

SANJA STEINER, D.Sc.
BORIVOJ GALOVIĆ, D.Sc.
ŽELJKO RADAČIĆ, D.Sc.
Fakultet prometnih znanosti
Vukelićeva 4, Zagreb

Traffic Safety
Review
U.D.C. 656.7:62-559.8(497.5)
Accepted: Oct. 14, 1998
Approved: Dec. 23, 1998

CONCEPT OF AIR TRAFFIC SAFETY PROGRAM IN CROATIA

SUMMARY

Paper deals with conceptual guidelines of national air traffic development from the point of view of safety and shows the necessity of creating a national safety program.

Requirement of safety program implementation is the foundation of national aviation safety board, which should be operated independent of civil aviation authority. The main tasks of this board are accident and incident investigations, data analysis and suggesting of safety recommendations and standards, i.e. prevention programs. The next premise of safety program modeling is to reach the legal and administrative considerations for introduction of incident reporting system on confidential principles. The application of the model of safety program in Croatian air traffic is closely related with implementation of European aviation normative.

1. INTRODUCTION

The category of safety and everything implied by this term in air traffic is in direct contradiction with the interests regarding financial profit by aircraft manufacturers, operators and airports. Opposition has therefore always accompanied acceptance of safety standards and the consensus was always difficult to achieve both on the national and international levels. Even the implementation of safety standards itself, apart from depending directly on the economic power of a state, i.e. its readiness to allocate funds from the budget for subventions, depends to a greater or lesser extent on the autonomy, authority and firmness of the aviation authorities.

Those who advocate safety, however, are primarily the users of air transport services, and they are precisely the ones for whom air transport is intended, and then also the professional associations of all personnel categories, directly related to the flight operations (pilots, air traffic controllers).

In conditions of deregulation and liberalisation of the market of air transport services, the safety aspects are made additionally complex, so that, considering the negative "cost versus" experiences of the developed countries, a strictly centralised control of

implementing the safety standards is preferred, as the only option of a steady safety operation of the system.

Safety programs i.e. preventive activities are based on the analyses of the elements that caused accidents and incidents. Studies of aircraft accidents present a source of tragic lessons, and the system of collecting and processing the relevant data about the incident circumstances is of extreme importance for the timely detection of the system deviations, and the quantitative dimension of the analysed sample, for confirming the justification of developing and implementing new safety standards.

Apart from accepting the safety standards, the safety programs include also the mechanism of controlling, checking and sanctioning of all the system segments whether they meet the safety minimum. The autonomy of inspection is at the same time a premise of the safety functioning of the system i.e. "feed-back" principle in managing the system.

2. INDEPENDENT NATIONAL ORGANISATIONS FOR AIR TRAFFIC SAFETY

In the majority of developed countries, beside the administrative and organisation bodies in the aviation field, there are also independent government organisations with a consultancy service. Their main objective of operation is the study of safety aspect of the national aviation and making recommendations in order to eliminate the established deviations and improve the system. As a rule, such organisations not only have the autonomous right to investigate an aircraft accident or incident, but they also have the right to monitor all the activities in air traffic exploitation, including the administrative authorities themselves. Based on the recommended safety and preventive measures by these organisations, the civil aviation authorities undertake the appropriate actions and review national air traffic safety programs.

In the USA, a special government board - NTSB (National Transportation Safety Board) has the pa-

tronage over the traffic safety issues. Its role of investigating and monitoring of the safety aspect of the national traffic system does not depend on the administrative authorities. The Board has a centralised management and organised special offices for the safety of all the transportation forms. The same principle as in the NTSB organisation, is used in the operation of the Office of Aviation Safety. It consists of several departments, e.g. for investigating the accidents, for regional operative units and general aviation, aircraft engineering, human factors, etc. Based on the results obtained from investigation and analysis of the data about the causes of accidents or incidents, the recommendations regarding safety measures issued by NTSB are sent to the national aviation administration, i.e. the related Offices of System Safety and Offices of Regulation and Certification. The justification and purposefulness of the NTSB operation is confirmed by the fact that on the average about 80% of safety recommendations are applied in the US FAR system.

