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On July 22, 1968, an El Al Boeing 707 flying from Rome to Tel Aviv was hijacked by three members of the Popular Front for the Liberation of Palestine. The hijackers ordered the plane flown to Algiers, where they demanded the release of an unspecified number of Arabs imprisoned in Israel, in return for the release of the crew and passengers. The Algerian government removed the hijackers to a nearby military camp but kept the hostages and took over the negotiations. The non-Israeli passengers were released, and later the three female flight attendants and the women and children passengers were also let go, but the 12 remaining Israeli crew members and passengers were held until September 1, when Algeria released all of them. On the following day, Israel announced the release of 16 Arab prisoners as a humanitarian gesture. Clearly, a deal had been struck.

The 1968 hijacking set a tactical precedent. There had been hijackings before, to be sure, but this was the first terrorist hijacking in which political demands were made. From the terrorists' point of view, it was a success. An El Al plane had been seized--that would never happen again. It had not been necessary to kill any of the hostages--in future episodes, hostages would die. The Israeli government had yielded--when faced with future hostage incidents, Israel would take a harder line. Other groups imitated the Palestinians, and by 1970, hijacking had become a well-established terrorist tactic.

The 1968 hijacking was also a strategic innovation. With it, terrorists defined commercial aviation as part of their battlefield. In this episode, the hijackers justified their action on grounds that El Al

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had carried spare parts for the Israeli Defense Forces during the Six-Day War and therefore was a legitimate target; later terrorist hijackers ceased to offer any justifications. The world would spend the next 20 years trying to keep commercial aviation off the terrorists' battlefield. How well has it succeeded?

Commercial airliners attract terrorists for both political and operational reasons. Airlines are symbols of nations, almost as much so as embassies and diplomats, and certainly as much so as big corporations with brand names--statistically, the two favorite targets of terrorists. Airlines are not only symbols of nations, they are scepters of nationhood. Every country must have a national airline to consider itself a real nation. That makes airlines prestige targets.

On the operational side, airplanes are convenient "containers" of hostages. They can be seized and controlled by a few persons. They are "portable" and can be flown anywhere in the world. On international flights, the majority of the hostages will usually share the nationality of the carrier, thus providing a direct challenge to that government; the presence of hostages of other nationalities will involve other governments as well and will complicate things--often to the terrorists' advantage.

Airports and airliners also offer terrorists easy concealment. Asked about the ways his life had changed after leaving government, a former U.S. Secretary of Defense mentioned that when he now flies, he is obliged to sit next to people he doesn't know. To terrorists, that is an attraction. Airports and commercial airliners are centers of anonymity where groups of strangers assemble and reassemble. Three worried-looking young men, standing about, dressed differently, somehow foreign-looking, might attract notice in Charlotte, North Carolina. But at Frankfurt Airport, who is a foreigner?

Hijackings account for half of all terrorist attacks on commercial aviation. Terrorist attacks on commercial aviation--hijackings, sabotage of aircraft, attacks at airports, and bombings of airline ticket offices--together account for 13 percent of all international terrorist incidents. But because of the heavy casualties resulting from airline bombings and the bloody terminations of some hijackings, they account for 34 percent of all fatalities.

Looked at another way, the 2,015 deaths resulting from terrorist attacks on commercial aviation over the past two decades account for nearly 10 percent of all commercial aviation deaths. Thus, if terrorism could be ended, which is not likely, airline travel would be 10 percent safer than it is now.

In response to the wave of hijackings and airline bombings that occurred in the late 1960s and early 1970s, airport security measures were increased. Passenger screening was introduced on all flights in the United States in 1973. El AL adopted even more rigorous search procedures. Analysts developed "profiles" of the types of passengers who were most likely to hijack planes--persons to be watched more carefully. Some countries, including the United States for a while, also deployed armed security guards on the planes themselves, a practice that a number of airlines continue. Pilots are divided on the use of air marshals. Some consider their presence a significant deterrent to hijackers; while others worry more about the safety of the passengers and the aircraft if a gunfight should erupt while the plane is in flight.

