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## **From Lockerbie to Umar Farouk Abdul-Mutallab**

(Assessing the Destruction of Civilian Aircrafts by Terrorism)

By Jean-Luc Marret

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*Assertions and opinions in this paper are solely those of the author (s) and do not necessarily reflect the views of the Center for Transatlantic Relations or the Fondation pour la Recherche strategique.*

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## Introduction

Data published by the Federal Aviation Administration (F.A.A.) in its "Annual report on the criminal acts against civil aviation" indicates that in the year 1960, there have been fifteen attacks onboard planes leaving 286 dead; 44 in the year 1970 with 650 dead (mostly hijackings); and 26 in the 1980s leaving 1207 dead. In the 1970s, the record is established by the year 1976 (168 dead). The three years - 1985 (390), 1988 (287), and 1989 (278) - were more deadly than the 1960s all together. These casualties were largely provoked by IEDs. Since the end of 1980 - the deadliest decade, with the exception of September 11, 2001 -, it is however a rare practice.

The reasons for the decline in big and politically motivated hijackings were varied. One could have been the improvement of the effectiveness of the safety response by States, airports and companies. The improvised explosive device (I.E.D.) posed a serious threat to the civil aviation industry in the 1980s. Since the 1990s, the jihadi networks have regularly tried to target aircrafts using various types of IEDs.

## South Korean Flight 858

Initially, and similarly for hijackings, the plane is a symbol. Air France represents France, an El Al flight- Israel, Aeroflot- Russia. Beyond the company, the State itself is targeted. The nationality of the passengers is as much a factor as the destination of the plane.

Planes are built from fragile materials. One needs only a few strategically placed explosives to destroy them. The Boeing 747 was destroyed above Lockerbie in December 1988 using 285 grams of Semtex i.e. the weight of vole of quarters (Cf. below).

The terrorists or operational intelligence officers - seeking a spectacular and dramatic media effect - generally target international flights with passengers of several nationalities. The destruction of South Korean flight 858 in 1987 was thus orchestrated by North Korea. South Korea became a target because it was going through a fluid political phase with the constitution being revised and elections due at the end of the year.<sup>i</sup> The aim was to plunge South Korea into chaos and prevent it from hosting the Olympic Games in Seoul. The North Koreans estimated that no State would entrust its athletes to the South Korean authorities due to the terrorist threat. Korean Air was en route from Abu Dhabi to Bangkok on 29<sup>th</sup> November, 1987, when it exploded over the Andaman Sea, killing all 115 on board. Two North Korean agents had boarded the plane in Bagdad and disembarked during its stopover in Abu Dhabi leaving behind a timed IED in an overhead compartment. The agents were arrested in Bahrain while using fake Japanese passports, and both immediately swallowed cyanide capsules.<sup>ii</sup> The male died instantly, but the female suspect, Kim Hyon Hui, survived and later publicly expressed remorse. She explained that they had left a radio containing 350 grams of C-4 explosive and a liquor bottle containing approximately 700 ml of PLX explosive (Picatinny Liquid Explosive, a liquid binary explosive) in an overhead rack in the passenger cabin.<sup>iii</sup>

When a plane is destroyed over a sea or an ocean, very little traces of explosives remain as evidence. Any residual explosives get diluted in water. A recent example proved the difficulties which could emerge from such a crash: In July 1996, T.W.A. Flight 800 exploded at an altitude of 4,175 meters. It hit the sea 26 seconds later and its debris was scattered over 2.4 kilometres. If we assume the explosion was due to a technical defect,<sup>iv</sup> the rumour about a missile only highlighted the difficulties of the investigation. The assumption of the missile-attack appealed to the media because it had the attraction of being a new means of destroying an aircraft.

## MANPADS

The threat of missile-attacks is not new either. For the terrorists, the advantage of this weapon was that it could be carried out by only one person, and it was particularly reliable against a large civil aircraft flying at low altitude. Sometime towards Christmas in

1974, a Palestinian commando based in Paris, finally accepted a Soviet anti-tank device-Rpg-7. In January 1975, the terrorists fired two rockets at an El Al plane at the Orly airport using this weapon. The rocket made a hole in the wing of a Yugoslav plane which was taxiing on the runway and wounded a French police officer on guard onboard. Six days after this more or less failed attempt, and as the safety of the Orly airport was increased to 750 men, a similar attempt was made, but failed, thanks to the vigilance of security forces.

