

Trends in Aviation Terrorism¹

On October 31, 2015 a Russian Airbus A321 plane was shot down on its way from the Sinai Peninsula to Saint Petersburg by a bomb that was planted under one of the plane's seats.² The Islamic State claimed responsibility for the terror attack and said that it had been able to detect a security breach at the international airport in Sharm El-Sheikh in the Sinai Peninsula.³ The force of the blast on the plane was equivalent to one kilogram of TNT explosive material which, according to the organization, had been hidden in a beverage can. The attack, which was carried out in the wake of Russia's involvement in the war in Syria, caused the plane to crash and killed all 224 people on board.⁴

Shortly after the terror attack in Sinai, three more significant attacks were carried out against the aviation industry. In the first attack, on February 3, 2016, a bomb was planted by Al-Shabaab Al-Mujahideen on a passenger plane in Somalia, which caused a hole in the plane shortly after takeoff. The second attack was carried out a month later on March 22, 2016 in Brussels by the Islamic State. Two suicide terrorists exploded at the entrance to the international airport terminal in Brussels and another suicide terrorist blew himself up inside a train carriage in a subway station next to the EU

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² Will Stewart. "Russian plane crash: Bomb on tourist jet that crashed in Egypt 'was placed under a seat'". Evening Standard. November 23, 2015. Retrieved from: <http://www.standard.co.uk/news/world/bomb-on-russian-tourist-jet-that-crashed-in-egypt-was-placed-under-a-seat-a3120741.html>

³ Dabiq, Issue 12, "Forward", pp. 2-5.

⁴ Will Stewart. "Russian plane crash: Bomb on tourist jet that crashed in Egypt 'was placed under a seat'". Evening Standard. November 23, 2015. Retrieved from: <http://www.standard.co.uk/news/world/bomb-on-russian-tourist-jet-that-crashed-in-egypt-was-placed-under-a-seat-a3120741.html>

Parliament.⁵ The third terror attack took place on June 28, 2016 in Ataturk international airport in Istanbul, Turkey. In this attack, three terrorists opened fire in the departures terminal and later detonated explosive vests, killing more than forty people and injuring 150 others.⁶

These attacks testify to the existence of terrorist organizations' motivation and ability to carry out terror attacks against the aviation industry, which they consider to be an attractive target. The motivation to attack public transportation targets in general, and the aviation industry in particular, is tied to the direct psychological effect of this type of attack. These attacks create fear and anxiety among the population, and may paralyze the transportation at the state level and sometimes at the international level.⁷ The famous statement made by George Habash following the successful hijacking of an El-Al flight to Algeria at the end of the 1960's that "when we hijack a plane it has a more significant effect than if we killed a hundred Israelis in battle",⁸ emphasizes the importance that terrorist organizations ascribed, even then, to the psychological and media effect of terror attacks in the aviation arena.

Global terrorist organizations, led by the Islamic State and Al-Qaeda, continue to demonstrate motivation to carry out attacks on the aviation industry. They do so by conducting intensive dialogue on the subject via the Internet, in closed forums, social networks and by communications applications. After the terror attack in Brussels, an Islamic State supporter called on Muslims in Germany to carry out a terror attack against the Cologne Bonn Airport in Germany, inspired by the Brussels attacks. Similarly, in April 2016 a jihadist posted, on the Telegram application, a call to hijack planes and

⁵ Alastair Jamieson. "'Mother of Satan' Explosive Likely Used in Attack: Expert". NBC News. March 22, 2016. Retrieved from: <http://www.nbcnews.com/card/mother-satan-explosive-likely-used-attack-expert-n543441>

⁶ Itay Bloomenthal, Reuth Rimerman, Itamar Eichner, Roey Case, Atalia Shomplevi and Amit Kotelratz. "Flights Renewed in Istanbul. Israelis at the airport: It is chaos, we are exhausted". Ynet. June 29, 2016. Retrieved from: <http://www.ynet.co.il/articles/0,7340,L-4821867,00.html>

⁷ Jack Riley. "Terrorism and rail security". RAND. 2014. Retrieved from: http://www.rand.org/content/dam/rand/pubs/testimonies/2005/RAND_CT224.pdf

⁸ Avihai Hillel. "Between Two Septembers: From the bargaining chip of Sept. 1970 to a strategic agent of Sept. 2001". ICT. June 2006. Retrieved from: <http://bit.ly/2aRloms>

even included a link to instructions on how to prepare a bomb.⁹ It should be noted that in April 2016, a German public television network revealed that 230 pages of the Cologne Bonn Airport's classified safety protocol had been published on the airport's website in November of 2015. Despite claims by airport authorities that the information was not classified, the documents specified the steps to be taken in the event of a terror attack, with reference to incidents of hostage attacks, detonation of explosives, explanations about emergency exits and gathering areas, and more.¹⁰ It is impossible to ignore the possibility that the jihadist's call to carry out a terror attack at this airport was not coincidental and stemmed from the exposed emergency plan.

Terror attacks against the aviation industry are not a new phenomenon. They began in the 1960's with the wave of Palestinian terrorism. However, it was the September 11 terror attacks that placed the threat of aviation terrorism and its potential damage at the forefront of the international arena. Naturally, these attacks constituted a significant milestone in the tactical innovation of terrorist organizations and in the use of a plane as a platform for executing a terror attack and not just as a target.

