New threats are gaining momentum on the civil aviation market – MANPADS

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Background

The commercial air transport industry contributes to the overall economic growth of nations, is crucial for international trade, tourism, and provides tax income. An attack against such a major economic sector could be expected to produce significant effects worldwide.

The fact the commercial aviation is a major socio-economic world feature and therefore also a continuing target for terrorists.

Attacks on civilian planes using Man-Portable Air Defense Systems (MANPADS), originally designed for military warfare to defend against aerial attacks, can occur, have occurred and arguably remain a threat also our days.

In fact, from the 1970s till 2018 more than 50 attacks, with more than 780 casualties, were carried out against civilian aircrafts using MANPADS.

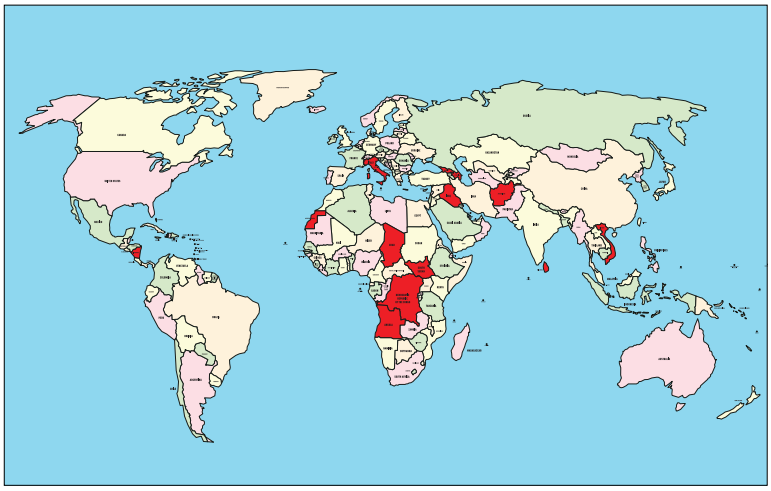

Figure 1. MANPADS attacks against civilian aircraft since 1970

MANPADS are lightweight anti-aircraft weapons. They are designed to protect soldiers on the battlefield from attacking aircraft. Because MANPADS are intended to be carried and deployed rapidly by ground forces, they are easy to use and operate, low cost, light weight, compact and mobile. They require only a single operator to use and can be very effective against low or slow aircraft.

The same characteristics that make MANPADS suitable for battlefield use by soldiers also make them attractive to terrorist groups and insurgents. They have been used in terrorist attacks against civilian aircraft targets in more than 50 documented cases since the 1970s until 2018 and they have been employed as effective weapons of asymmetrical warfare in Afghanistan, Iraq, Iran, Sri-Lanka and Syria.

Figure 2. Russian modern MANPAD – SA-24

In the last decade several incidents several attempts of shooting commercial aircrafts were prevented, for example: Russian international arms trafficker Viktor Bout (aka the "Merchant of Death") was arrested in March 2008 for attempting to sell 100 MANPADS to undercover agents whom he mistakenly believed were representatives of the Revolutionary Armed Forces of Colombia (FARC). He had previously supplied arms to such diverse groups as the Taliban, the Northern Alliance, Hezbollah and various militant groups in Africa.

Some more incidents in the last decade:

- **2009:** Four men in New York were arrested for plotting to shoot down a U.S. military cargo plane with a fake Stinger they had acquired from undercover agents.
- **June 2009:** The U.S. Department of Homeland Security canceled Delta's inaugural flight from Atlanta to Nairobi over concerns of a MANPADS attack.
- **July 2009:** It was revealed that a FARC commander was negotiating with Venezuelan contacts to obtain Russian SA24 missiles that Caracas had recently acquired from Moscow.
- **August 2009:** A Syrian arms trafficker was extradited to the United States for selling SA7 missiles to undercover agents posing as FARC representatives. The missiles were being housed in a Hezbollah warehouse in Mexico.
- **September 2009:** During national elections in Germany, German airports were on heightened alert after intelligence information raised concerns of an al Qaeda-linked MANPADS attack against civilian aircraft.
- **October 2009:** An unconfirmed press report indicated that Hezbollah was in possession of Iranian-produced MANPADS (though, as noted previously, Hezbollah has had MANPADS in its arsenal for some time).
- **From 2014 to 2018:** more than 10 deadly attack were carried out against Russian, Ukraine and Syrian civilian and military aircrafts in Turkey, Ukraine and Syria.