The portable ground-to-air missiles, MANPAD (Man Portable Air Defense System), are allegedly a major threat to civil aviation. It is actually surprising that there have not been any more attempts at deployment. This type of missile is in the hands of about thirty political organizations committed to intra-state conflicts in Africa, Central Asia and in the Caucasus. Moreover, they seem rather easily available in the black market. Attacks on civilian aircrafts flying at low altitude (using the US FIM-92 Stinger, Mistral, Javelin, Strela-2 and -3, Iгла-1, or quite simply a RPG) were numerous since the 1970s, but considering that the civilian aircrafts with many passengers did not grab the attention of the media, other aircrafts became targets. Thus in October 1993, an American helicopter Mh-60 Black Hawk was brought down by Somali militants. The attack (using materials of Russian origin) on an Israeli charter plane at the time of takeoff on 28<sup>th</sup> November, 2002, with 260 passengers onboard is the last and most spectacular example of all. The easy availability of such weapons and their dramatic effects (destruction of a plane and possible crash over dwellings) make them an inevitable choice in unleashing terror. However, the danger seems to be overestimated. If the proliferation of MANPADS is as alarming as it is sometimes made out to be, then, civil aviation would have faced numerous losses. The MANPADS that are in the hands of non-state armed groups- for example, the LTTE - have been provided by a State in the 1970s and 1980s, or bought in the illegal market. Hence, some of their components such as batteries could be not working anymore.<sup>v</sup>

Why were the destructions of civilian aviation so effective in the 1980s? Airports around the world were prepared to counter the threat of hijackings, which was the hallmark of the attacks in the 1970s. The terrorists changed their *modus operandi* from hijackings to bombings as to adapt to the airports and civilian aviation safety standards, designed in reaction to hijackings.

## **Unequal Levels of Security at Airports**

In the 1980s, it was difficult to distinguish between certain explosives like Semtex, which can be moulded to take the shape of objects (plates, mugs etc.). In London, in May 1989, the police force discovered boxes of what looked like Middle-Eastern candies. On inspection it was revealed that the candies had been replaced by Semtex of the same colour and consistency. The design of “luggage-bombs” (with a detonator hidden in a standard "computer" or "radio" came from the military uses of booby traps made with plastic explosives. Everything can become a bomb or hide a bomb. The Lockerbie attack<sup>vi</sup> which left 270 dead was thus carried out using 285 grams of Semtex hidden in a Toshiba radio packed in a bag of clothing. The bag travelled from Malta to Frankfurt, and was then transferred on Pan Am Flight 103 bound for New York via London, without their owners on board.<sup>vii</sup>

It should be admitted that the transfer of luggage from an unreliable country can be problematic from a security point of view. For example, in the Brazzaville attack in September 1989, a bag filled with explosives was placed in the compartments of DC-10 of U.T.A. bound for Paris via N'Djamena. The attack claimed 171 lives.<sup>viii</sup> This incident also illustrates the possibility of terrorist operational cells using an innocent third person to assemble the bomb onboard the plane. Often when a passenger is late for a flight, the security check is slackened to enable the scheduled departure time of the flight. Terrorist groups could take advantage of this situation to slip past security. Lastly, people themselves are used to carry the bombs without having to bother about concealing them in the luggage.

## **Techniques of Destruction of Planes**



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The following cases will illustrate the frequency of the attacks and the various techniques employed. The terrorist's action however is not without risks and is not a guaranteed success. The police most often intervene in a pre-emptive way by detecting bags planted in an airport. Sometimes the passengers themselves pre-empt an attack:

In August 1982, a sudden explosion on Pan Am Flight 830 from Tokyo to Honolulu killed several Japanese citizens and wounded fifteen others. The bomb was of the same type as that found a few days later onboard a 747 in Rio de Janeiro before it exploded.<sup>ix</sup> On closer examination by American experts, it was concluded that the mechanism/trigger, installed with the bomb under the seat of a passenger could detonate the bomb from a seating position. The machine was hidden in a kind of document-case while the timer could make a seven-hour calculation.

The purchase of a ticket for the last time and the absence of the passenger in the flight are an alarming sign of a potential terrorist act. In June 1984, a Boeing 747 of Air India<sup>x</sup> disappeared abruptly over the sea off the coast of Cork in Ireland. All 329 passengers were killed. Less than one hour later, the same day, a piece of luggage exploded in a container coming from Canada. The luggage had just been off loaded from a Canadian Pacific plane at Tokyo airport. The Air India flight disintegrated just as it was descending towards London before flying on to Mumbai. On the radars, the Air India went out with a blip suggesting that it fell down like a stone. Besides, the point of impact with the sea confirmed that it had hit the water vertically. This indication is invaluable and characteristic of an explosion onboard. Even with very serious electronic or mechanical problems, a Boeing 747 is capable of steering several kilometres, and "to even plane" 150 km without its four engines.