In effect, in the wake of the "staggering success" of the September 11 attacks and the tendency to attempt to replicate it, terrorist organizations carried out more attacks, demonstrating innovation, especially in the field of explosives. For instance, approximately two months after the September 2001 attacks, Richard Reid, a British Al-Qaeda operative, was caught on an American Airlines flight from Paris to Miami with an improvised explosive device hidden in his shoe. An additional incident occurred in 2006 when an Al-Qaeda plan to carry out 17 simultaneous attacks on Canadian and American planes traveling from London to the United States by smuggling liquid explosives in soda bottles, was discovered. In 2009, Al-Qaeda in the Arabian Peninsula (AQAP) attempted to attack an American passenger plane, en-route from the Netherlands to the United States, using a sophisticated explosive device consisting of powder and liquid. After this

⁹ Site Intelligence Group.

¹⁰ "Security fail: Cologne Airport's terrorism emergency evacuation plan accidentally put on internet". RT. April 21, 2016. Retrieved from: <https://www.rt.com/news/340484-germany-terrorism-cologne-airport/>

attempted attack, an issue of the organization's online magazine, *Sada al-Malahem*, was published containing details of the incident, demonstrating the process used by terrorist organizations to draw conclusions after attacks.¹¹ In October 2010, packages of explosives were discovered on two aircrafts, which had been sent originally from Yemen destined for the United States. The first explosive device was discovered on a layover in Dubai, while the second was discovered on a layover in Britain. An investigation into the incidents revealed that PETN explosive material, which is especially powerful, had been hidden inside ink cartridges and was aimed at the intended target of Jewish religious institutions in Chicago, USA. Following this attempt, an article was published in an issue of AQAP's *INSPIRE* magazine titled "\$4,200", implying the low cost of the aforementioned terror attack compared with the billions of dollars invested by the West to develop sophisticated security counter-mechanisms.

These events, despite their failure, reflect the great efforts being made by terrorist organizations to carry out attacks of this type, as well as their understanding of the range of possible acts against the aviation industry. These include when planes serve as the target of the attack, a platform for executing attacks against a strategic target, or a tool for transporting explosive material to a selected target.¹² **In addition, recent successful attacks against aviation targets strengthen the motivation of terrorist organizations to carry out attacks in this arena, which - as demonstrated above - are not limited to attacks on planes but include attacks within airports as well.**

One of the main trends emerging from recent terror attacks is the attempt to make use of personnel employed by the aviation industry to aid or execute an attack. In many cases, terrorist organizations choose to recruit airport employees in order to transfer weapons to secure areas by bypassing security measures or to carry out the attack themselves. The recruitment of these employees is mostly done via social networks, especially Facebook, which can provide an almost unlimited supply of potential recruits. It should be noted that the recruitment can also be carried out in

¹¹ Sada al-Malahem, Issue no. 12, January-February 2010.

¹² Bruce Hoffman. "Inside Terrorism". New York: Columbia University Press. 2006.

traditional ways, via other circles of acquaintances such as worshippers in mosques, family, friends and more.

In a study carried out by the International Institute for Counter-Terrorism (ICT) in 2015, Facebook profiles were discovered that belonged to employees of airports throughout Europe who had access to secure areas of commercial and cargo flights and who had posted Islamic-jihadist content. Despite airports' strict security policy, there has been an increase in the number of incidents in which deficiencies in the employment process were found. For example, security forces in Egypt conducted a thorough investigation of employees at Sharm El-Sheikh Airport following the crash of a Russian plane in the Sinai Peninsula in October 2015, in an effort to examine the possibility that a bomb was smuggled onto the plane by an airport employee.¹³ At the end of January 2016 it was reported that a mechanic, a transport worker (loading luggage) and two police officers at Sharm El-Sheikh Airport were arrested on suspicion of involvement in the attack.¹⁴ Following the attack in Sinai and the possibility it involved an airport employee, US security agencies reported discovering 69 airport employees suspected of identifying with the Islamic State.¹⁵

Additional incidents in which airport employees chose to join terror organizations were noted at the Minneapolis - St. Paul international Airport in the United States, including: Abdifatah Ahmed, who filled fuel tanks for aircrafts and worked as a cleaner on planes until he joined the Islamic State; Abdirahmaan Muhumed, who joined the Islamic State

¹³ Mark Townsend and Peter Beaumont. "Russian plane crash: Calls for new era of airport security after Sinai terror". The Guardian. November 8, 2015. Retrieved from: <https://www.theguardian.com/world/2015/nov/07/new-era-airport-security-sinai-terror>

¹⁴ Peter Graff. "Exclusive: EgyptAir mechanic suspected in Russian plane crash". Reuters. January 29, 2016. Retrieved from: http://www.reuters.com/article/us-egypt-crash-suspects-idUSKCN0V712V?utm_source=twitter

¹⁵ John Hayward. "U.S. Worries about Airport Security after Possible ISIS 'Inside Job' in Egypt". Breitbart. November 10, 2015. Retrieved from: <http://www.breitbart.com/national-security/2015/11/10/u-s-worries-airport-security-possible-isis-inside-job-egypt/>

from Minnesota, USA, had also worked as a cleaner on planes at the same airport;¹⁶ Shirwa Ahmed, a trolley driver at the airport who transported passengers to the gates of the airport, joined Al-Shabaab Al-Mujahideen. It should be noted that four years after he joined the organization, he became the first American suicide bomber in Somalia; Abdisalan Hussein Ali, who served coffee at the airport, joined the ranks of Al-Shabaab Al-Mujahideen and became a suicide terrorist in Mogadishu, Somalia.¹⁷

This issue has a significant impact, especially in the European context where there is the potential to recruit a relatively large number of airport employees to carry out terror attacks.¹⁸ It should be noted that according to Belgian television reports, one of the suicide terrorists in the Brussels airport attack last March, Najim Laachraoui, had worked at the airport terminal for five years until 2012 and at an earlier stage had also worked as a cleaner at the European Union Parliament. It was also reported that near the time of the attack, a hidden prayer room was located in the airport where radical Muslim employees used to pray in secret.¹⁹

