

## POSSIBILITIES OF COUNTERING THE AIR THREAT AND PREVENTION AGAINST IT

Tomáš SCHÓBER\*, Blažej LIPPAY\*\*, Pavel NEČAS\*\*\*

\* CGCI (Central ground-controlled interception), Operation Centre, Zvolen, Slovak Republic,  
\*\* National Security Authority, Bratislava, Slovak Republic, \*\*\* Armed Forces Academy of General M.  
R. Štefánik, Liptovský Mikuláš, Slovak Republic

*Abstract:* This article elaborates on all possible air threats, especially the most lethal once, which can cause a serious damage to civilians and national economy – the renegade planes. Safety management system with all its parts is described in the article as the best prevention and protection measure, as well as Quick Reaction Alert procedures, as a last valid tool to face such menace.

*Keywords:* threat, security, decision making process, safety management system, renegade, quick reaction alert.

### 1. INTRODUCTION

Civilian aviation is a target of special importance for terrorists, given the global impact of such attacks. Every terrorist attack in the air focuses the attention of the world through news coverage and around-the-clock publicity. Even now, in times of extensive intelligence and military counter-terrorist activity, it is very difficult to detect and to identify terrorists, and it is often impossible to blame concrete persons and organizations for attacks that occur.

Without any doubt, the issue of security is considered to be a major concern for air transport. Consequently, terrorism is considered to be the most serious threat to air transport. Many agree that this threat is real, persistent, evolving, sophisticated and hardly predictable. Terrorists use asymmetric methods which are difficult to reveal and defend against them. The seriousness of this threat to air transport, as well as national security, was demonstrated by terrorist attacks on the World Trade Center and Pentagon on September 11, 2001. A response to 9/11 attacks called for a change in methods, trainings and procedures in air traffic management. Now, ten years after, it is clear

that with the expected growth in air transportation, we will need to make further efforts in adopting new measures to continue improving aviation safety.

The use of Safety Management System (SMS) at air traffic management (ATM) can contribute to this effort by helping detect and correct safety problems before they result in aircraft accidents or incidents.

### 2. TYPES OF THREAT SCENARIOS

When considering the most probable threats to in-flight security in the 21<sup>st</sup> Century, we may sum up four most probable threat scenarios. These include cyber attacks, bomb warnings, “conventional hijacks”, and last, but not least, 9/11 type attacks. However, it is need to say that these are the most probable and the length of this article does not permit us to focus on all possible threats.

In terms of the first listed threat, a cyber attack, it is necessary to make clear that aviation is far more than just planes. It is a sector, which safety and fluency is supported by a large scale computer network. Every part of this network, whether it includes radar, link, and phone lines, which make the entire system operable and safe is a potential target.

Cyber attacks have become a global pandemic and no system is immune to them. It is realistic to imagine that hackers would be able to remove all the protections of a traffic collision avoidance system (TCAS) which can lead to mid-air collision. A hack into the ATC system and consequent misuse of sensitive data is something that really needs to be addressed. In better case it would interfere with the ability of controllers to handle their job and result in massive delays and restrictions in air traffic. In the worst case, especially in combination with jamming up the radio frequency, the consequences can be fatal. Besides a loss on human lives, it is logical to predict that an economic impact of taking down the ATC systems would be tremendous.

Bomb warning represents another type of threat. A protection against bomb warning lies mainly on shoulders of ground (airport) security. Only consistent, multilevel monitoring and scanning of passengers and cargo, including banning of all dangerous, suspected and unaccompanied freight shipments could reduce the risk of further such events. Intelligence is also one of the key factors and way how to discover something doubtful.

Another type of threat is a “conventional” hijack. In this case the compliant aircraft is directed to designated or required airport with specialist facilities on the ground to deal with siege and negotiations. ATC must promptly inform all inbound traffic about closure of airport and surrounding airspace. This may result in significant reduction in capacity due to diversions and other restrictions related to ATM. Active defense is based on awareness and training, but particularly on use of aircraft protection officers and locked cockpit doors.

The fourth type of a potential threat is “9/11” type terrorist attack, which is the main type of the threat discussed in this article.

### **3. RENEGADE AIRCRAFT**

One of the main dilemmas regarding in-flight security is determining an optimal level of integration of security systems and procedures, in order to ensure the speed and uniformity of protective actions. The way how

in-flight security incidents are managed has greatly changed since the tragic events on 9/11. It was the day a civil aircrafts were used as weapons of mass destruction for the first time in history of aviation. In response to these attacks, NATO has developed a new concept called “Renegade” for dealing with such a threat. Officially, NATO defines renegade as an aircraft operating in such a manner as to raise suspicion that it might be used as a weapon to perpetrate a terrorist attack. Important to know is the fact that renegade is legislatively considered as civil threat, not the military. Hence, not NATO, but the nation itself is responsible for determining the best way of action against renegade. Of course, the decision to launch the quick reaction alert interceptor (QRA/I) is always made by appropriated NATO agency, but after successful interception and identification of a suspected aircraft the authority is given to national command and control centre. Thus, the decision to use of weapons and engaging the aircraft lies on the national authorities. This is because each country has a different law system, which can differ in such a sensitive issues.