In this case, the safety procedures were not properly adhered to. In fact, it became an example of what should not be done. The luggage was not adequately monitored, and on the Canadian Pacific, the unidentified baggage was not offloaded. Other planes which fell prey to terrorist bombings in the 1980s reveal a real sophistication in the kind of bombs used. In February 1986, an IED was found by the Israeli security services. It was particularly sophisticated as it was composed of explosive PETN hidden in thin layers at the bottom and corners of the bag. A barometric sensor, an electric detonator in contact with the explosive and an electronic timer were to start the detonation. A

“stop/interlocking” button made it possible to transport the bomb without any danger. This barometric sensor was intended to guarantee that the explosion would happen at a certain altitude during the flight. It engaged at a certain altitude, signalled the countdown to the explosion and stopped when the plane went down again under programmed altitude (such as for a stopover). It appears that the terrorists using such systems are remarkably informed and aware that many compartments of the civilian aircrafts are pressurized. If the civilian aircrafts fly to altitudes of 12,000 meters, the pressurization of the compartments never exceeds the equivalent of an altitude of 3,000 meters. The terrorists thus program their barometric sensor to trigger the explosion of the bomb at around 2,800 metres.

## Trade vs. Safety

If some states are too poor to set up modern security systems at their airports, the commercial viability is at odds with the safety requirements in these states. Hence, security is entrusted to the airline companies or private companies. This is the case in North America. In the United States, one such airline company entrusted its security evaluation to an Israeli company but applied the recommendations of this company only to half of its installations around the world for lack of financing.

Yet, in the mid-1980s, all American airports continued with the practice of “curb side in check in” i.e. passengers could check-in their baggage as soon as they arrived at the airport (before they actually entered the airport). This way, no one could guarantee the safety of these bags on their way from the taxi and to the cabin of the plane.

The French board of inquiry looking into the destruction of DC.-10 of U.T.A. in the desert of Ténéré in September 1989 denounced the safety measures at the airport of Brazzaville from where the plane took-off. The dimensions of the air terminal were criticized for being too modest for the number of passengers. Also, there were too many simultaneous boarding of flights. The airport was also criticised for not checking-in passengers and luggage at the same place. The public spaces, restricted areas and the baggage carrousel were easily accessible. As in the United States, the passengers did not

have to be present in person to check-in their luggage. This facilitated substitution or addition of luggage. Finally, passengers did not have to identify their luggage.<sup>xi</sup>

## The Shield vs. the Sword

Given the numerous terrorist threats, the limitations of airport security and the vulnerability of planes, do solutions actually exist? In the 1990s, pragmatic remedies began to emerge. In London, for example, new technologies in Terminal 1 made it possible to systematically check all the luggage onboard flights bound for Ulster and passengers were not allowed to carry hand baggage. In Tel Aviv, the passengers must present themselves at the security check-point two hours before the departure of the plane and, on the road towards the airport, the police inspect all cars. Each passenger is then questioned on the contents of their luggage. El Al has its own security service at each one of its stopovers. In the mid-1980s, El Al removed its flights to Bucharest because the local authorities did not authorize this system. Lastly, there are two to four security agents on each El Al flight. They are armed with small-gauged revolvers, sufficient enough to kill but not powerful enough to pierce the fuselage and risk depressurization.

More substantial measures such as the detection and marking of explosives are under consideration or in the process of application. These measures obviously cannot guarantee the total safety of a plane.

At present, there are three methods for the detection of explosives: the imagery X-ray; the detection of the “molecular vapour” of the explosives; and nuclear detection. But still, no particular technique has proved to be effective enough.

In the US today, the Transportation Security Administration (TSA) uses the following equipment:

- More than 900 “advanced technology X-ray Systems.” This technology allows operators to see the luggage from multiple angles. Some of these new machines also have a high-resolution zoom capacity.

- 34 CastScope machines. These x-ray machines, deployed at 11 airports, are used to examine casts or prosthetic limbs to make sure they do not contain explosives or weapons.
- Explosive Detection System. This system, which works like a Magnetic Resonance Imaging (MRI), is standard at many airports and is used to screen checked baggage for weapons and explosives.