The physical security measures have been matched by efforts to put pressure on countries granting asylum to hijackers. In the 1968 El Al incident, the International Federation of Airline Pilots Associations as well as several airlines threatened to suspend flights to Algeria if the hostages were not released. A prerequisite to progress on the international front was a change in attitude. Until terrorists adopted the tactic for their own ends, hijackings were often seen in a positive light--as a means of escape from the totalitarian regimes behind the iron curtain. "Freedom flights," they were called then. The spate of hijackings to Cuba in the 1960s, however, caused people to review their thinking, and the later terrorist hijackings accelerated the shift. All hijackers had to be punished. If that meant people had to find another way to escape communism, it was the price we would pay to achieve international cooperation.

New conventions to guarantee the trial and punishment of terrorists who hijacked or placed bombs aboard airliners were negotiated and signed. They have been widely ratified and now represent one of the few areas where there is considerable international cooperation. A 1988 protocol extends the measures to cover airports as well as airliners. Governments also exerted direct pressure on organizations like the PLO to abandon hijackings and bombings of aircraft as a component of their armed struggle.

What were the results? Hijackings did decline from 151 hijackings or attempted hijackings between 1968 and 1970, to 56 incidents between 1971 and 1973, to 17 between 1974 and 1976--an overall drop of nearly 90 percent. Most of the hijackings were still getaways in which the hijackers wanted only to change the destination of the airplane. Only 20 percent of the ostensibly politically motivated hijackings were carried out by actual terrorist organizations. These declined too, from 27 in the 1968 to 1970 period, to 25 in the 1971 to 1973 period, to 13 in the 1974 to 1976 period--an overall decline of nearly 50 percent. Terrorist hijackings remained at this level until the second half of the 1980s, when there was another drop.

At the same time that terrorist hijackings were declining, terrorists were altering their tactics and shifting to easier commercial aviation targets. Terrorist attacks at airports began in 1972 with the bloody assault on passengers at Lod Airport in Israel by Japanese terrorists, allies of the Palestinians. Twenty-five persons were killed, and more than 70 were wounded, many of whom turned out to be Puerto Rican pilgrims on their way to visit the Holy Land. This episode shocked the world both by its ferocity and by its international quality. How is it, people asked, that Japanese come to Israel in the name of Palestinians to kill Puerto Ricans? Terrorist assaults at airports increased the following year. During the next decade (1973-1982), terrorists carried out 39 such attacks. Terrorist bombings of airline offices also increased beginning in 1974, and for 10 of the next 15 years, bombings at ticket offices outnumbered terrorist attacks on airliners. Overall, as shown below, terrorist attacks of all types

against commercial aviation increased, reaching a high point in the 1980 to 1982 period. Since 1983, we have seen a another decline.

Terrorist Attacks (all types) Against Commercial Aviation

Time Period	No. of Attacks
1968-1970	43
1971-1973	49
1974-1976	62
1977-1979	67
1980-1982	105
1983-1985	80
1986-1988	44

Despite the decline, however, hijackings remain a serious problem. They can be divided into two types: those in which terrorists hijack an airliner as a means of escape and perhaps to obtain a moment's publicity for their cause (this type accounts for 41 percent of all terrorist hijackings), and those involving political demands and sometimes lengthy negotiations (59 percent). As security measures have required would-be hijackers to make a greater investment and take greater risks, terrorists want more in return. In recent years, hijackings have become more likely to involve demands beyond destination changes. Of the 13 terrorist hijackings in the last five years, 11 have involved demands beyond asylum or publicity.

Terrorist hijackings are also somewhat more likely to involve bloodshed than ordinary hijackings. Fatalities occurred in 23 percent of the terrorist hijackings, compared with 16 percent of the non-terrorist hijackings. This is somewhat misleading, however. In

ordinary hijackings, it is often the hijacker who is killed, while in terrorist hijackings, passengers are more likely to be counted among the casualties. It seems that terrorist hijackings are getting bloodier. Of the 13 hijackings carried out by terrorists during the past five years, seven incidents (or 53 percent) resulted in fatalities.

The crash of Pan Am Flight 103 underlines the second major component of the terrorist threat to commercial aviation. Sabotage of aircraft is the biggest terrorist threat we confront today. Since 1969, terrorists have placed or attempted to place bombs aboard commercial airliners on at least 46 occasions. Eleven of these have caused crashes resulting in the deaths of 1,016 persons. Not all the planes crash. In 1986, four passengers including a mother and her infant daughter, were blown out the side of a TWA airliner over the Adriatic Sea. Despite the damage to the hull, the pilot was able to bring the plane down safely-- but the incident left four fatalities.