Attacks on the World Trade Center and Pentagon and dozens of exercises pointed out on the biggest problem concerning the chain of transferring of authority and decision making process – time. Time in combination with high speed of the renegade, bad weather conditions, limited situational awareness and time-consuming decisions could pose a serious danger especially for smaller countries. Therefore, many nations have signed bilateral agreements to cope with cross-border incidents. However, this is not enough. The international dimension of in-flight security incidents requires coordination at European level. If we compare the flight paths of 9/11 aircrafts onto a Western or Central Europe, three or in the worst case five countries would be affected by occurrence in a short time frame.

Within the geographic and political conditions of European territory, it is generally agreed that there are two options to face this challenge.

The first option is to establish a specific transnational joint Pan-European office on juridical base, which would replace national Governmental Authorities (NGA) in decision making process. Such office would have full QRA(I) command competence, but should respect national legislations in particular manner with renegade handling. Advantage of this approach is a possibility of immediate action against the threat thanks to all relevant information being “in one place”, minimal downtime and Europe-wide impact. Although, this option would be very effective, it is highly unlikely that countries would be willing to give up their national powers in favor of this office.

The second option is far more complex. It would require a close coordination and cooperation between all participants dealing with international menace. EUROCONTROL<sup>1</sup> and NATO just started to work together and created the NATO EUROCONTROL Air Traffic Management Security Coordinating Group (NEASCOG), with the mission to ensure the necessary close coordination and development of all related security activities with the aim that the member nations of each organization reach converging views. The NEASCOG promotes, develops and supports effective pan-European security measures in two focus points. Firstly, it provides a technical support enabling secure and real time dissemination and share of information of the situation on board. Secondly, it establishes a framework for dealing with in-flight security incidents via high level concept – Airspace Security Incident Management (ASSIM).

The objective of this concept is to support the decision making process by providing the national authorities responsible for airspace security with real time reliable information about airspace security incidents. NGAs are considered as the end user and the rest actors

should play only supporting role and facilitate the decision making process.

One should keep in mind that there is no uniform procedure regarding the renegade. Each situation will be always assessed on individual basis and civil just like military controllers must trained to identify suspicious behavior and to work in close cooperation. Segregation of airspace around the suspected aircraft made by civilian ATC is essential for rapid approach of the military QRA. Differences in directives, procedures and rules between these two agencies creates immense problem, which could in some circumstances lead to hazard and safety incidents. Therefore, an effective SMS must be put in place.

#### 4. SAFETY MANAGEMENT SYSTEM

In order to counter air terrorism, the world community has strived to create rational and commonly accepted judicial processes and technical regulations. These „anti-terror procedures“ are being updated as a result of previous, mostly tragic, terrorist attacks, in order to prevent similar events from occurring in the future. Unfortunately, these international regulations have not fully eliminated the threats against aviation. The International Civilian Aviation Organization (ICAO) plays an important role in current counter-terrorist operations, primarily through elaborating and finalizing the appendixes and recommendations to existing conventions by means of SMS. Effective use of SMS is a basic requirement for any modern business. It consists in a set of coherent policies, procedures and practices for effectively managing the safe operation of any business. It is not a surprise that the same must be applied in an aviation industry.

ICAO defines SMS as a systematic approach to managing safety including the necessary organizational structure, accountabilities, policies and procedures. In other words, SMS is a systematic, comprehensive process for identifying, managing and removing safety risks, but its main goal is not to remove all safety risks, but manage them under organizational control. SMS is a complex system consisted of

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<sup>1</sup> EUROCONTROL - European organisation for the safety of air navigation, is an international organisation with 39 European member states, with the intention of creating a single European upper airspace and supporting its member states to achieve safe, efficient and environmentally-friendly air traffic operations across the whole of the European region.

subsystems covering wide spectrum of various analyses, training methods, risk managements and multiple procedures.

In respect to a renegade aircraft, a reader should especially pay an attention to following elements of SMS:

#### **4.1 Security Incident Management.**

In-flight security incidents are time critical events that require strong coordination among different actors and the gathering and validation of nearly real time information for decision making process. The main points of view to handle a security incident include:

- Optimizing awareness - identification of suspicious aircraft, incident notification, information dissemination, maintaining awareness;
- Information requirements - relevant information needed to manage and resolve an incident;
- Time factor - required information must reach the appropriate recipient on time to be able to provide adequate response;
- Technology support - automation and encryption facilitate information exchange, reduce delays and guarantee confidentiality.