The Canadian national TSB (Transportation Safety Board of Canada) is organised on the same principle. It operates separately from the other government agencies and departments. TSB is under the direct authority of the Canadian Parliament, and the independence of its operation provides full objectivity in making conclusions and recommendations regarding safety measures.

A Bureau of Air Safety Investigation (BASI) was organised in Australia, as a special government agency, operating within the government department for transportation and regional development, but with full autonomy in investigating and monitoring the safety aspects of national aviation. The operation of BASI includes investigating the accidents and incidents, developing pro-active preventive programs, and managing of a central database. BASI has no legal competence of implementing the safety recommendations, but almost 90% of the recommended safety standards are accepted by the regular safety board (originally: CASI - Civil Aviation Safety Authority) within the Australian Civil Aviation Administration (CAA).

The countries of the European Union are at the moment in the process of agreeing upon the organisation and authority of a common European Aviation Safety Authority (EASA), which should take over the control and pro-active operation related to the application of the safety standards (of the current JAA system). The merits of EASA in investigating accidents and incidents and in the developing and dictating of safety programs have not been defined as yet. The operationalisation of the EASA safety system is planned sometime during the year 2000, and its founding has been supported by the majority of relevant European and international aviation associations.

3. NATIONAL SYSTEMS OF INCIDENT REPORTING

The accident, i.e. "risk" conditions reporting systems, operationalised in the countries with high aviation safety "rating", are based on the model of immunity. The US Aviation Safety Reporting System (ASRF), 1977, was the first one introduced on this principle, under the authority of FAA and the administration of NASA. Over time, the results obtained by processing a large number of reports have been systematically used in the safety and preventive programs i.e. in developing the safety standards¹.

Analogous reporting systems have been introduced over time in other countries as well. In Canada e.g. the CASRP system (Confidential Aviation Safety Reporting Program) was implemented in 1985, in New Zeland - the CSFS (Confidential Safety Feedback System) in 1987, and in Australia the CAIRS (Confidential Aviation Incident Reporting System) in 1988.

Some countries have introduced an integrated system of incident reporting with subsystems for all the forms of transportation, including air transportation, and as an example the Canadian CTSRP (Confidential Transportation Safety Reporting Program) "Securitas" can be mentioned.

Among almost all of the mentioned national reporting systems there is a continuous co-operation in distributing the data i.e. technological transfer.

The CHIRP (Confidential Human Factors Incident Reporting Program) was founded in England as early as 1982. Its administration is located at the Royal Air Force's School of Aviation Medicine, and it is financially supported by the aviation administration. The operating of this system is primarily oriented towards the safety aspect of the English air force.

European countries are lagging behind in implementing the national reporting systems. This may be explained by the inertia in the expectation of a unique safety regulation. This is confirmed by the fact that the members of the European Community are now in the phase of implementing a network of a unique reporting system - the so-called EUCARE - European Confidential Safety Reporting Network, with administration and central database within the Technical University in Berlin.

The main objective of these systems for collecting and processing of reports on the incident conditions is to discover drawbacks or possible operative deviations from the national regulations, to design the safety and preventive programs, and to provide input data in order to plan and improve the national air traffic systems, whether it is the study of human factors or safety recommendations for the future procedures, operations, devices and equipment.

4. THE MODEL OF AIR TRAFFIC SAFETY PROGRAM IN CROATIA

The existing administration and organisation and the valid regulations in the civil aviation in Croatia do not provide objective evaluation of the safety aspect of national air traffic, nor planning of an adequate safety program. Therefore, it is extremely important in the strategy of further development, to plan for an independent mechanism for monitoring and analysing of all the safety elements within the system of air traffic, which would enable the development of preventive programs and implementation of safety recommendations and standards.

Taking into consideration the positive experiences of the national air traffic safety systems in the countries with an absolute "safety image", that is, by applying the elements of verified models of safety programs, Croatia would first of all have to draft a model of a national air traffic safety program in accordance with the strategic goals of the general economic and traffic development and the characteristics of the surrounding.