Another incident which reinforces the potential danger in recruiting airport employees is the terror attack on Daallo Airlines plane, which took place in Somalia in February 2016. In the attack, an explosion caused a hole in a passenger plane shortly after takeoff. A US government source claimed that a bomb planted in the plane caused the

¹⁶ Michael Walsh. "ISIS terrorist from Minnesota worked at major American airport: report". Daily News. September 3, 2014. Retrieved from: <http://www.nydailynews.com/news/world/isis-terrorist-minneapolis-worked-major-american-airport-report-article-1.1925924>

¹⁷ Tom Lyden. "INSIDER THREAT: Side-by-side with a future terrorist at MSP Airport". Fox 9. November 16, 2014. Retrieved from: <http://www.fox9.com/fox-9-mn-special-archive/1642467-story>

¹⁸ "US adds air security 'enhancements' amid Russian plane crash probe". The Indian Express. November 7, 2015. Retrieved from: <http://indianexpress.com/article/world/world-news/us-adds-air-security-enhancements-amid-russian-plane-crash-probe/>

¹⁹ Julian Robinson. "ISIS bomb maker 'worked at Brussels Airport for FIVE YEARS' before launching suicide attack as it emerges hidden prayer room was found at terminal 'where radicalised staff prayed in secret'". Dailymail. April 21, 2016. Retrieved from: <http://www.dailymail.co.uk/news/article-3551669/ISIS-bomb-maker-worked-Brussels-Airport-FIVE-YEARS-launching-suicide-attack-emerges-hidden-prayer-room-terminal-radicalised-staff-prayed-secret.html>

explosion.²⁰ It was also suggested that the explosive was smuggled in the terrorist's personal computer and that had the explosion occurred while the plane was at cruising altitude, the bomb would have caused the entire plane to explode due to the passenger's location, near the fuel tanks.²¹ As noted, this conjecture was not confirmed or verified by officials but in a video published after the attack, taken from airport cameras, the explosive device is seen being transported inside a computer to an airport employee, in order to evade the security check.²² According to other reports, it is possible that two terrorists were involved in the attack, one of whom used a wheelchair in order to avoid or minimize potentially rigorous security checks. According to these reports, the terrorist in the wheelchair was booby-trapped and was the one who detonated the device during the flight.²³

Another threat that should not be underestimated in this context, are the foreign fighters leaving for theaters of jihad around the world. One of the most significant dangers inherent in this phenomenon is the return of those fighters to their countries of origin, some of whom have citizenship from various western countries. Their accumulated military experience, coupled with increased radicalization processes, turn these returning fighters into "ticking bombs". For instance, after the terror attacks in Brussels, the Islamic State published in its magazine, *DABIQ*, photos of the terrorists directly or indirectly involved in the attack wearing IS uniforms, most likely while they were staying in Syria.²⁴

²⁰ Jason Burke. "Explosion on flight from Somalia was caused by bomb, sources say". The Guardian. February 3, 2016. Retrieved from: <https://www.theguardian.com/world/2016/feb/03/explosion-daallo-airlines-flight-somalia-bomb>

²¹ Robyn Kriel and Dana Ford. "Somali authorities identify suspect in jetliner blast". CNN. February 5, 2016. Retrieved from: <http://edition.cnn.com/2016/02/05/africa/somalia-airplane-explosion/>

²² "Somalia plane blast: airport worker 'handed device to bombing suspect". The Guardian. February 8, 2016. Retrieved from: <http://www.theguardian.com/world/2016/feb/08/somalia-plane-blast-airport-worker-handed-device-to-bombing-suspect>

²³ "Hole Torn in the Plane, Passenger Sucked Out and Killed". Ynet. February 3, 2016. Retrieved from: <http://www.ynet.co.il/articles/0,7340,L-4761259,00.html>

²⁴ Dabiq, Issue 14, "The Murtadd Brotherhood", pp. 4-7.

In another incident, Abu al-Ayna al-Ansari, a Salafi-jihadist operative in the Gaza Strip affiliated with the Islamic State, was interviewed on an American radio station in New York and stated that the organization has agents dispersed at sensitive facilities around the world, including metro stations and airports in the West and in the Arab world. He stated that the organization made sure that its operatives integrated as employees at these sensitive facilities.²⁵

Another trend emerging in light of events taking place in conflict zones and from the jihadist discourse has to do with the tactical and technological knowledge and experience that terrorist organizations and their fighters accumulate. This knowledge is likely to be applied to the implementation of terror attacks in the local and international aviation industry, in the foreseeable future. For instance, in addition to the “traditional” threats to the aviation industry posed by rockets, new threats are emerging in technologies such as simulators, drones, laser, as well as cyberspace capabilities.