Information about situation on board is essential and must be gathered both from civil and military line. A pilot in command is the key actor, and measure to support him must be implemented according to pre-defined scenarios when possible. Risk assessment should evaluate what is the real threat posed by the aircraft in terms of its endurance, objectives at range, aircraft behavior (i.e. deep descent), confirmation of legitimate pilot in command or pilots' intention and information about the flight - type of aircraft, nationality, operator, passengers on board, nationality, VIPs (very important persons), children. Several criteria for suspicious behavior have been identified, but the list is not and can never be exhaustive. Training, security awareness and best judgment of pilots and controllers are therefore a key factor to manage such situation.

#### **4.2 Risk Management.**

Risk management is a process of identification, analysis, and elimination or mitigation of hazards to an acceptable or tolerable level. The objective of Risk management is to ensure that the risks associated with hazards to flight operations are systematically and formally identified, assessed, and managed within acceptable safety levels.

The complete elimination of risk in aviation operations obviously is an unachievable and impractical goal. As not all risks can be removed, nor are all possible risk mitigation measures economically practical. In other words, it is accepted that there will be some residual risk of harm to people, property or environment, but this is considered to be acceptable or tolerable by the responsible authority and the society. Risk management is the main component of the SMS and plays key role in addressing the risk in practical terms. In general, it is a structured approach and systematic action aimed to achieve the balance between the identified and assessed risk and practicable risk mitigation.

Risk management consists of three essential elements:

- Hazard identification - Identification of undesired or adverse events that can lead to the occurrence of a hazard and the analysis of mechanisms by which these events may occur and cause harm. Both reactive and proactive methods and techniques should be used for hazard identification.
- Risk assessment - Identified hazards are assessed in terms of criticality of their harmful effect and ranked in order of their risk-bearing potential. They are assessed often by experienced personnel, or by utilizing more formal techniques and through analytical expertise. The severity of consequences and the likelihood (frequency) of occurrence of hazards are determined. If the risk is considered acceptable, operation continues without any intervention, if it is not acceptable, risk mitigation process is engaged.

- Risk mitigation - If the risk is considered to be unacceptable, then control measures are taken to fortify and increase the level of defenses against that risk or to avoid or remove the risk, if this is economically feasible.

### 4.3 Risk Analysis Simulation.

Simulation of various scenarios is the best way how to arrange new procedures and challenges concerning not only day-to-day business, but especially those ones not exercised in real traffic. The figure below represents an optimal scenario simulation procedure:

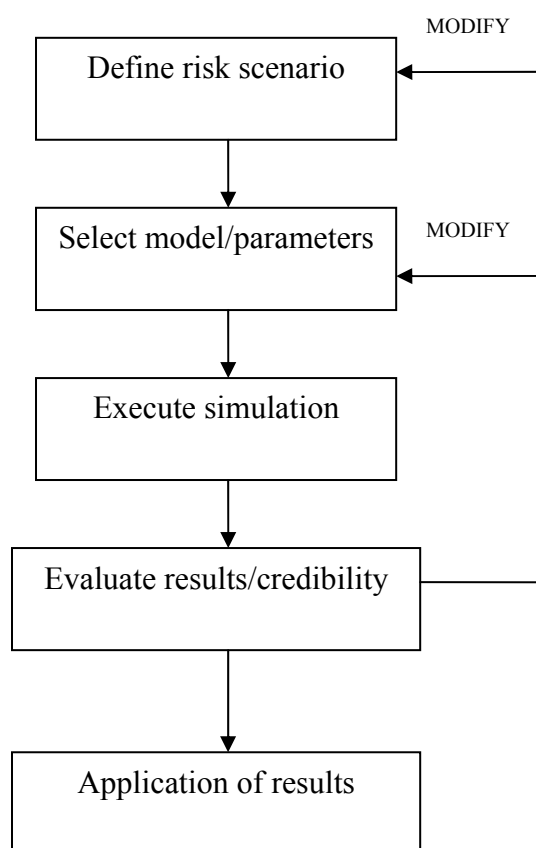


Fig. 1. Optimal scenario simulation process

Valid results are recorded and lead to change, update or redesigning of existing procedures, system upgrades. Keeping up the pace of safety as the ability to adapt to new challenge requires steadily growing investments.