In order to develop and operationalise the program, it is necessary to found a national air transportation safety board, which would operate completely independently from the civil aviation administration. The scope of operation of such a board would include investigation of accidents and incidents, i.e. circumstances that may have caused them, the analysis of the data and suggesting of safety recommendations and standards, i.e. preventive programs. A further premise in designing the program is to ensure the legal and administrative assumptions for introducing a reporting system about the incident conditions on the principle of confidentiality and immunity, i.e. with no penal or disciplinary actions against persons submitting such reports. The national air transportation safety board would have the right to monitor the operative units of the airport, carriers and air traffic control, but without the right for sanctions, that have to stay in the authority of the regular inspection department within the aviation administration. The national board should also have the discretionary freedom to monitor the civil aviation administration.

4.1. Administrative and Organisational Structure of The Board

The model of the organisational structure of the national air transportation safety board, apart from managing bodies (presidency and executive management) includes two main departments for investigation and system analysis of safety with the related departments as well as special mechanisms of operative support in the form of a reporting system and a moni-

toring system. The department of investigation includes four categories of the causal factors according to the SHELL concept: human factor, technology, operative elements (rules and procedures) and software. The department of the system analysis of safety includes the central database, system for indication of irregularities (drawbacks or deviations), and the system of safety recommendations i.e. programs. The management of the national air transportation safety board is obliged, apart from making mandate reports, to make reports on the results of the carried out projects, in the form of safety recommendations, suggestions for corrections of standards and safety programs, which are submitted to the Government i.e. civil aviation administration for verification and implementation.

4.2. Board Personnel

The national air transportation safety board is a government agency of scientific profile (research institute) and employs experts in the relevant scientific fields and disciplines: aircraft engineering, air traffic technology, aviation medicine and psychology, aviation legislation, aviation communication and phraseology, and information sciences. Should need arise, external associates may be engaged (scientific and research institutes and experts from the operative units). The administrative body of the board is not to include active employees from the aviation administration or from the operative units of airports, carriers, and other activities related to the exploitation of air traffic.

4.3. System of Board Funding

The national air transportation safety board is funded directly out of the budget on the basis of the budget plan for every year, retaining the right to realise its own income (scientific publications, publishing of statistical bulletins, software design, development of projects, etc).

4.4. Development and Realisation of the Safety Programs and Projects

On the basis of systemic analysis of data gathered by operative mechanisms of reporting and monitoring, the expert groups update the mandate reports on the air traffic safety conditions, specifying the drawbacks and deviations, as well as recommending measures of prevention. Over time, as a result of targeted research projects and comparative analysis of the tendencies in the safety system as a whole, and of single influencing elements, the main causal factors may be defined and the suggestions for safety recommendations and programs prepared. Complete safety pro-