Depending on their type, MANPADS have the ability to engage aircraft between three to seven kilometers by range from launche and can reach altitudes of between 10,000 and 15,000 feet above their launch point.

While MANPADS ranges are modest compared to larger missile systems, they are large enough to have significant implications for the safety of aircraft taking off, landing or in low altitude flight, especially against civilian jet aircrafts, rotary aircraft and helicopters.

Modern MANPADS are equipped with advanced seekers, which allow them better performances, for example advanced Infra-Red (IR) capabilities for firing during night time and difficult conditions, combined Tri-band seekers with IR and CCD sensors or IR and UV sensors.

Those capabilities enable the missiles to hit smaller targets (like commercial aircrafts), faster and maneuvering targets and to overcome defense measures such as flares.

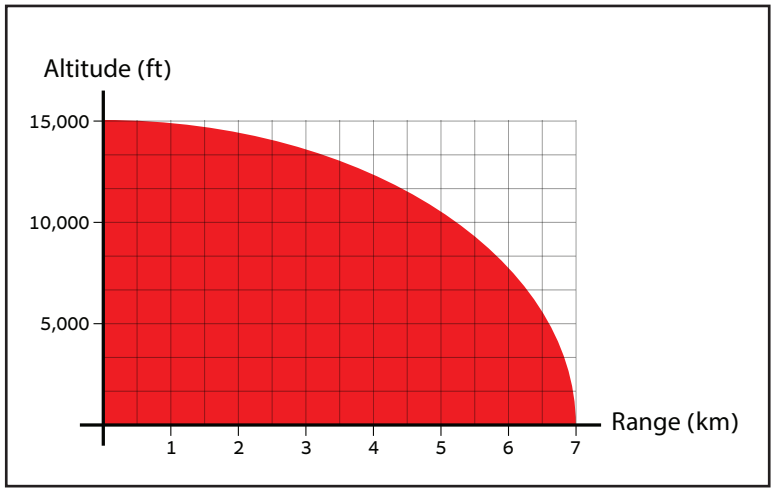

Figure 3. The engagement envelope of a typical MANPADS missile. An aircraft within the red area is potentially in danger from a MANPADS missile fired from the point X.

Worldwide Proliferation

It is estimated that worldwide inventories now hold between 500,000 and 750,000 MANPADS, developed or produced under license by several countries, such as USA, Russia. China, Iran, France and others.

Many of the MANPADS have been incorporated into military stocks where they remain today.

However, many thousands of MANPADS are known to have been illegally traded to third parties, including and mainly

non-state actors and terror organizations. Of the MANPADS outside state inventories, some have been used during periods of conflict by insurgent groups (like in Afghanistan, Iraq and Syria for example), and some of them have been used for attempted acts of terrorism against civilian aircrafts.

Terrorist groups, all over the world, had acquired thousands MANPADS over the years, and still seeking to acquire MANPADS and are willing to use them against civilian aircraft given the opportunity.

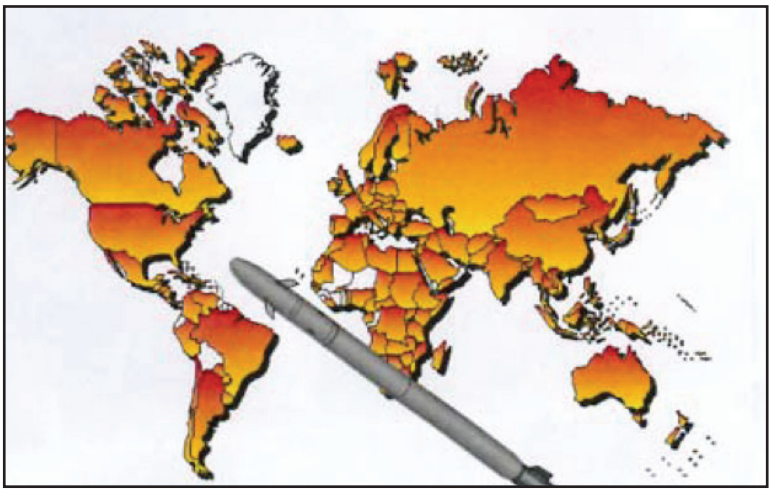

Figure 4. MANPADS Deployed Countries

The main problem is that countries do not have the resources to impose sufficiently strict export controls, physical security or inventory controls. As such, they are at risk of being stolen or channeled into the hands of non-state actors and to be sold at black markets.