The installation of body scanners is interesting from a security point of view but at the same time poses many questions concerning privacy. But even here, one can count on the terrorists to come up with innovative solutions- one of them being to put explosives inside the body. For instance, liquid explosives could be hidden in an encasement of silicone implants or in the body, in the same way as narcotics.<sup>xii</sup>

## The Jihadi Practices of Destroying Planes

The jihadi networks renewed the terrorists' interest in the destruction of civilian aircrafts. They did it in their own way, taking into consideration the methods adopted in the 1980s and 1990s, and also the heterogeneity of their militants. The 11<sup>th</sup> September, 2001 attack is a hybrid form of different techniques: hijacking, and using an airplane as a kinetic object to take advantage of its speed and weight to destroy hard-targets, critical infrastructures etc.

If it is always difficult to believe in statements of arrested individuals or police remarks which could sometimes be "spectacularized" for legal purposes, it is highly possible to distinguish some trends in jihadi practices here.

The jihadi networks are very heterogeneous and decentralized. In general, there seems to be a certain correlation between the complexity of the attack (because of the number of planes to be attacked simultaneously, or the type of IED to be used) and the profile of the operational militants engaged in the operation.

One can distinguish here two types of jihadi operations. One is the sophisticated operation with trained militants. They are very skilled, and help plan a coordinated operation against many targets. The other is a “one-shoot” operation that exploits the statistical probability of such an attack being successful. The second kind of operation is generally carried out by isolated individuals who are indoctrinated by radicals in radical incubators.

The “inaugural” operation, the famous “Bojinka plot” was a planned large-scale terrorist attack by Ramzi Yousef and his uncle, Khalid Shaikh Mohammed, to blow up a dozen airliners along with approximately 4,000 passengers as they flew from Asia to the United States. This plot was disrupted after a chemical fire drew the attention of the Filipino police on 6<sup>th</sup> January and 7<sup>th</sup> January, 1995. Before carrying out their attack on the airliners, Yousef decided to do a trial run of the operation. In December 1994, a bomb exploded onboard a Philippine Airlines flight from Manila-Tokyo. One passenger was killed, and twelve were wounded, but the plane managed to land in Okinawa.<sup>xiii</sup> It turned out that the bomb had been assembled in the toilets of the plane by placing nitroglycerine in a case of contact lenses with an alarm clock as the detonator.

The lessons learned by the masterminds of this plot were apparently used and put to use by those involved in the 11<sup>th</sup> September attacks. One can observe some similarities between the two plots. Both plots focused on the United States and intended to target airliners simultaneously. The funding for both operations was low-profile and fragmented (micro-funding techniques such as money laundering and small international transfers). The difficulty in handling unstable chemical substances (the fire which led to Yousef’s arrest) forced the 11<sup>th</sup> September conspirators to revert to the old technique of hijacking. On the other hand, the safety measures introduced after 9/11 made the use of weapons difficult (knives, scissors etc.), thus renewing the operational interest in IEDs.

After a few operational tests, another type of IED was developed which consisted of the use of Casio digital watches as timers, stabilisers that looked like cotton wool balls and nitro-glycerine as the explosive.<sup>xiv</sup> Other ingredients may have included glycerin, nitrate, sulfuric acid, and minute concentrations of nitro-benzene, silver azide (silver trinitride), and liquid acetone. Two 9-volt batteries in each bomb were used as a power source. The batteries would be connected to light bulb filaments that would detonate the

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bomb - something far less sophisticated than what was used in the 1980s by state-sponsored terrorism. Yousef is also reputed to have wired a silicon controlled rectifier as the switch to trigger the filaments to detonate the bomb.

The 2006 transatlantic plot was the next big terrorist plot. The plan was to detonate liquid explosives carried onboard at least ten airliners travelling from the United Kingdom to the United States and Canada. The plot was unearthed and foiled by the British police, apparently far before it became fully operational. Immediate safety measures were put in place which delayed flights and caused long disruptions.

The British seem to have acted pre-emptively, maybe under US pressure according to numerous reports. The fact is some European counter-terrorism services did not receive any technical reports from the UK providing data about the IED itself and the explosives. That could mean that the terrorists' plot was far from being fully operational. The trial began in April 2008 and ended in September 2008. The jury failed to reach a verdict on charges of conspiracy to kill by blowing up an aircraft, but the court did find three guilty of conspiracy to murder. In September 2009, a second jury found three individuals guilty of the plot. The British-Pakistani network had links in Pakistan and (through Rashid Rauf, who might later have been killed in a US drone attack), with the Al-Qaeda or some Kashmiri organization.