In all, 1,128 persons have died in the past 20 years as a result of bombs going off aboard airliners in flight or in cargo containers on the ground. This represents 20 percent of all of the deaths in international terrorist incidents during the past two decades. The large number of fatalities in each incident--329 were killed by a terrorist bomb on an Air India flight in 1986, and 115 were aboard the Korean Airlines flight brought down by a bomb in 1987--attracts intense media coverage and causes public alarm. Eleven of the 25 worst incidents of international terrorism, measured by the number of fatalities, resulted from terrorists putting bombs on commercial airliners. (The other episodes were mainly car bombings.) The threat of bombings, more than hijackings, now drives airline security.

The passenger screening procedures developed in the 1970s do not provide adequate protection against terrorist bombs. Standard X-ray machines and metal detectors will not necessarily alert operators to the presence of explosives. Research into explosives detection has accelerated in the last few years, however, and several technologies are being developed. One depends on the characteristic vapor emissions made by certain explosives. A machine using this technology can detect the minutest trace of explosives in luggage or on a person. Another device

analyzes the unique "backscatter" patterns created when different materials are bombarded with neutrons.

The challenge has been to develop technologies that can accurately indicate the presence of explosives and that are still reliable and practical given the tremendous volume of passengers and baggage that must be inspected at every major airport. The current vapor-detection machines require up to a minute-and-a-half to detect the presence of explosives. At that speed, even with two machines, it would take several hours to check the passengers and baggage on a single 747 jet. Canadian officials look forward to an improved model that will require only three seconds per passenger, but even with a prototype in hand, we are still several years away from deploying bomb detection technology at airports around the world. In the meantime, although improved X-ray machines can now alert operators to the possible presence of explosives in a suitcase, our most reliable procedure remains the tedious hand search of all luggage.

We may also want to think about additional ways to secure aircraft against bombs, for example, by hardening cargo holds to sustain or deflect explosions or by shielding vital controls to reduce the chances of an explosion resulting in loss of control and the crash of the airliner.

Bombings of airline ticket offices may be viewed as a substitute for attacks on airliners--a "poor man's" hijacking, a way to make a political point without running the risks. In contrast to airline sabotage, bombings of airline ticket offices are mainly symbolic forms of attack. Of 267 bombings, only eight incidents, or 3 percent, involved fatalities.

These bombings provide an indirect indicator of the threat to commercial airliners. They tell us which airlines terrorists would attack if security measures were less stringent. Terrorists, for example, have difficulty getting near El Al airliners, but they frequently attack El Al ticket offices. This is not to say that all terrorists planting bombs in front of airline ticket offices would hijack or blow up airliners if they could. One of the attractions in setting off a bomb at a ticket office is that casualties can be avoided.

But these bombings do reflect grievances, anger, a willingness to resort to violence, and in some cases, a willingness to cause casualties. Thus it could be argued that those airlines whose ticket offices are bombed most frequently are those whose aircraft are at greatest peril.

Who gets hit most often? Ten airlines account for 57 percent of all airline ticket office bombings. In descending order of frequency, these are Aeroflot, Pan American, Air France (and affiliated French carriers), El Al, THY (Turkish Airlines), Lufthansa, British Air, Saudia, TWA, and Swissair.

How does this profile compare with attacks on airliners? If we count both terrorist hijackings and incidents of aircraft sabotage over the past ten years (1979-1988)--a total of 62 incidents, including foiled attempts--we see some differences. First of all, the threat is diffuse. Thirty-two airliners from 30 countries have been attacked by terrorists. Air India heads the list, followed by Middle East Airways, Pan American, Air France (and other French carriers), Kuwaiti Airlines, El Al, VIANSA (Venezuela), AVIANCA (and other Colombian carriers), SAHSA (Honduras), THY, and American Airlines, the last four with two attacks each.

Looking at both terrorist and ordinary hijackings, plus incidents of aircraft sabotage during the past five years--a total of 64 incidents--gives us a somewhat different picture. Here, Middle East Airways heads the list, followed by Aeroflot, Iranair, Air India, and Air France. American carriers were targeted in 9 of the 64 incidents, or 14 percent of the total.

Security consultants sometimes advise their clients to avoid certain carriers, certain routes, or certain airports to decrease their risk of becoming a victim of terrorism. To the extent that this advice is based on the historical record, I tend to be somewhat skeptical. As one can see from the preceding discussion, how secure an airline appears to be depends a great deal on how far back one wants to count and on how one counts. Does an unscheduled detour to Havana count the same as a terrorist hijacking to Beirut? Merely counting how many times an airline has been hijacked or bombed, without taking into account the number of flights, also may give a misleading impression.