The Rocket Threat

In recent years, shoulder-fired missiles (man-portable missile) and anti-aircraft missiles have become one of the central threats to civil aviation around the world. Shoulder-fired missiles are inexpensive, do not require advanced training and they have even become a common weapon used by terrorist organizations in conflict zones. In this framework, in 2002 an attempt was made to shoot down an “Arkia” civil aircraft that took off from the airport in Kenya on its way to Israel.²⁶

It should be noted that the threat is not limited to missiles fired at planes in-flight but also extends to missiles fired at airports. For example, in December 2015, the Kurdish

²⁵ Joseph Jankowski. "Top Jihadist Claims ISIS Has Agents Working in Western Airports, Metro Stations". Planet Free Will. March 25, 2016. Retrieved from: <http://planetfreewill.com/2016/03/25/top-jihadi-claims-isis-agents-working-western-airports/>

²⁶ Amos Harel and Yossi Melman. "2 Shoulder Missiles Miss Arkia Plane About One Minute after Takeoff". Haaretz. November 29, 2002. Retrieved from: <http://www.haaretz.co.il/misc/1.1559032>

rebel organization, TAK, claimed responsibility for launching anti-tank missiles at the international airport in Istanbul, Turkey, which caused damage to several planes.²⁷

Terrorist organizations and their supporters express great interest in promoting training in the use of anti-aircraft and anti-tank weapons. For instance, a visitor to a jihadist Web forum noted that the Islamic State's Sinai Province held a training course on the subject for its members. The visitor presented photos from the course in which the weapons were displayed alongside theoretical presentations. In another instance, a guidebook was published on how to self-produce anti-aircraft missiles, and another article reviewed the possibility of assembling a "heat-seeking missile" from components that can be purchased on the Internet and described the launch angles needed in order to attack aircraft.²⁸

Shoulder-fired and anti-aircraft missiles are not the only threat for the aviation industry; steep-trajectory missiles also pose a growing threat. During Operation "Protective Edge" in 2014, a rocket hit a residential building in the city of Yehud, near Ben Gurion International Airport. Despite the fact that the airport itself was not hit, foreign airlines announced that they were canceling their flights to and from Israel, and so Hamas' steep-trajectory missiles threatened to paralyze, even partially, the aviation system in Israel.²⁹

Unmanned Aircraft Systems ("Drones") Threat

The phenomenon of flying drones has gathered momentum in recent years and become an international concern. On August 8, 2015 a drone passed by a plane that was in descent for landing at Ben Gurion Airport. The drone was seen near the airplane at an

²⁷ "Kurdish rebels claim responsibility for deadly Istanbul airport blast". The Guardian. December 27, 2015. Retrieved from: <http://www.theguardian.com/world/2015/dec/27/kurdish-rebels-claim-responsibility-for-deadly-istanbul-airport-blast>

²⁸ ICT JWMG Desk. "Recent Jihadi Discourse Pertaining to Aviation Threats". 2015. Retrieved from: <https://www.ict.org.il/Article/1508/Recent-Jihadi-Discourse-Pertaining-to-Aviation>

²⁹ "The System that prevented the Closure of Ben Gurion Airport". Israel Defense. August 31, 2014. Retrieved from: <http://bit.ly/2aRHiru>

altitude of approximately 4,000 feet and less than 100 meters from the plane,³⁰ forcing the “Brussels Airlines” pilots to deviate from their intended course.³¹ The head investigator at the Israeli Transportation Ministry claimed in the incident investigation report that the incident was part of a growing and concerning phenomenon of piloting drones, both private and commercial, without the supervision, regulation, coordination or awareness of the relevant authorities.³² The report also noted that in certain cases it may even be possible to down an airliner, especially when it comes to activity near airports where planes are in various stages of ascent or descent.³³

The drone threat is also recognized at the international level. For instance, at a NASA-sponsored conference that was held in July 2015 in California, it was revealed that drones had been detected near airports in Newark, New Jersey, Minneapolis, Minnesota, and Austin, Texas.³⁴ In light of the threat posed to the aviation industry, on December 21, 2015 the head of the Federal Aviation Administration (FAA) announced the first step in a series of regulations in the field, according to which drone owners will be required to register them as planes.³⁵

The first case of a crash between a drone and a civil aircraft, which was reported in London, took place on April 2016 when a drone hit a “British Airways” passenger plane as it was landing at Heathrow Airport in London. Even though the incident ended

³⁰ Ministry of Transport - Aviation Incidents and Accidents Investigation. Information about security incident, serious incident case no. 88-15. August 12, 2015. Retrieved from: <http://aiai.mot.gov.il/publication-cbl/hodahot-cll/1236-1099>

³¹ Avi Ashkenazi. “Drone Passes a Plane Planning to Land at Ben-Gurion Airport, Nearly Causing a Tragedy”. Walla News. August 12, 2015. Retrieved from: <http://news.walla.co.il/item/2881221>

³² Ministry of Transport - Aviation Incidents and Accidents Investigation. Information about security incident, serious incident case no. 88-15. August 12, 2015. Retrieved from: <http://aiai.mot.gov.il/publication-cbl/hodahot-cll/1236-1099>

³³ Ministry of Transport - Aviation Incidents and Accidents Investigation. Information about security incident, serious incident case no. 88-15. August 12, 2015. Retrieved from: <http://aiai.mot.gov.il/publication-cbl/hodahot-cll/1236-1099>

³⁴ Ministry of Transport - Aviation Incidents and Accidents Investigation. Information about security incident, serious incident case no. 88-15. August 12, 2015. Retrieved from: <http://aiai.mot.gov.il/publication-cbl/hodahot-cll/1236-1099>

³⁵ Unmanned Aircraft Systems (UAS) Registration in Federal Aviation Administration. Retrieved from: <https://www.faa.gov/uas/registration/>

without damage or injuries, sources report that while planes are designed to deal with birds, tests have not been conducted to examine scenarios of a drone's impact with a plane's motor or windshield.³⁶

Terrorist organizations do not hide their motivation to make use of this technology. During the month of April 2016, jihadists posted on the Telegram application a recommendation to use remote-controlled drones carrying explosives in order to attack planes. In another post on a jihadist Web forum, a visitor suggested making an assembly line for the production of gliders for the Islamic State.³⁷ In addition, a variety of suggestions were published on how to carry out terror attacks against airplanes using drones. The owners of the "Mujahideen Secrets" (*Asrar al-Mujahideen*) channel on the Telegram application maintained that simple drones can carry C4 explosives weighing 300 grams, which "are sufficient to crash a plane on the airfield".