Black markets have been identified in countries and regions in or around war zones but not only, including Afghanistan, the Balkans, Russia, Iraq, Lebanon, Myanmar, Malesia, Bangladesh, Sri Lanka and several African countries, including Egypt, Rwanda, Tanzania, Libya, Algeria, Yemen and Somalia, and other countries in Center/South-America such as Venezuela.

More than 27 militias, non-state actors and terror organizations holds MANPADS, such as Al Qaeda, Taliban (Afghanistan), Hezbollah (Lebanon), Chechen rebels (Russia and Chechnya), Kurdistan Workers Party (Turkey), Armed Islamic Group (Algeria), Harkat al-Ansar and Hizbul Majahideen (Kashmir), ISIS (Syria, Iraq, Libya, Egypt), Revolutionary Armed Forces of Columbia, Thailand, Macedonia and others.

MANPADS have been described by the UN as a 'weapon of mass effect', recognizing that a credible threat of a terrorist attack is enough to affect public confidence and willingness to use civilian aviation (commercial, VIP, etc.), and in fact, several UN aircrafts and helicopters were shot down by MANPADS.

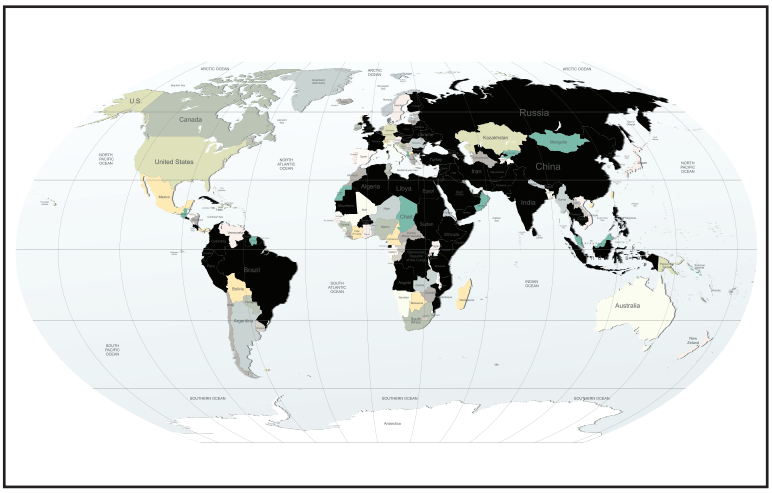

Figure 5. Countries with MANPADS Potentially in the Hands of Terrorists

Protection of Civil Aircrafts

As described above, the ease of transportation, proliferation and use of MANPDS impose a major threat on civil, commercial and VIP aerial transportation, and especially with the new sensors technology which is being integrated in the new and modern MANPADS, that are manufactured by China, Russia, Iran and others, and finds its way to the black markets.

The protection of civil aircrafts is much complicated than the protection of the military aviation. Civil aircrafts don't get intelligence on regular basis which allow them to avoid dangerous areas and VIP and commercial aircrafts are not under governmental monitoring that can give them warnings in a case of emerging threats.

The new MANPADS enable lone-wolf terrorists, terrorist organization and other non-state actors, which are difficult to monitor, control and track by states and intelligence agencies, can be used easily against VIP, civil and commercial aircrafts all over the world, near airports, landing/taking-off fields and in areas which aircrafts are flying at low altitudes.

There are several ways to reduce the threat to civilian aircraft from MANPADS, including by:

- Risk mitigation strategies via a coordinated intelligence-led approach, which is giving only on "Need to know" bases, and not for all.
- Avoiding airports where the MANPADS threat is highest. But as shown in figure 3, It is almost impossible to avoid those areas, because they are spread all over.
- Changing the flight paths of aircraft to reduce their exposure on take-off or landing when they are most vulnerable, but to do so it's very expensive and not always possible.
- Increasing the secure zone around airports and/or implement a robust ground patrolling regime, but this is not in the hands of the aircrafts owners.
- Implementing a technical countermeasure system on aircraft that can decoy or defeat a missile fired at the aircraft.

