I·F·A·L·P·A
The Global Voice of Pilots

Security Briefing Leaflet

07SECBL01

December 2006

MANPADS threat assessment

The perception of a MANPADS threat to commercial aviation increased dramatically following the attacks against the New York World Trade Center and the Pentagon on September 11, 2001. Fortunately, as of late 2005, all MANPADS attacks on commercial aircraft have occurred in either war zones or regions of active conflict and terrorism.

The ability of terrorists to successfully launch a MANPADS attack depends on numerous variables such as quality of training, type and condition of equipment, weather, target aircraft size, and location of the aircraft with respect to the shooter. The ability of terrorists to successfully destroy a transport-size aircraft is questionable, based on the demonstrated failure to down Arkia and DHL aircraft attacked since September 11, 2001.

The opportunity to currently attack commercial aviation outside war zones with MANPADS appears limited. This does not, however, guarantee that no such illegal weapons are present. MANPADS represent only a single element of the multiple threats that may potentially be confronted during the taxi, takeoff, and landing phases of flight operations. Mortars and rocket-propelled grenades can destroy aircraft, as well as large caliber rifles using incendiary bullets, or improvised explosives smuggled aboard by passengers or ground staff. Many of these devices are far less complicated, relatively inexpensive, easily constructed, and equally as destructive compared to a shoulder-fired MANPADS.

MANPADS Countermeasures

As yet, Counter-MANPADS defensive systems have not been proven to be sufficiently effective, affordable, or available for commercial aircraft application.

One technology identified for potential commercial use is the so-called Directed Infrared Counter-Measure (DIRCM), an infrared device that jams missile guidance systems. Current DIRCM technology, however, would require re-engineering before being used by commercial airlines. The DIRCM system is complicated and challenging to maintain, requiring repair or refurbishment after approximately
300 hours of operational use. While such a maintenance requirement can be met by the military given their maintenance and logistical infrastructure, it is incompatible with commercial airline operations whose aircraft operate 10–12 hours per day. The cost of training, ground support equipment, supplies, and the required logistics trail needed at airports throughout the world makes the DIRCM system prohibitive for current employment by civilian commercial fleets.

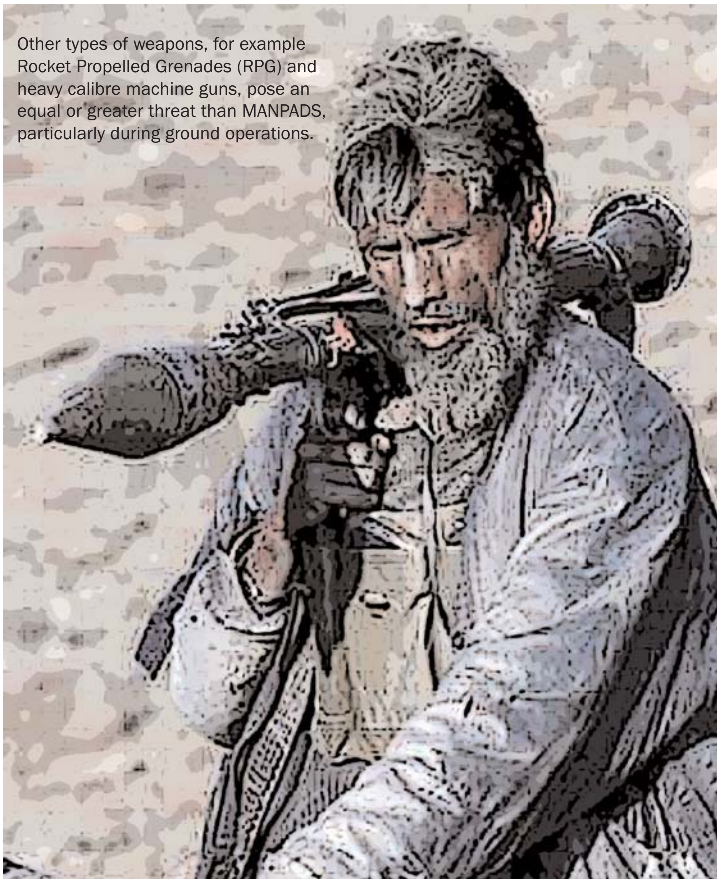
A military-designed missile countermeasure such as the Large Aircraft Infrared Countermeasures (LAIRCM) unit, which employs DIRCM technologies, exists in various stages of development and initial field testing. DIRCM/LAIRCM systems defeat missile guidance systems by directing a high-intensity, modulating laser beam onto the missile-seeker head. A disadvantage of these detection systems, however, is their vulnerability to strobe lights and other triggering devices frequently present in municipal airport environments.

As well, the same requirement for extensive maintenance currently limits these systems applications to military and heads-of-state aircraft.

In order to be a viable security tool for commercial aviation, C-MANPADS must be reliable, operate automatically without crewmember involvement (due to the short time between MANPADS launch and impact), and be economically viable.

Different sources that have studied C-MANPADS systems have indicated that the unit cost should be targeted to be less than $1 million per aircraft for the 1,000th system delivered. Some manufacturers claim their proposed systems are within the cost target and “well below” the operational cost target of less than $500 per takeoff and landing.