In other cases, terrorist organizations use drones in order to collect intelligence. Beginning in 2014, a significant increase was noted in terrorist organizations' use of drones for this purpose. The most significant use of drones in this context was found in Syria, followed by Iraq, Libya and Yemen. In addition, the Islamic State and its various branches use the largest number of drones of any terrorist organization.³⁸

Simulators Threat

Simulators serve as one of the most significant sources of information found on the Internet, which have become a training tool in the hands of terrorist organizations in recent years. Today, there are a wide range of games that illustrate, almost precisely, how to operate aircrafts. For example, there are simulators which emulate the different flight phases as well as multiplayer games that serve as a type of social network in which

³⁶ Pierluigi Paganini. "A small drone hit a British Airways plane over the Heathrow Airport". Security Affairs. April 18, 2016. Retrieved from:

<http://securityaffairs.co/wordpress/46442/security/drone-hit-british-airways-plane.html>

³⁷ ICT JWMG Desk. "Recent Jihadi Discourse Pertaining to Aviation Threats". 2015. Retrieved from: <https://www.ict.org.il/Article/1508/Recent-Jihadi-Discourse-Pertaining-to-Aviation>

³⁷ IntelCenter. Analyst Notes: Terrorist Eyes in the Sky. May 17, 2016.

³⁸ IntelCenter. Analyst Notes: Terrorist Eyes in the Sky. May 17, 2016.

one can learn about the aviation world in different countries, including flying civilian aircraft and fighter jets.³⁹ The Islamic State is one such terrorist organization that uses this type of simulator. For instance, the organization trains its fighters in Libya using civilian and combat simulators. The simulators, which are posted in the city of Sirte, simulate various aspects of flight, including air-to-ground communications.⁴⁰ It should be noted that the use of simulators has become a widespread phenomenon in various arenas of jihad.

Lasers Threat

In recent years, an average of 11 incidents per day were recorded of lasers being aimed at planes. The laser confuses the pilots and temporarily blinds them to the point that, in some cases, pilots have needed medical attention. Since the issue started to be tracked in 2005, the number of such incidents has increased by over 1,000 percent.⁴¹ Just recently it was discovered that pilots on ten different passenger planes and even a US military aircraft were temporarily blinded by lasers as they approached landing at La Guardia Airport in New York, Newark Airport in New Jersey and Pittsburgh Airport in Pennsylvania.⁴²

In another incident on November 24, 2015, it was reported that a laser caused significant damage to the eyes of a "British Airways" co-pilot as he landed the plane at Heathrow Airport in London. The identity of the pilot remains confidential but it was reported that he has not yet returned to work. It was noted that the retina in one of the pilot's eyes was burned, a fact that may indicate the use of an especially powerful laser.

³⁹ International Virtual Aviation Organization (IVAO). A multiplayer simulator operates as a free social network with tens of thousands of users, including an Israeli community that teaches the work method in Israel. Retrieved from: <http://ivao.org.il>

⁴⁰ Roi Kais. "Report: ISIS training fighters to fly commercial aircraft in Libya". Ynet. December 12, 2015. Retrieved from: <http://www.ynetnews.com/articles/0,7340,L-4733894,00.html>

⁴¹ FBI simulation regarding the dangers of laser pointers aimed at airplanes. November 11, 2014. Retrieved from: <https://www.fbi.gov/news/stories/2014/february/protecting-aircraft-from-lasers>

⁴² "Pilot Has Blurred Vision After Planes Are Struck by Lasers Near Newark Airport". ABC News. July 16, 2015. Retrieved from: <http://abcnews.go.com/US/11-planes-struck-lasers-approaching-newark-airport/story?id=32488609>

It is evident that the widespread prevalence of laser pens, has led to a significant increase in laser attacks against pilots.⁴³

Although no real damage has yet been caused by the laser threat against airplanes, the possibility cannot be ignored that terrorist organization will use laser beams against pilots in order to carry out a terror attack. This issue becomes even more significant in light of the fact that there are particularly powerful laser devices that can be found in the possession of terrorist organizations.

Cyber-Terrorism Threat

Cyberspace can also serve as a platform for executing terror attacks against the aviation industry. In addition to the professional debate regarding the possibility of causing real damage in a cyber-attack against airplanes, several gaps in the field also need to be addressed. For example, reports were found stating that cyber-security experts successfully hacked a plane's control system from a passenger seat. In this instance, the hacker claimed that he was able to penetrate the network in the cockpit through communication with the aircraft's network. In this context, it seems that many entertainment systems have USB connections and some planes even operate Wi-Fi. As such, there are information security researchers who claim that the architecture of the communication network on a plane is not sufficiently secure, and that there are security gaps that allow flight systems to be breached and the normal activity of the plane to be disrupted.⁴⁴ In August 2014, Ruben Santamarta, an information security researcher, revealed that he had found a way to exploit security gaps in wireless Internet systems on the plane in order to gain access to additional systems.⁴⁵ It should be noted that a

⁴³ "Laser Burns Pilot's Eye as Plane Lands in London". NDTV. November 24, 2015. Retrieved from: <http://www.ndtv.com/world-news/laser-burns-pilots-eye-as-plane-lands-in-london-1246784?site=full>

⁴⁴ "Cyber Threats against the Aviation Industry". InfoSec Institute. April 8, 2014. Retrieved from: <http://resources.infosecinstitute.com/cyber-threats-aviation-industry/>