While all these measures have their place in a layered defense when the risk of MANPADS attack is high, none is infallible. And all of them have associated costs that make implementation problematic and of questionable benefit in low-risk environments. Avoiding airports where the MANPADS threat is highest - around war or catastrophic zones for example—is an obvious response, but not always possible. At some stage on the cessation of hostilities, air traffic will resume but the threat may continue. As well, chartered traffic, such as aircraft carrying international negotiators or humanitarian workers, will still be at risk.

Since the September 11, 2001 hijackings in the United States, the US Department of Homeland Security (DHS) has instigated a program to investigate the feasibility of fitting civilian airliners with protective technologies.

Protective technologies for civilian aircrafts that common today are decoy or deception systems such as flares, and systems which can shift the missile from its trajectory or explode it in the air, using directed energy by laser beam – DIRCM systems (Direct Infra-Red Counter Measure).

The use of flares, even thought is relatively cheap and effective against the old MANPAD missiles, is very complex and limited. Taking off, landing and staying at a civilian airport with flare system is restricted, because of safety regulations and restrictions. Taking off, landing and staying with flare system is only possible at an air force base.

Against the new and modern MANPADS, which combine Tri-color or Dual-mode sensors, the flares are ineffective.

In those cases, implementing an automatic and sophisticated system, such a DIRCM system, that can operate against variety and multiply threats, with robust capabilities against modern MANPADS and in different kinds of scenarios, will be the best solution for a civilian aircraft.

The DIRCM solution also has no restrictions and safety limitations in takin-off, landing or staying at civilian airports.

MANPADS ATTACKS AGAINST CIVILIAN AIRCRAFTS

Includes suspected and attempted attacks

#	DATE	AIRCRAFT OPERATOR	KILLED	ATTACKER	OUTCOME	LOCATION
1	1/15/73	Israel government flight	0	Black September	Foild in final minutes	Italy
2	9/5/73	El Al	0	Black September	Foild in final minutes	Italy
3	3/14/75	Air Vietnam	26	North Vietnamese forces	Crashed	Vietnam
4	1/25/76	El Al	0	Baader Meinhof and PFLP	Foild in final minutes	Kenya
5	1/29/78	French DC-4	3	National Liberation Front of Chad	Crashed	Chad
6	9/3/78	Air Rhodesia	48	Zimbabwe People's Revolution Army	Crashed	Zimbabwe
7	2/12/79	Air Rhodesia	59	Zimbabwe People's Revolution Army	Crashed	Zimbabwe
8	5/16/81	TAAG - Angola Airlines	4	Unknown	Crashed	Angola
9	11/8/83	TAAG - Angola Airlines	130	UNITA	Crashed	Angola
10	2/9/84	TAAG - Angola Airlines	0	UNITA	Landed	Angola
11	9/21/84	Ariana Afghan Airlines	0	Afghan guerrilas	Landed	Afganistan
12	9/4/85	Bakhtar Afghan Airlines	52	Hizb i-Islami	Crashed	Afganistan
13	8/16/86	Sudan Airways Services	60	Sudan People's Libertion Army	Crashed	Sudan
14	10/5/86	Corporate Air Services	3	Sandanistas	Crashed	Nicaragua
15	5/5/87	Sudanese Aeronautical Services Airways (SASCO)	13	Sudan People's Libertion Army	Crashed	Sudan
16	6/11/87	bakhtar Alwatana Airlines	53	Afghan guerrilas	Crashed	Afganistan
17	11/9/87	Air Malawi Shorts Skyvan	10	Mozambique Army	Crashed	Mozambique
18	4/11/88	bakhtar Alwatana Airlines	29	Afghan guerrilas	Crashed	Afganistan
19	12/8/88	USAID flight	5	Polisario rebels	Crashed	Western Sahara
20	12/8/88	USAID flight	0	Polisario rebels	Landed	Western Sahara
21	6/28/89	Somali Airlines	30	Unknown	Crashed	Somalia
22	12/21/89	Doctors Without Borders	4	Sudan People's Libertion Army	Crashed	Sudan
23	6/12/90	Aeroflot Uzbekistan	0	Afghan guerrilas	Landed	Afganistan
24	2/22/91	Antonov 26 transport flight	47	UNITA	Crashed	Angola
25	3/16/91	Transafrik Airlines	9	UNITA	Crashed	Angola
26	4/1/91	ICRC flight	0	UNITA	Landed	Angola