With these limitations in mind, and looking only at the period 1981 to 1988, one could safely tell frequent flyers to try to avoid, if they can, domestic flights in Iran, Poland, the Soviet Union, China, and Central America. Since 1981, eight flights out of Miami have gone to Havana. Flights from airports in Beirut, Athens, New York (another jumpoff point for hijackings to Cuba), and Frankfurt have been targets of more than one terrorist attack. Attacks on U.S. carriers account for 19 percent of the total number of incidents, most of them being non-terrorist hijackings.

Who are the adversaries? Individuals or groups or persons not known to be affiliated with any terrorist group account for the biggest share--32 percent of all attacks on airliners since 1968. Arabs operating on behalf of various Palestinian groups and other Middle Eastern groups account for about 22 percent of the total. Various Latin American groups account for about 10 percent. The remaining attacks have been carried out by diverse European and Asian groups.

Focusing on terrorist hijackings and sabotage of aircraft gives us a different picture. Various Palestinian organizations have claimed responsibility for 24 percent of all terrorist hijackings; Shia extremists account for 12 percent; and other Middle Eastern groups account for another 6 percent. Together, they account for 42 percent of all terrorist hijackings. Palestinian, Shia, and other Middle East organizations account for 45 percent of the sabotage incidents.

Some of our worst fears have not been realized. Although guerrillas used portable heat-seeking missiles to bring down civilian airliners in Zimbabwe and Sudan, and German terrorists threatened to do so, thus far we have not seen attacks of this type on commercial airliners outside of conflict zones. Some might argue that the shooting down of a Libyan jet by Israeli jets in 1973, the Soviet shooting down of a Korean Airline 747 which had violated Soviet air space in 1983, and the destruction of an Iranair passenger plane in 1988, which the United States claims its naval forces had tragically mistaken for an attacking military aircraft, all belong in the same category with terrorist attacks. Regardless in what category one places them, the first and the

last of the three incidents provoked terrorist attacks and they could be cited as justification for retaliation in kind. In the first case, Libya reportedly provided Arab terrorists with a surface-to-air missile to shoot down an El Al plane; the terrorists were apprehended with the weapon in Rome. In the last episode, an Iranian group claimed responsibility for the bombing of Flight 103. This claim was dismissed but an Iranian connection with the attack has not been ruled out. Precision-guided surface-to-air missiles are being mass produced and are becoming more widely available; some terrorists groups are suspected of having them in their arsenal.

Terrorists have not conducted a sustained campaign of sabotage that would seriously disrupt air travel. Fortunately, bombing attempts have been months apart, long enough for alarm to subside, which ironically makes things more difficult for those charged with security responsibilities. As the last episode fades from public consciousness, tolerance for delays resulting from security measures declines, until the next incident when public demands for better security sharply rise. Analysts with a taste for the cost-benefit ratios of terrorism have speculated on how many bombs it would take to bring airline travel to a halt. The answer probably is at least another incident before primary news coverage of the first has died down. The objective of terrorism as we know it, however, has not been to bring airline travel to a halt. Commercial aviation is the arena of combat, it provides terrorists with targets, it is not the enemy.

The nightmare of governments is that suicidal terrorists will hijack a commercial airliner and, by killing or replacing its crew, crash into a city or some vital facility. It has been threatened in at least one case: In 1977, an airliner believed to have been hijacked crashed, killing all on board. And in 1987, a homicidal, suicidal ex-employee boarded a commercial airliner where he shot his former boss and brought about the crash of the airliner, killing all 44 on board. Fear of such incidents is offered as a powerful argument for immobilizing hijacked aircraft on the ground at the first opportunity and also, some argue, for armoring the flight deck.

What are we likely to see in the future? Perhaps fewer but deadlier and more sophisticated terrorist hijackings. The 1988 hijacking of Kuwaiti Flight 441 illustrates the problem. In that case, the hijackers were familiar with cockpit and ground procedures and apparently even the tactical ploys used by negotiators, which they took steps to counter. The challenge, then, will be how to deal with hijackers who know our procedures and tactics.