⁴⁵ Adam Clark. "Estes Researcher Can Hack Airplanes through In-Flight Entertainment Systems". Gizmodo. April 4, 2014. Retrieved from: <http://gizmodo.com/researcher-hacks-airplanes-through-in-flight-entertainm-1615780083>; Pierluigi Paganini. "Hacking satellite communications equipment on passenger jets". Security Affairs. August 5, 2014. Retrieved from:

breach of the passenger network is unlikely to enable the takeover of the plane's network since they are designed as separate systems despite the fact that they have overlapping interfaces.⁴⁶

In another incident that took place in June 2015, Poland's national airline, LOT, was grounded in light of what appeared to be a breach by hackers of the airline company's computers at the international airport in Warsaw, and the breach of the systems that issue flight plans. The breach caused the cancelation and delay of dozens of flights.⁴⁷ In this case as well, it was apparent that cyber operations against the aviation industry have broad implications at the national and international levels.

It should be noted that, in order to carry out cyber-attacks, the technological capabilities of professional hackers are needed, not to mention the capabilities of the state or at least state support. Nevertheless, various terrorist organizations, especially the Islamic State, are working hard to recruit hackers to their ranks in order to operate in the cyberspace as well. The terror organizations' interest in this arena is manifested in the many publications on this topic, including a post by a visitor to a jihadist Web forum in which he appealed to Islamic State engineers to find ways to disrupt an airplane's GPS and other means of navigation. The visitor also claimed that the Iranians had used "GPS Spoofing" in order to down a UAV belonging to American intelligence in December 2011 and he referred to an academic study on the topic titled: "The Requirements for Successful GPS Spoofing Attacks". In addition, in March 2016 the Israeli Shin Bet revealed that a computer engineer from Gaza had managed to hack into the IDF's UAV system and view images that were broadcast.⁴⁸ Nevertheless, **experts in the field**

<http://securityaffairs.co/wordpress/27358/hacking/hacking-satellite-communications-jets.html>; Jim Finkle. "Hacker says to show passenger jets at risk of cyberattack". Reuters. August 4, 2014. Retrieved from: <http://www.reuters.com/article/us-cybersecurity-hackers-airplanes-idUSKBN0G40WQ20140804?feedType=RSS&feedName=technologyNews>

⁴⁶ "Can a hacker hijack a plane from his seat?". IHLS. May 26, 2015. Retrieved from: <http://ihls.com/2015/05/can-a-hacker-hijack-a-plane-from-his-seat/>

⁴⁷ "Hackers ground 1,400 passengers at Warsaw Airport". Ynet. June 21, 2015. Retrieved from: <http://www.ynetnews.com/articles/0,7340,L-4671142,00.html>

⁴⁸ Ilana Curiel. "Shin Bet Revealed: Jihadist Breached IDF Drone Systems". Ynet. March 23, 2016. Retrieved from: <http://www.ynet.co.il/articles/0,7340,L-4782233,00.html>

estimate that, at this stage, terrorist organizations are not capable of executing cyber-attacks at the magnitude of an attack on civilian aircraft.

How Has the Civil Aviation System Handled Recent Terror Attacks?

Since the September 11, 2001 terror attacks, the United States and the European Union have formulated a strategy for addressing the issue of aviation security and have even implemented several steps to improve cooperation between security forces. This, in addition to applying uniform standards and increased security around airports. **Recent terror attacks, whether those that were carried out in the aviation sphere or other significant terror incidents such as the attack in Paris in November 2015, have led to a number of changes in the aviation security systems in the United States and Europe.**

In the days following the terror attack in Paris in November 2015, the European Parliament revealed that it had begun to perform risk assessments in the aviation industry that are focused on terror threats posed to the Union. Among the topics raised in the framework of the risk assessment: the terror threat to cargo planes and commercial flights, illegal trafficking of weapons and explosives, flights arriving from conflict zones and commercial flights that fly over conflict zones.

However, there are a number of issues whose solutions are incomplete or whose effectiveness is currently discussed in the public and professional discourse. For example, **the issue of border crossings in the EU and the Schengen Agreement, which allows free movement between the countries that are party to the agreement.** An investigation into the November 2015 terror attacks in Paris revealed that at least one of the terrorists was born in Belgium and it is possible that another terrorist managed to infiltrate Europe in the guise of a refugee using forged documents, indicating that the terrorists exploited the lack of inspections at border crossings between EU countries and managed to evade detection by security agencies. As a result, Belgium decided to

increase border inspections and placed 19 electronic gates in the airport in Brussels.⁴⁹ It should be noted that **the efficiency of technological security measures** was also examined. This issue has been raised in the wake of the EU's response to the attacks in Paris, in which steps have been taken to increase the use of new technological systems rather than manual security checks,⁵⁰ while the latest screening machines were installed to detect explosives.⁵¹ Despite the implementation of advanced technology systems at airports, experts note that the security systems lack the means to detect a fake explosive device. For example, in December 2015 an Air France flight from Mauritius to Paris was forced to make an emergency landing for fear of a bomb on board. An investigation into the incident found a fake bomb on board the plane.⁵² Even though an actual terrorist attack was not carried out, this incident could damage passengers' sense of security, thereby indirectly affecting the entire aviation industry.