Although the cost for a flare counter measures system



Other types of weapons, for example Rocket Propelled Grenades (RPG) and heavy calibre machine guns, pose an equal or greater threat than MANPADS, particularly during ground operations.

falls into a price range of $300,000 to $500,000 per aircraft, this system faces significant controversy in the public and government domain. Additionally, flares have minimal effect against the latest generation of MANPADS while creating problems when deployed. Significant concerns exist regarding the fact that dispersed flares falling to the ground could start fires and generate public panic. As well, flare systems are subject to unacceptable levels of false alarms. These collective concerns have led to the restricted use of this countermeasure system within the United Kingdom and a ban on these systems by the US FAA.

C-MANPADS operating costs will be driven not only by maintenance considerations but also by drag and weight penalties. Added drag equates to added fuel consumption, while additional weight amounts to lost payload and revenue.

Various consideration lead to a desired weight limit of 450kg (1,000 lbs.) and a maximum drag penalty of 1 percent when the systems are fully installed and operational.

Aircraft Survivability

Large transport category aircraft have a high statistical probability of surviving the damage sustained by a single MANPADS hit to the aircraft, although survival is not guaranteed. Consequently, design improvements could be made that would markedly improve the odds of surviving single or multiple missile hits. Aircraft could be "hardened" to make them less susceptible to the damage and loss of primary flight control systems that allow the airplanes to remain aloft. Many newer aircraft already incorporate improvements, such as hydraulic fuse plugs and other enhancements, to maintain flight control, but redundant backup control systems should be considered to assure survivability.

NASA conducted research and development in the early 1990s on engine-propulsion control system technology to be used in the event of flight control damage or incapacitation. One such technology, the Propulsion-Controlled Aircraft (PCA) system, enables the flight crew to safely fly and land an FMS/FADEC-equipped aircraft whose flight control systems have been rendered inoperative.

NASA has successfully demonstrated this technology on several types of aircraft, including those in the large transport category. PCA systems could significantly enhance the ability of an aircraft to survive any type of standoff weapon attack, not just shoulder-launched missiles. This system would also prove useful in the event that flight control systems are lost due to mechanical failure (e.g., United Flight 232 in Sioux City, 1989). IFALPA fully supports the development, certification, and installation of the PCA system, a system that could be deployed for a mere fraction of the cost of installing electronic MANPADS countermeasures.

The MANPADS threat is real, but based upon statistics (6 of 7 widebody aircraft attacked survived) the actual risk of a catastrophic hit on transport aircraft is probably lower than commonly understood.

Conclusions

1. The MANPADS threat is real, but based upon statistics (6 of 7 widebody aircraft attacked survived) the actual risk of a catastrophic hit on transport aircraft is probably lower than commonly understood.

2. Other types of standoff weapons pose an equal or greater threat than MANPADS, particularly during ground operations.

3. Equipping all aircraft with counter-MANPADS technology will not provide defense against other types of standoff weapons.

4. Aircraft could be "hardened" against MANPADS attacks by making them less susceptible to the loss of flight control systems. This may be done through the use of such devices as hydraulic fuse plugs and other enhancements to prevent the loss of all hydraulic fluid and the subsequent loss of flight control.

5. Further tests should be conducted of a PCA system that could be used to safely fly and land an FMS/FADEC-equipped aircraft whose flight controls have been damaged or incapacitated.

6. The MANPADS threat to commercial aviation is a threat to national security. As such, the research cost of Counter-MANPADS technology should be borne by the State authorities.

7. When defensive systems are effective, affordable, and available, and government agrees to bear the cost, equipage should be considered.

Recommendations

1. Prevention

Governments should continue to deploy other countermeasures, such as intelligence, surveillance, disruption of terrorist plans, and non-proliferation measures, to counter all types of standoff threats, including MANPADS. Emphasis should be placed on identifying and disabling the "man" in the MANPADS threat.

Airports, municipalities, and law enforcement organizations should work to prevent attacks involving MANPADS and other types of standoff weapons by keeping areas around major airports under surveillance.

The public should be informed of measures that the government and industry are undertaking to counter MANPADS and to deter terrorists, possibly incorporating "area watch" programs as implemented by the British around their airports.

2. Defence

Aircraft should be made less susceptible to the loss of flight control systems. Aircraft should be equipped with hydraulic fuse plugs and other enhancements, as appropriate, to prevent the loss of hydraulic power in the event of a MANPADS attack.

Governments should fund, develop and certify the PCA system for deployment on commercial aircraft. This system, which would cost a mere fraction of the potential expense of electronic MANPADS countermeasures, would allow flight crews to fly the aircraft to a safe landing in the event of a total or partial failure of flight control components.

If the outcome and evaluation of current test program leads to a mandated installation of counter-MANPADS technologies on commercial aircraft, the systems should be purchased, installed, and maintained by the respective national government.

Such systems must be totally automated and require no intervention by flight crews to function correctly.

National authorities should establish clearly defined procedures for crewmember response to a MANPADS threat alert, and define plans to direct aircraft away from airspace threatened by missile attack.

3. Response

Air transport carriers should develop amendments to their flight training curriculum that instruct flight crews on planning for a MANPADS attack, alternate airport considerations in the event of an actual hit, and what type of emergency flight procedures to use, particularly in those cases in which flight control by conventional means is lost or impaired.

IFALPA strongly supports evaluations on the part of the manufacturers and regulators to develop Throttle Only Control (TOC) techniques for each aircraft model, and operators should provide adequate training guidance so that flight crews can achieve a successful landing.

This Briefing Leaflet is based on MANPADS research carried out by ALPA International