The alleged plotters planned to use peroxide-based liquid explosives. US authorities have named named two peroxides that could be used: Acetone Peroxide (TATP) and Hexamethylene Triperoxide Diamine (HMTD). During the trial of the suspects, the prosecution stated that each alleged bomber would board a plane with the "necessary ingredients and equipment" and begin the difficult process of assembling the bomb in the restroom of the plane.

In the immediate aftermath of the first arrests, passenger rules were amended for flights between the United States and the United Kingdom in which all liquids (apart from baby milk) were forbidden, including beverages, hair gels, toothpaste, lipstick, sunscreen, and hand lotions due to the suspicion that liquids could be used in the attacks.

In contrast with the Bojinka plot, or even the 2006 transatlantic plot, the “shoe bomber” case was far less sophisticated. The perpetrator and self-claimed Al-Qaeda member, Richard Reid, was convicted by a US court for attempting to destroy a commercial flight with an IED hidden in his shoes. Reid, who was radicalized in jail, attended radical mosques in London, was condemned for petty crime, and rudimentary trained in Afghanistan, did not have the profile of a potential highly skilled operational militant. He was instead a simple “soldier” of the cause. On 21<sup>st</sup> December, 2001, he attempted to board a flight from Paris to Miami, but his boarding was delayed because his disheveled physical appearance raised suspicion amongst the screeners. He also did not answer all of their questions, and had not checked any luggage for the transatlantic flight. Additional screening resulted in his being re-issued a ticket for a flight on the following day. He returned to the airport on 22<sup>nd</sup> December, 2001, and boarded American Airlines Flight 63 from Paris to Miami, wearing his special shoes packed with explosives in the hollowed-out bottoms. At that time, preliminary forensic results indicated that Reid's shoes contained few grams of PETN explosive, enough to blow a hole in the plane and cause it to crash, or at least a sudden depressurization.

Even if numerous sources indicate some complicities or even a failed planned coordinated attack against airliners, Reid's profile and *modus operandi* are particularly sophisticated. But such an attempt has numerous advantages for the transnational jihadi networks, both, in theory and in practice: firstly, it allows for the testing of a militant; secondly, it tests the safety measures in civil aviation; thirdly, it can lead to the destruction of an airplane with high-profile victims (passengers); and lastly, it can provoke massive disruptions in airports and flight management. The “low-cost” of a suicidal militant is nothing in comparison to the potential political gains.

The attempt made by Umar Farouk Abdulmutallab, a young Nigerian citizen, to detonate explosives hidden in his underwear on 25<sup>th</sup> December, 2009, more than anything resembles Richard Reid's case. Their profiles might differ, but they are both highly representative of those “deterritorialized” young radicals– Reid coming from diasporas living in the UK and Abdulmutallab coming from an influential family in Nigeria.

Both had transnational connections with radicals and sometimes prominent jihadis (in Yemen or Pakistan). Both were well-travelled in Western countries which enabled

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them to move around discreetly. And like Reid's attempt, Abdulmutallab's *modus operandi* did not appear to have much sophistication. The passengers and crew onboard the plane said Abdulmutallab spent about 20 minutes in the bathroom as it descended towards Detroit, and then covered himself with a blanket after returning to his seat. They then heard popping noises accompanied by a foul odor. Soon Abdulmutallab's trouser and the wall of the plane were on fire. The explosive device, according open sources, consisted of a 15-cm packet of explosive powder which was sewn into his underwear, and a syringe containing acidic liquid. It was lately reported that the bomb materials also contained PETN, the same explosive that was allegedly used by Richard Reid in 2001.

Finally, let us compare the methods that were used to destroy planes in the 1980s with those actually used by the terrorists today:

- The devices currently used are simpler than those used in the 1980s, which probably indicates the increased level of security with regard to the detection of explosives and the identification of possible containers.
- This progress in the levels of security has prompted the terrorists to adopt more modest practices. To try to pass through stringent airport security measures with explosives is risky but highly feasible given the low cost of the entire operation. At the same time the jihadi networks have drawn their lessons from the past.
- The *modus operandi* of current jihadists is qualitatively limited (basic soldier of the jihad, IEDs whose certain components are easily reproducible by anyone who is fairly skilled) and quantitatively limited as well (low capacity of carrying by a man alone, not multiple targets but a single one), etc.
- As a principle for modernizing counter-terrorism strategy, it is important to exercise caution, as terrorism is bound to continue reinventing itself.

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- <sup>xiv</sup> After 9/11, this watch even became one of the unclassified proofs of potential terrorist activities, in connection with other indicators of jihadi "way of life" and practices.