MODELLING THE AIR TERRORIST PROFILE AS A SYSTEM

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***Abstract**: In this paper, the multidisciplinary approach of the systems theory offers solutions to prevent future terrorist attacks starting from various potential attackers profile analysis of the air, civil and military transport system.The model developed is particularly useful in assessing terrorist threats, in identifying vulnerabilities in the system, in developing capabilities for rapid assessment of different risk scenarios of attack, anticipation of possible attacks, in other words, increasing the effective air transport system security.*

***Keywords**: air transport system, terrorist profile, security.*

1. INTRODUCTION

The air transport system (ATS), part of the national critical infrastructure, has grown fast in recent years. According to a Boeing study regarding the number of transport aircraft, a continuous increase from 17,500 aircrafts in 2005 to approximately 36,000 in 2025 is expected. This development is subject to some challenges, the most important being in the field of safety: without safety development, a major loss per week in the subsequent years is projected; the present economic context imposed budgetary constraints that were felt by reducing safety costs.

Any disruption of the stability of the overall transport system will leverage: the decrease of passengers` safety, the reduction of air transportation demands, airline industry losses and, ultimately, the disruption of economic stability (U.S. Patriot Act, 2001:75).

For these reasons, ATS has been and will remain a preferred target of terrorist attacks. The potential success of such an action would mean, in addition to human losses and material damage, a strong psychological impact. The size, complexity and geographical layout of ATS make the fight against terrorism a process with global implications that is difficult to manage. The proved failures (Table 1) in rendering a prompt answer, efficient in case of terrorist actions can be interpreted as a sign of weakness and may lead to new and spectacular attempts (Anastasiei, 2011:2-4).

Table 1 Aviation incidents

Year	Number of incidents	Number of victims
1990	0	0
1991	0	0
1992	0	0
1993	1	0
1994	1	0
1995	0	0
1996	1	127
1997	0	0
1998	0	0
1999	0	0
2000	1	0
2001	5	3020
2002	0	0
2003	1	21
2004	0	0
2005	0	0
2006	1	0
2007	3	0

2. TERRORISM SYSTEM

2.1 Organizational profile. Unfortunately, the evolution of society as a whole brings new

and important advantages for terrorist groups. Whether targets are found in countries that encourage terrorism or in a democratic world, the ease of movement and information enables them to choose the time, place and purpose to strike and move on. Thus, terrorist groups are themselves a moving target that is difficult to combat, requiring the ability to anticipate how and where the evolution takes place in time, while understanding the mechanisms that make these changes occur. With such an understanding, safety specialists may be able to anticipate where and how a terrorist group is likely to act.

Knowing the organizational profile of such groups on the basis of information available that is often difficult to obtain, can help in planning the fight against terrorism in three phases (Fig.1).

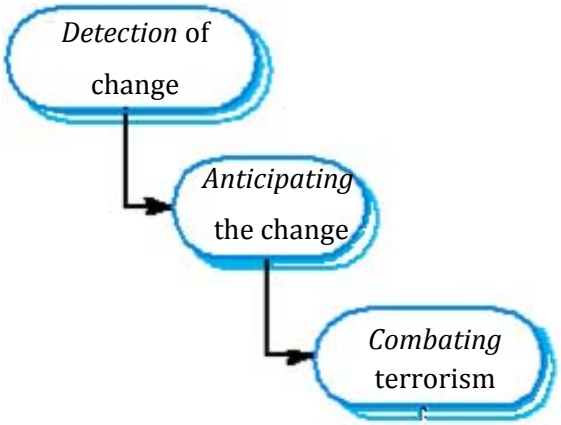

Fig. 1 Phases to counter the terrorist groups adaptation efforts (Source: RAND MG331-4.1)

Detecting the efforts of terrorist groups before they are fully realized and used in an attack represents the challenge of the first phase. The ability of a group to gather information and resources necessary for an attack determine its chances of success. Thus, by understanding these processes, the threat level of actions to be undertaken and the success rate may be anticipated. With a sufficiently detailed understanding of the learning processes necessary for adaptation and operation of terrorist attacks, the counter measures of action can be designed. The difficulty to capture all the elements that determine the evolution of terrorist groups is recognized. Also, random and unpremeditated changes, arising from specific circumstances, will make the possibility of accurate prediction more difficult. (McCornick, 2003:17-23). The threat of terrorist groups is not based on what they intend to do, but rather on the success of intentions.

2.2 The Attacker Profile. Drawings, diagrams and charts will be separated by a free space from the text and printed as close as possible to the first reference. Their width will not exceed that of the column they belong to. Should this be impossible to achieve then they will be printed across the whole breadth of the page either at the top or the bottom of the page. Reality has proved that terrorists who represent a significant threat are rational and intelligent. Without the latter attribute we could not discuss about the impact of asymmetric conflicts.

The characteristics of terrorist groups provide information about possible types of attacks, information that are particularly useful for decision makers responsible for aviation safety systems in allocating resources to increase the response capacity of the system. Thus, three theoretical profiles of terrorism have been identified (Jiemenez, 2009:7-11) based on four parameters:

1. funding source
2. technical capabilities
3. fear of failure
4. desire for innovation

These profiles are: the „echo-terrorist" group; „the lonely wolf" group and the „state versus state" group. The capture of various potential behaviors is suggestively shown in table 2.