As for sabotage of aircraft (our biggest problem today), we are again talking about relatively few incidents, but incidents causing great numbers of casualties and widespread alarm. As their sophisticated devices show, terrorists are familiar with current security measures. If the frequency of incidents like the crash of Pan Am 103 goes up, passengers, particularly business flyers, may seek safe travel in corporate aircraft, or "membership" flights chartered by consortiums of companies that will vet and clear passengers beforehand.

In addition to lives lost, which remains the primary concern, the alarm caused by terrorist attacks on commercial aviation can have disastrous secondary effects on airline revenue and on the income normally derived from tourism. Public opinion polls taken in early 1986, after a series of spectacular terrorist attacks on airlines and airports in the preceding months, revealed that by a margin of two-to-one, Americans would advise friends traveling abroad to alter their plans, and would alter their own travel plans for fear of terrorism. To be sure, other factors like the declining dollar and the Chernobyl disaster also affected tourists' decisions, but fear of terrorism played a significant role. Some Americans may also have been registering their irritation at what was perceived in the United States to be slack security and a limp European response to international terrorism. This produced dramatic effects on American tourism to Europe and the Mediterranean. According to a study by R. Bar-On, the annual total of tourism for the year 1985, when the string of attacks began, fell significantly below what had been projected on the basis of trends early in the year and prior to the first attacks. The decline continued into 1986 with decreases of up to 62 percent recorded in international

tourism from the United States to 29 countries in Europe and the Mediterranean. Although American tourism began to recover somewhat in mid-1986, arrivals in 1987 were still behind those of 1985 in 18 of the countries. Professor Bar-On estimates the total revenue loss for the three years to have been about \$6 billion, not counting airline receipts since some of these tourists may have travelled by air to other locations.²

With a growing number of places to travel to and airlines to choose from, the tourism industry in general, and commercial carriers in particular, will be vulnerable to sudden shifts in international travel patterns caused by terrorist incidents. Terrorists themselves are not unaware of these effects and have launched terrorist campaigns at the start of the usual tourist seasons to discourage foreign tourism as a form of economic warfare against the government. We have seen examples of this in Uruguay, Puerto Rico, and Spain.

The airlines have to contend not only with sudden tourist decisions to go elsewhere but also with their selecting a different carrier to get there when they think one is more likely to be a target of terrorist attack. This is particularly true of the business traveler who has little choice of when and where he travels, but often has numerous options when it comes to who will fly him there. American carriers object to security consultants advising their clients to fly foreign carriers because they are less likely to be attacked by terrorists. To counterattack a shift to foreign carriers, several American carriers have launched new international security programs and have aggressively advertised these. American Airlines, for example, has contacted corporate directors of security and security consultants by telephone and by letter to describe its new security measures in detail.

Threats against airlines will remain a major problem. Should they be publicized? I think not. The fact is, airlines receive hundreds of threats. All are scrutinized. When they are specific, a flight may be delayed while the aircraft is searched. When they are general, security

²R. Bar-On, "The Effects of Terrorism on International Tourism," International Seminar on Aviation Security, Herzeliyya, Israel, February 1989.

measures may be increased, depending on an assessment of credibility. We probably need to devote more attention to how we do this. But to publicly post threats would only inspire the pranksters, the fanatics, and the lunatics, multiplying the number of threats, increasing the noise level, and making it more difficult than it is now to assess credibility. Publicizing threats would tell passengers everything but would provide them with no information. It's a bad idea.

Increased scrutiny of passengers and luggage will make it more difficult to smuggle weapons or explosives aboard aircraft through the "front door." In some of the recent incidents, terrorists are suspected of having had confederates among the ground staff or of themselves having posed as members of flight crews or ground staff. We will have to pay more attention to locking the "back door" that is controlling access to planes and cargo. This poses a major challenge. Major airports may have 25,000 to 50,000 workers. Aircraft cannot easily be sealed. Unlike boarding passengers, there are few obvious chokepoints.

With these trends in mind, we come to the question that concerns us most: Just how safe is air travel? Over 200 million passengers flew internationally in 1988; 259 of them died in the crash of Pan Am 103. The 2,015 fatalities since 1968 would give us a probability range of one chance in a million to one chance in several million of being killed by terrorists while flying on a commercial airliner or passing through an airport. One is in greater danger of being killed by a falling object. Several hundred million persons fly domestically each year in the United States alone. The odds against death at the hands of terrorists here would be even more remote. The best advice to frequent business flyers is still, drive carefully on the way to the airport.