Another issue on the agenda is the growing importance of **implementing a passenger name record (PNR) system** also in systems related to the aviation industry, such as companies involved in booking flights.⁵³ In recent years, especially in the wake of the growing threats of terrorism and organized crime, law enforcement agencies have begun to use PNR data with greater frequency and efficiency. This type of data includes: flight dates and routes, contact details, travel agent, payment details, seat number and information about the passenger's baggage. Although airline companies have been required to transfer information about their passengers entering EU countries since the

⁴⁹ "Brussels Airport Tightens Security, Opens 18 Automated Border Control Gates". Sputnik News. January 14, 2016. Retrieved from:

<http://sputniknews.com/europe/20160114/1033143474/airport-security-gates-terrorism.html>

⁵⁰ Commission presents a new Aviation Strategy for Europe in. European Commission. December 7, 2015. Retrieved from: http://europa.eu/rapid/press-release_IP-15-6144_en.htm

⁵¹ "More than 50 EU airports deploy Itemiser 4DX explosives trace detectors". Aerotime. December, 3, 2015. Retrieved from: <http://www.aerotime.aero/en/airports/airports-news/other/20608-more-than-50-eu-airports-deploy-itemiser-4dx-explosives-trace-detectors>

⁵² Colin Freeman. "Airline security 'cannot screen for hoax bombs', experts warn". The Telegraph. December 21, 2015. Retrieved from: <http://www.telegraph.co.uk/news/worldnews/europe/france/12062123/Airline-security-cannot-screen-for-hoax-bombs-experts-warn.html>

⁵³ European Agenda on Security - State of Play. European Commission. November 17, 2015. Retrieved from: http://europa.eu/rapid/press-release_MEMO-15-6115_en.htm

2004 train attacks in Madrid, it appears that the EU is subject to data protection laws that prevent it from providing PNR data to countries that are not members of the EU unless they provide adequate protection for personal information. **Although these processes were put into motion prior to the recent terror attacks, it can be assumed that the attacks served as a catalyst for these decisions and their implementation.**

The terror attacks at the Brussels Airport in March 2016 and Istanbul Ataturk Airport in June 2016, constitute another step in radical Islamic terrorist organizations' war against the West, possessing both a psychological and economic effect. The Brussels airport suffered an economic blow when the departure area was completely damaged, a fact that has impacted the airport's ability to operate at full capacity to this day.⁵⁴ **These terror attacks revealed the need to improve security systems prior to the stage of security checks for the passengers themselves, including the positioning of security in additional locations throughout the airport such as the entrance hall and parking areas.**⁵⁵ Attacks of this type have an impact on circles far beyond the borders of the attacked country. The fact that several countries, including Belgium's neighbors, decided to cease flights to Brussels immediately after the attack, led to the paralysis of the city and all subsequent implications. Air traffic was diverted from the airport in Brussels to other airports in Europe and Belgium, including Charleroi, Liege and Ostend-Bruges, and the alert level was raised in several airports throughout Europe.⁵⁶ Another incident which indicates the ease in which one can damage the extended aviation infrastructure, though it was not carried out as an act of terror, occurred in June 2016 when a man threw an explosive device at the check-in desk area of the international airport in

⁵⁴ Citrinot, Luc. "Belgium reshapes after Brussels attack". Jane's Airport Review. May 1, 2016. Retrieved from: <http://search.proquest.com/docview/1778916998?accountid=38867>

⁵⁵ "Kurdish rebels claim responsibility for deadly Istanbul airport blast". The Guardian. December 27, 2015. Retrieved from: <https://www.theguardian.com/world/2015/dec/27/kurdish-rebels-claim-responsibility-for-deadly-istanbul-airport-blast>; Andrew Burnyeat and, M. T., & Vogel, B. (2016). "Reforms underpin European security strategy". Jane's Airport Review.

⁵⁶ ICT. "The Brussels Attacks - 22/03/2016 What do we know? & Insights from ICT Experts". Retrieved from: <https://www.ict.org.il/Article/1645/The-Brussels-Attacks>; Andrew Burnyeat and, M. T., & Vogel, B. (2016). "Reforms underpin European security strategy". Jane's Airport Review.

Shanghai, injuring four travelers. The preliminary investigation showed that the attacker had filled a beer bottle with gunpowder from fireworks and firecrackers.⁵⁷

One of the central lessons for the EU in this context was to increase **regulations on the implementation of the security standards outlined by the EU**. Nevertheless, a special EU committee published a report, months before the Brussels attack, which unveiled the existence of security gaps at the Brussels Airport, but no steps were taken in order to correct them. As a result of this, fierce public criticism arose against Belgium's Transportation Minister, Jacqueline Galant, who subsequently resigned.⁵⁸ Additionally, an examination recently conducted by the Aviation Safety Agency of the European Union found that airports in Germany were ranked next to last in regards to airport security, with 18 serious security gaps detected.⁵⁹

Another issue that made headlines was that of **screening airport employees**. In November 2015, the French media reported that several private companies in the Charles de Gaulle Airport in Paris were under investigation for employing workers who were under surveillance by French law enforcement authorities. These employees, who had access to sensitive sites within the airport, were catalogued as "Fiches-S", an indicator of a serious threat to national security.⁶⁰ In December 2015, security clearances of over 70 employees working in sensitive areas of the airport in Paris were revoked on suspicions that they had undergone radicalization processes. Since the

⁵⁷ Steven Jiang and Paul Armstrong. "Man hurls explosive device at Shanghai airport, then attempts suicide". CNN. June 13, 2016. Retrieved from:

<http://edition.cnn.com/2016/06/12/asia/shanghai-airport-explosion/>

⁵⁸ Andrew Burnyeat and, M. T., & Vogel, B. (2016). "Reforms underpin European security strategy". Jane's Airport Review.