Table 2 Map of attackers profile

Descriptors/ Profile	**Resources**	**Technical capabilities**	**Fear**	**Innovation capacity**
Echo-terrorist	■	■		■
The lonely wolf			■	
State vs state	■	■		

After identifying the theoretical profile, consequences can be determined based on the allocation of indices for relevant components of each built scenario. Although the information necessary to accomplish a full and accurate profile of the attacker are relatively difficult to obtain, once the map of threats completed, the authorities responsible for aviation safety need to focus efforts and to allocate the necessary resources to counter the possible threat. For example, positioning the "lonely wolf" group on the map of indicators as having low technical capacities and financial resources, could be interpreted in terms of risk of attack as being of high probability using explosives, at the expense of advanced technical systems.

The use of proactive approach based on building models of attack in conjunction with the attacker's profile, in addition to the advantage given by the achievement of an adequate assessment of potential risk, avoid the need to obtain sensitive safety information.

2.3 Terrorism as system. Tackling terrorism using systems engineering, emerged as a possible solution offered by International Council on System Engineering (INCOSE) to reduce or eradicate terrorism after September 11 attacks. Systems engineering capability to analyze and evaluate all aspects of complex socio-technical problem in a multidisciplinary approach recommends the use all specific instruments (principles, techniques and methods) to understand the physical structure and functioning of the act of terrorism.

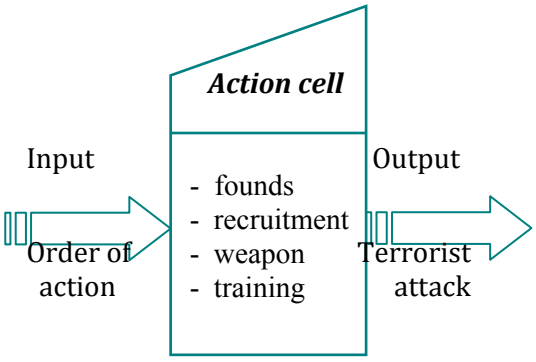

Fig. 2 A process model of the terrorist system

The system, as defined by some experts (Zadeh, 1969:73), represents a lot of input-output pairs. A system is determined by the continuous exchange of matter, energy and environment information (Mureşan, 2004:11-15), a result of functional interaction between components. As a result, processes that occur in a terrorist group can be modeled as an open system, in which the relationship between inputs and outputs is achieved only through the transmission system (Fig.2). To illustrate the interaction between the terrorist group and organizations meant to combat terrorism, a system with close loop control mechanism is built in order to reduce the consequences and to eliminate factors that make possible terrorism proliferation (Fig.3).

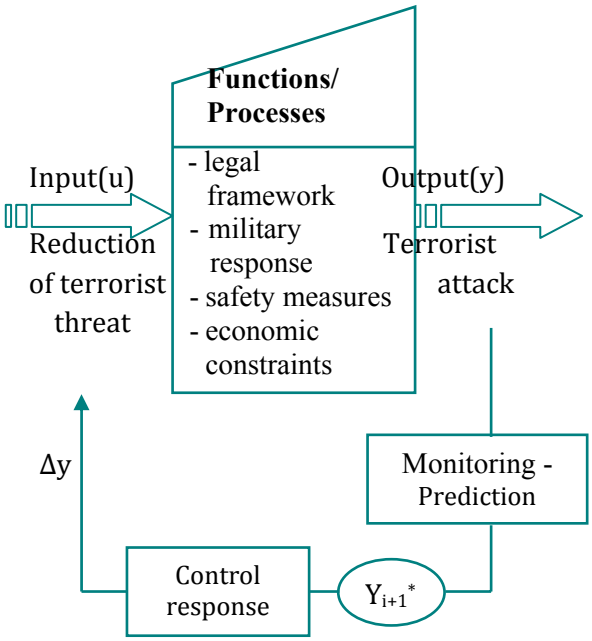

Fig. 3. A process model of the antiterrorist system

Besides the four basic components (inputs, outputs, processes, control mechanism), external constraints and the relations between elements/subsystem components are very useful for analysis. The simplified model shown in figure 3 shows at least some essential advantages in its efforts to counter the terrorist phenomenon deriving both from the stages of the life cycle of terrorist attack

1. preparation – legislative framework, security measures, constraints, etc.
2. development (the attack) – military response
3. conclusion – the legislative framework

and from understanding thinking processes of attackers and the attacked.

The use of feed-before has the role of analyzing the y output value evolution tendency and of anticipating the y_{i+1}^* value. Calculation of control ($\Delta y = y_i - y_{i+1}^*$) is accomplished by the control block. The allowed multidisciplinary approach by engineering systems to fight terrorism has the advantage of communicating the system problems (legal, technical and economic) in an understandable manner (Mackey, 2003:3-5). System engineering process is essential in the whole life cycle of it and the main specific activities must be repeated every time there is a new requirement/challenge for the system (Maloş, 2005: 27-34), in a creative way to meet the initial goal.

3. CONCLUSIONS

The multidisciplinary approach is useful in order to understand the functional architectures of the terrorist action. In this context, the discipline of systems engineering may assist in designing a behavioral model, as a possible solution for reduction and eradication of international terrorism.

Evaluating the behavior of terrorist groups from a system perspective could provide a better management policy to combat terrorism.

Directions for future research move towards building a complex simulation framework to describe how the aviation system functions in terms of extreme events and the main stages of implementation can be summerized as follows: the identification and description of possible states of the system, of the system entries and of the relations between system components in terms of probability distributions; the simulation achievement by generating random varables that describe events; the process repetiton for different alternatives and configurations (scenarios).

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