July 1996 made the social and political pressure to institute significant improvements in baseline security measures irresistible. Within 3 months, congressional legislation appropriated Federal funds for a large-scale purchase of expensive security equipment. This was a first in the United States, with one minor exception about 25 years ago. Air carriers, not the Federal Government, have traditionally had the responsibility for such purchases.

Legislation authorized other security enhancements, such as background checks on security screeners, vulnerability assessments at airports, and the increased use of dogs for detecting explosives. How long this pressure will be maintained is, of course, uncertain. However, a major deployment of advanced equipment is now underway, and this in itself constitutes a major advance in security measures, in terms of deterrence and of real security capability. Nevertheless, as of today, the pressure for improvement remains and is supported by the administration (following the recommendations of the White House Commission), Congress, and the private sector. In fact, representatives of the industry are participating with the FAA on a Government team that is responsible for the acquisition and deployment of the new security equipment.

In the following sections, I will describe some major aspects of the current effort to improve aviation security for U.S. travelers and to construct a friendly and equitable cooperative regime between the United States and its international partners in developing and deploying aviation security measures on flights from and into the United States.

#### DEPLOYMENT

The first stage of the deployment of new, advanced security equipment follows the allocation by Congress of some \$144 million to this end in fiscal year 1997. It will include the purchase of 54 additional CTX explosives detection systems (beyond the 3 that were already being tested in an airport demonstration project), some 20 other units of advanced bulk detection equipment, and nearly 500 trace detection devices. This instrumentation will be placed in major U.S. airports and is well underway, having begun at Chicago O'Hare and JFK International Airport in New York. Further details regarding locations of equipment and the timetable for deployments will not be discussed in public, for obvious reasons. The intention is to complete this round of deployment by mid-1998, at which time the FAA hopes to have sufficient funding from Congress to proceed to a second phase of equipment installation.

Current and past research programs are now bearing fruit as well. In addition to the currently unique explosives detection system, and as I mentioned earlier, L3 Communications and Vivid Technologies could provide competing commercial systems for certification within a few months. These hold the promise of being faster than the current system, possibly with lower false alarm rates. Also, InVision itself has significantly improved the speed of its system and is working on a faster version for introduction within a year or so.

The category of advanced bulk detection equipment (other than the certified explosives detection systems) includes dual energy x-ray devices

that cannot meet FAA certification standards but are nevertheless far more capable than conventional x-ray equipment. These will be used for screening luggage too large for explosives detection system devices and also to study the effects of faster equipment on passenger and baggage flow. Further, some nuclear quadrupole resonance units will be purchased.

There are several different types of trace detection devices that will be purchased and deployed, based on chemiluminescence and on ion mobility spectrometry technologies. I would again emphasize that an interesting aspect of this deployment, within the American perspective, is that the Government is paying for the equipment itself (albeit from the Aviation Trust Fund) instead of requiring the air carriers to do so. With the exception of the purchase of some much less costly metal detection equipment some 25 years ago in response to a spate of aircraft hijackings, the U.S. Government has strongly resisted any effort to pay for security measures from Federal funds until now. The responsibility for aviation security in the United States has remained with the carriers and in fact still does. Security costs, like all other costs, are normally expected to be borne by the carrier and passed on to the flying customer.

There are some 600 million emplanements per year in the United States, of which only 10 percent are on international flights. Given that volume, it will be years before it will be practical for all checked baggage to be subjected to screening by explosives detection systems, due to the limited number of units available and their relatively slow speed. The best current certified explosives detection system is able to screen only 320 bags per hour, assuming no alarms. When alarm resolution is taken into account, the global baggage screening rate will be further reduced, to about 200 bags per hour. Further, there is the issue of bag intervention, a time-consuming process in which a passenger is brought to his or her bag to open it when an alarm cannot be resolved by external inspection. The rate of such bag openings may be higher elsewhere than in the United States, judging from past experience. This provides a further difficulty to the task of screening every bag.