⁵⁹ Daniel Michaels and Robert Wall. "Germany Trails European Peers in Enforcing Air-Safety Rules, Report Says". Wall Street Journal. April 24, 2016. Retrieved from:

<http://www.wsj.com/articles/germany-trails-european-peers-in-enforcing-air-safety-rules-report-says-1461532124>

⁶⁰ "Report: 57 Islamists under surveillance by authorities work at the Paris airport". Ynet. December 1, 2015. Retrieved from: <http://www.ynet.co.il/articles/0,7340,L-4733248,00.html>; "INFO M6 - Aéroport de Roissy: vague de perquisitions dans des entreprises". Yahoo. November 19, 2015. Retrieved from: <https://fr.news.yahoo.com/info-m6-aeroport-de-roissy-des-fiches-s-avaient-acces-a-la-piste-181429268.html>

recent terror attacks in France and Belgium, airport employees are being thoroughly and rigorously checked. As such, authorities searched over 4,000 lockers of employees at the Charles de Gaulle Airport and Orly Airport in Paris.⁶¹ Additionally, the Brussels airport police claimed that at least 50 Islamic State supporters work in the airport as baggage handlers, cleaners and catering staff, some of whom have tags that allow them direct access to planes. A sharply worded letter sent by police stated that a warning had been sent to the companies regarding these employees but that nothing was done about the matter.⁶² It seems that security officials in the EU failed to realize the scale of the challenge and that the steps taken so far in the field are not sufficient.

In the United States, in response to recent terror attacks, it was decided to implement stricter inspection of travelers. As such, the head of the American Transportation Security Administration (TSA) updated security inspection protocol in airports and decided that passengers can now be required to undergo inspection by body scanner technology, as opposed to certain cases in the past when passengers could request a manual inspection. This update is designed to reduce the security weaknesses that exist in the detection of metallic and non-metallic contraband during a manual inspection.⁶³

In addition, travelers who do not require an entry visa to the United States will be required to undergo a biometric security check, iris scan and fingerprint checks, in addition to information about visits to countries that may provide a breeding ground for terrorist activity, such as: Somalia, Mali, Egypt, Lebanon, Iraq, Colombia, Venezuela, and

⁶¹ Lizzie Dearden. "Paris attacks: 70 staff have security clearance revoked for suspected 'radicalisation' at French airports". The Independent. December 15, 2015. Retrieved from: <http://www.independent.co.uk/news/world/europe/paris-attacks-70-staff-have-security-clearance-revoked-for-suspected-radicalisation-at-french-a6773691.html>

⁶² John Stevens. "At least FIFTY ISIS supporters are working as baggage handlers, cleaners and catering staff at Brussels airport, claim police". DailyMail. April 1, 2016. Retrieved from: <http://www.dailymail.co.uk/news/article-3517493/At-FIFTY-ISIS-supporters-working-baggage-handlers-cleaners-catering-staff-Brussels-airport-claim-police.html>

⁶³ Rene Marsh. "TSA changes rules for who must go through body scanner". CNN. December 23, 2015. Retrieved from: <http://edition.cnn.com/2015/12/23/travel/tsa-airport-screening-change/>

others.⁶⁴ It should be noted that efforts are currently being made in the United States to write a law prohibiting foreign fighters from flying. The law is supposed to be based on a database of people under surveillance by law enforcement agencies in the US and its goal, among other things, is to improve information sharing between law enforcement and security officials in airports.⁶⁵

It should be noted that about a month after the attacks in Paris, the airport security system in the US was challenged when packages sent from the airport in Cairo to the United States by an express mail service company required an additional inspection for fear that they contained explosive material.⁶⁶ The packages went through the standard security process but, apparently due to the existence of ink used for printers, the scanners reported that the packages contained suspicious substances. According to a source at the Cairo Airport, the packages - weighing approximately 10 kilograms - were on their way from Egypt to the United States via London. Even though no explosives were found, the United States asked Egypt not to send packages and/or mail on commercial flights to the US.⁶⁷ In this context, it is important to note the initiative of US Congressman, John Katko, to provide the TSA with a platform to evaluate risks at airports around the world and to provide airports facing a high threat with measures to handle these threats accordingly in order to reduce the threat posed to American passengers traveling abroad and on flights to the United States.⁶⁸

In conclusion, despite the changes that have been made in Europe and the United States in an attempt to cope with recent terror attacks against the aviation industry, efforts are

⁶⁴ Janene Pieters. "U.S. Pressing Netherlands on tighter airport security". New York Times. December 1, 2015. Retrieved from: <http://www.nytimes.nl/2015/12/01/u-s-pressing-netherlands-on-tighter-airport-security/>

⁶⁵ "Goodlatte urges house to support 'no fly for foreign fighters act'". Lanham: Federal Information & News Dispatch, Inc. April 2016.

⁶⁶ "No explosives found in U.S.-bound parcels at Cairo airport: DHL". Reuters. November 24, 2015. Retrieved from: <http://www.reuters.com/article/us-usa-security-egypt-report-idUSKBN0TD38H20151125>

⁶⁷ "No explosives detected in parcels destined for US at Cairo International Airport". Ahram Online. November 24, 2015. Retrieved from: <http://english.ahram.org.eg/News/171664.aspx>

⁶⁸ "katko legislation to strengthen security at international airports with direct flights to united states passes house". Lanham: Federal Information & News Dispatch, Inc. April 2016.

needed to promote international cooperation with regard to passenger records and the implementation of biometric identification, with emphasis on the continuous security surveillance of transportation infrastructure employees. In the wake of the growing competition between terrorist organizations and security officials, it is evident that a comprehensive approach is needed, one which integrates the promotion of capabilities at various security layers, from the individual level to the implementation of advanced technologies.⁶⁹

⁶⁹ ICT. Interview with Prof. Erroll G. Southers. Retrieved from: <http://bit.ly/2b2YWGp>