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Includes suspected and attempted attacks

#	DATE	AIRCRAFT OPERATOR	KILLED	ATTACKER	OUTCOME	LOCATION
27	6/10/19	Angolan government contract cargo flight	7	UNITA	Crashed	Angola
28	9/17/91	ICRC flight	0	Unknown	Landed	Somalia
29	1/28/92	Azarbaijani gov.t flight	47	Armenian militants	Crashed	Azerbaijan
30	3/27/92	Armenian Airlines	0	Unknown	Landed	Armenia
31	9/3/92	United Nations flight	4	Unknown	Crashed	Bosnia
32	4/5/93	United Nations flight	0	UNITA	Landed	Angola
33	4/26/93	United Nations flight	1	UNITA	Crashed	Angola
34	6/25/93	Aeroflot Uzbekistan	0	Abkhazian rebels	Landed	Georgia
35	7/22/93	Tupelov TU-154 plane	0	Abkhazian rebels suspected	Landed	Georgia
36	9/20/93	Orbi Georgian Airlines	0	Abkhazian rebels	Unclear	Georgia
37	9/21/93	Transair Georgia Airline	27	Abkhazian rebels	Crashed	Georgia
38	9/22/93	Transair Georgia Airline	108	Abkhazian rebels	Crashed	Georgia
39	4/6/94	Rwandan Government	12	Rwandan Patriotic Front	Crashed	Rwanda
40	9/29/98	Lionair flight	55	LTTE	Crashed	Sri Lanka
41	10/10/98	Congo Airlines	41	Tutsi rebels	Crashed	Democratic Rep. of the Congo
42	12/26/98	United Nations flight	14	UNITA	Crashed	Angola
43	1/2/99	United Nations flight	8	UNITA	Crashed	Angola
44	6/8/01	United Nations flight	0	UNITA	Landed	Angola
45	6/16/01	United Nations flight	0	UNITA	Landed	Angola
46	6/16/01	United Nations flight	0	UNITA	Landed	Angola
47	11/1/02	Arkia Israeli Airlines	0	al Qaeda	Missiles missed target	Kenya
48	11/22/03	DHL cargo flight	0	Iraqi insurgents	Landed	Iraq
49	3/23/07	TransAVIAexport cargo plane		11	al Shabaab	Crashed Somalia
50	8/13/07	Nordic Airways	0	Iraqi insurgents	Missiles missed target	Iraq

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MANPADS ATTACKS AGAINST CIVILIAN AIRCRAFTS

#	Date	Against	Killed	Attacker	Outcome	Place
1	10/2008	UN Peacekeepers	0	opposition fighters	Missile missed	Somalia
2	02/2014	Ukraine air force Mi-8 Helicopter	Unknown	Russia	Crashed	Ukraine
3	02/2014	Ukraine air force Mi-8 Helicopter	Unknown	Russia	Crashed	Ukraine
4	06/2014	Ukraine air force Mi-8 Helicopter	Unknown	Russia	Crashed	Ukraine
5	06/2014	Ukraine air force Su-25	1	Russia	Crashed	Ukraine
6	06/2014	Ukraine commercial An-30	Unknown	Russia	Crashed	Ukraine
7	25/11/2015	Russian Mi-8 helicopters	Unknown	ISIS	Crashed	Syria
8	25/11/2015	Russian Mi-8 helicopters	Unknown	ISIS	Crashed	Syria
9	8/7/2016	Russian Su-25	1	ISIS	Crashed	Syria
10	1/8/2016	Russian Mi-8 helicopters	Unknown	ISIS	Crashed	Syria
11	3/2/2018	Russian Su-25	1	ISIS	Crashed	Syria
12	13/5/2018	Turkish Super cobra Ah-1W	2	Curds	Crashed	Turkey