Foreseeable improvements to the speed of explosives detection system equipment may eventually double the net bag flow rate. But even if one decides to screen only high-profile flights, such as international overwater and major transcontinental ones, there still will not be sufficient explosives detection devices to screen everyone's baggage, systemwide, for a number of years. Current thinking is, therefore, to extend the capability of explosives detection screening by selecting only a small fraction of passengers for expanded security measures.

COMPUTER-ASSISTED PASSENGER SCREENING (CAPS)  
AND BAG MATCH

For several years, the FAA, in cooperation with Northwest Airlines, has been developing a computer-assisted passenger screening (CAPS) system, which permits the airline's computer reservation system to use information in the passenger name record to exclude the great majority of passengers from further security measures. The FAA arrived at the criteria and algorithms used to perform this function through consultations with a large number of security and terrorism experts, who gave their assessments of the likely patterns of behavior of individuals intending to attack civil aviation, as reflected in their passenger name records. I would emphasize that these criteria do not involve at all the ethnic, gender, or religious characteristics of passengers. In the United States, we would not use such information in passenger screening. Such actions by the Government or the air carriers would be unlawfully discriminatory.

The Department of Justice was given the task of independently vetting the criteria and procedures that the FAA directs air carriers to use in screening passengers. The Department's review, conducted by its Civil Rights Division with assistance from the FBI and the Department's Criminal Division, covered both the manual security screening process (in use before the introduction of the automated system) and the CAPS system. The review found that neither procedure unlawfully discriminates against passengers based on their race, ethnicity, national origin, or religion. The Department of Justice did recommend certain follow-up actions that could be taken to ensure that the civil rights of the flying public are maintained in an air transportation environment secure from terrorist threats. The Department of Transportation and the FAA have acted on all the recommendations.

In September 1996, a follow-on grant was awarded to Northwest to refine the CAPS program to achieve operational capability and to assist in adapting CAPS to other airlines' reservation systems. Northwest met with other air carriers in the fall, conducted preliminary system tests during the winter, and progressed to operational tests on selected flights in its system in April 1997. Northwest has completed the process of phasing in CAPS throughout its domestic system, with over 150 stations online today.

Seven major air carriers, covering all major airline reservation systems, began work in earnest on developing their CAPS systems in 1997. Several major carriers have begun field-testing CAPS in 1998. The FAA is helping to fund these efforts through cooperative agreements that will disburse to the carriers funding appropriated by Congress for CAPS.

It is anticipated that all major carriers will have phased in CAPS voluntarily before a new Federal regulation mandates its use as the method of determining which passengers' bags must be subjected to additional security measures such as bag matching or screening with explosives-detection devices.

#### MEASURES TO HARDEN AIRCRAFT AND BAGGAGE CONTAINERS

Another approach to aviation security is to try to strengthen aircraft frames and to plan redundancies in vital systems; for example, controls, electrical systems, and hydraulics, to mitigate the effects of bomb blasts in flight. A further alternative is to use hardened baggage containers that can control the effects of bomb blasts in checked baggage.

The former path is difficult to accomplish by retrofitting. It is easier and more practical to incorporate such design measures in aircraft from the beginning. The FAA has engaged in extensive studies with military experts and airframe manufacturers to learn how aircraft fail due to explosions in flight and to discover measures to increase chances of aircraft survival. Explosives tests have been carried out to check calculations, both in the United States and in the United Kingdom. The best known of these efforts was the explosives testing on a Boeing 747 in Bruntingthorpe, in England in May, 1997. Several simultaneous experiments were run with four independent bombs. The experiments tested the effects of various protective measures to different parts of the interior cargo hold of the aircraft and also tested a model of a hardened baggage container.

The aircraft hardening experiments in this case were run by experts from the United Kingdom, not the United States, and I therefore will not comment extensively on them other than to say that they appear to indicate some promise for the future, in which the application of material of relatively small weight may contribute significantly to the resistance of aircraft to bombs at certain locations in their cargo holds.