### 4.4 Disseminating Safety Information.

Every workplace or a position should be the focal point for safety-related information — hazard reports, risk assessments or safety analyses. Some messages are urgent (before the next flight), some are directive, some are for background understanding, some are seasonal, etc. In most cases, the personnel do not have time to read all the information, so they are usually divided into two types. Safety critical information, which are an urgent safety information disseminated by direct messages (oral, written or electronically) or so-called „Nice-to-know“ information. These are mainly incident reports, safety studies, aviation journals, proceedings of conferences and symposia, manufacturers’ reports and training videos.

### 4.5 Renegade Decision Procedure – Target Management.

For every air traffic controller (ATC), time is always the biggest constrain when solving an extraordinary or threat situation. People need enough time to analyze, to decide, and to provide another site with important information. The decision process always suffers from lack of time and obviously brings human errors which can lead to accidents or even fatalities. Correct defining of probable target (according to predicted course, intelligence info or terrorist demands via radio/ visual signals with QRA), using proper counter-measures, analyzing overall risk and severity of consequences brings stress and errors. There are so-called decision-making supports helping the ATCs used both in military and particularly in civilian sector.

SMS is combination of risk and quality management methods in order to achieve the safety goals and provides the organizational framework to establish and foster the development of a positive corporate safety culture.

## **5. AIR POLICING AS AN INDISPENSABLE CONTRIBUTION TO SAFE EUROPEAN SKIES**

Airspace Security comprises safeguarding of the airspace of responsibility from unauthorized use, intrusion, illegal activities or any other violation. This involves managing the airspace to prevent, detect and resolve where possible airborne threats. To determine a sufficient level of security depends on the actual threat scenario and can heavily impact normal life conditions. It is the responsibility of the relevant international and national civil and military authorities to implement the appropriate security measures in response to the actual threat scenario.

Hence, importance of Air Policing and the requirement to have air defense assets available at short notice remains fundamental. For this purpose NATO has at its disposal a comprehensive system of air surveillance and airspace management means as well as QRA assets for immediate use. By means of radar sites, remote data transmission and central command and control centers the Alliance ensures constant control of its entire airspace to react within seconds to air traffic incidents in the Allies' airspace. This structure of weapon systems, control centers and procedures is referred to as the NATO Integrated Air Defense System (NATINADS).

During the Cold War, Air policing was set up as the key air component deterrent against an adversary mounting a surprise conventional air attack against the territory of the Alliance's members. This role has marginally persisted up to this date, but new spectrum of air policing operations has emerged as a result of changed threat assessment.

Today, the focus is to deter a 9/11 type terrorist attack, verification of questionable flights and help the aircrafts in emergency. Therefore, the NATINADS should be restructured to provide optimal air defense capability against new threats combining SMS with civilian and military procedures. It is vital for each country to have supersonic fighters capable conducting these missions. Unfortunately, some nations cannot provide themselves air policing missions because of

lack of suitable aircrafts or simply because of an absence of air force. They are either covered by neighboring alliance member with adequate „equipment“, or by other NATO country fighters sitting directly on their airports on rotational basis. Apart from financial aspect in both cases, the first possibility is very ineffective due to longer distances QRA must overcome to reach the violator.

## **6. CONCLUSIONS**

Aviation targets must be still considered to be highly tempting objects for terrorists. Aircraft cannot be stopped in mid-air, thus, the final effects of attacks against aircraft are both highly destructive and extremely dramatic. At present, national authorities responsible for security of national airspace are more sensitive to any indication leading to security disquiet, i.e. loss of communication with aircraft (COMLOSS), transponder switch off or wrongly set deviation from flight plan or any suspicious behavior. Nowadays, interceptions against aircrafts with problems mentioned above are more frequent and very often practiced as live exercise or simulation.

Combating air threat requires the use of a wide range of organizational and technical efforts based on appropriate legislative solutions. While terrorist actions are very hard to predict, universal international legal measures that are designed to help protect aviation from illegal interference has been put in place. The successful achievement of the ATM Security Concept and precise usage of SMS will allow the responsible organizations to focus on the security threats to the ATM system and find viable solutions to make it as least vulnerable as possible. The current strategy and the recent evolution towards single European sky underline the importance of civil-military interoperability. The application of a more dynamic use of airspace will lead to a mixed air traffic environment where all airspace users – civil and military - share the same airspace. In this mixed environment it is of utmost importance that civil and military aviation cooperate and

coordinate through the use of appropriate interoperable systems.

The organizational activities dealing with aviation security should also embrace prevention against terrorist assaults. Therefore, in terms of European continent, there is a need for inter agency collaboration, coordination and communication – common situational awareness and real time exchange of security information. Another need is for cross-border, pan-European coordination/co-operation and multi agency approach at national and international level concerning both civilian and military components.

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