Regarding hardened baggage containers, the FAA has focused until now on ULD-3 versions, suitable for wide body aircraft. However, we are currently also engaged in designing containers that are substantially smaller and could fit on narrow-body aircraft. In 1994, a hardened ULD-3 container developed by JAYCOR was tested successfully, using bombs that were comparable in size to those used in past terrorist events. This container was not a great deal heavier than many currently used aluminum ULD-3's. Further development was needed, however, to incorporate doors into the container that would make its use by air carriers operationally feasible. The FAA then contracted with several other vendors to provide models for testing. This testing produced mixed results

until Bruntingthorpe, when another JAYCOR container with a useable door successfully contained one of the bombs detonated in this test. The FAA has contracted with JAYCOR and with Galaxy Corporation to produce further containers for explosives testing. We expect delivery of the containers this month. Upon successful conclusion of the tests, the FAA anticipates ordering some 20 to 40 units for operational testing of these containers. This effort is being carried out in close cooperation with several U.S. air carriers.

The future success of hardened containers could radically change the detection capability requirements for explosives detection equipment for checked baggage screening. Of course, for any given container, a large enough bomb can be constructed to overcome it. However, a larger bomb is more susceptible to detection, and increasing the mass of explosives that need to be detected would relax the requirements on the detection equipment. If it is possible, eventually, to protect against a bomb of substantially greater mass than is now needed to destroy an aircraft in flight, this approach could conceivably lead to smaller, cheaper, and faster bomb detection equipment.

#### IDENTICAL MEASURES

The final topic I wish to discuss is the coming requirement to apply the same security measures to U.S. carriers that are applied to other carriers for flights coming directly into the United States from certain overseas airports. This matter is controversial, especially to partners in whose territories heightened security measures are now applied to U.S. carriers.

Congress passed the Antiterrorism Act of 1996 nearly two years ago. An amendment to that act requires that the FAA assure that the same security measures (not merely similar ones, as heretofore had been the case) used by U.S. carriers on routes into or from the United States will be implemented by non-U.S. air carriers on those routes. The controversy is generated by the argument that many of those carriers are not considered to be targeted by terrorists (at least not targeted to the same degree, as determined by intelligence assessments) and therefore should not have to apply the same level of costly security measures demanded of those that are. Because of its international status as a major world power, the United States and, by extension, U.S. air carriers, are more likely targets of international terrorists. Of course, the United States could assure that security measures are identical simply by reducing its own to the levels used by other air carriers on the same routes. Given the perceived levels of threat and the political imperative in the United States not to decrease security measures, as I mentioned earlier, this is not a viable option. Nor would it be particularly wise.



The FAA is engaged in a rulemaking process and expects that a notice of proposed rulemaking (NPRM) on this topic will be published in the near future. All parties and, indeed, the public will then have a period of at least 60 days (the minimum established by executive order) to review the NPRM and submit comments to a docket. If there are compelling circumstances, the period for comment can be extended.

The comments will then be analyzed. Further review, economic evaluation, and possible redrafting will follow. A summary of the comments, the FAA's evaluation of them, and an economic evaluation will be included with the final rule, which then will be published in the Federal Register. The effective date of the regulation will be at least a month from publication, and the FAA will implement the final rule by amendment of the foreign air carrier security programs.

We intend to develop the specific security program amendments in a process that parallels the public rulemaking. That process will involve a revalidation of the measures required, with special attention paid to the more complex measures, such as profiling, which would present considerable practical difficulties if identical performance were literally mandated. We hope to carry out the revalidation in consultation with the aviation security authorities of the affected nations, and we will be guided by the statement in the conference report of the legislation that it is not the act's intent to reduce security levels that are characterized by the measures currently required of U.S. air carriers.

#### SUMMARY REMARKS

The new emphasis on aviation security in the United States is resulting in many changes in procedures and equipment in the domestic aviation security arena and will have major ramifications on international flights to and from the United States as well. Symposia such as this one are essential for communicating current plans and intentions, and stimulating a public discussion among experts, so that we may enjoy a smooth transition to a security regime that will be more effective and, we hope, will represent no increase in the burdens of air travel.