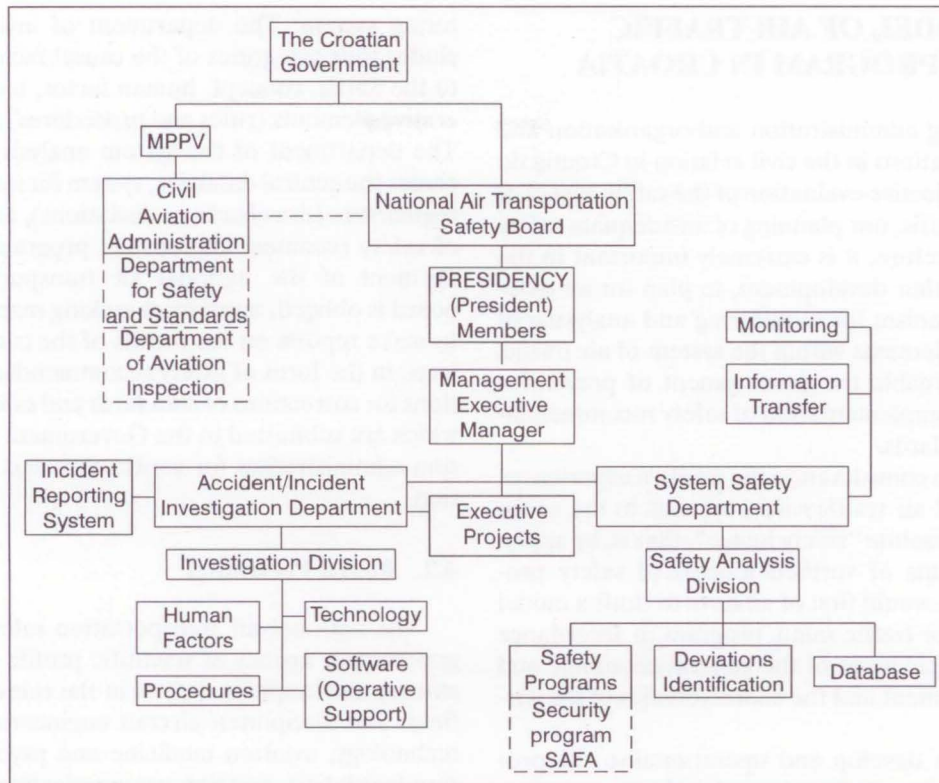


Figure 1 - Model of the National Air Transportation Safety Board

grams are verified by the aviation administration (according to foreign experiences, the aviation administration accepts on the average 80-90% of the recommendations suggested by the safety program) and these are realised through normative corrections and intensifying of the inspection activities.

Since at the moment, due to objective circumstances, there is no special department for system analysis of air traffic safety established in Croatia at the level of aviation administration, there are no indications about the operative drawbacks and deviations.

However, in conditions of planned increase of traffic volume, whose rate of growth in Croatia will be above the European average², special attention will have to be paid to the safety aspect of exploitation. Therefore, it is suggested that the preliminary planning of the safety programs includes the application of safety indicators of the operationalised causal-analytic systems (FSF³, NTSB/NASA/FAA, BASI/CASA⁴, TSB, etc.).

The priority topics of the accepted safety programs (1998) are related to prevention of the frequent danger risks (accidents and incidents) in the final flight operation phases, at flight intersections and airport zones, respectively:

- collisions with obstacles during flight⁵
- mid-air collisions⁶
- aircraft collisions on the ground and obstruction of runways⁷

- pilot's fatigue⁸.

Safety programs are accompanied by the appropriate research projects with the aim of improving the procedures, training and design, and the actual emphasis is on the analysis of the wake vortex, problems of applying the digital aircraft instruments, use of flight data for evaluating the safety and human factors, accidents in using TCAS systems, accidents in servicing the aircraft at the apron, capabilities of the crew in case there is a failure of the aircraft system, etc.

5. APPLICATION OF THE MODEL OF NATIONAL AIR TRAFFIC SAFETY PROGRAM IN CROATIA

The strategic guideline in the development of the national traffic system in general, including air traffic, is the integration into the European traffic system i.e. re-integration of the international traffic flows in the Croatian territory. In this context, the development of air traffic in Croatia is conceptually dependent on the implementation of the JAA-standards into the national aviation regulations.

The accepted interests and the "European integration" orientation need to be followed at the government level by such traffic policy which will contribute to the "new tendency of developing the national air traffic safety system", and this means by new compati-

ble legislative regulations and by organising adequate authorised bodies.

The supporting air traffic legislative regulations are thus determined by the top-priority co-ordination with the actual regime of the Chicago Convention and by the application of the JAR system as the precondition of joining the JAA membership.

The demanding conditions of aircraft certification regarding airworthiness and technical maintenance, training and certification of the flight crew, integrated air traffic control system, airport exploitation and safety standards, which will be incorporated in the legal provisions and related documents, need to be consequently implemented in practice and if necessary revised on the "feedback" principle. Therefore, from the point of view of safety, a reliable system for the control of stipulated safety and technical minimum is necessary.

Within the new administrative and organisational structure, it is necessary to plan the interactive operation of the aviation inspection and the department for safety system and standards, and independent, but proactive operation of the air transportation safety board as a "supervisor". The actual suggestion of the organisational structure of the new Civil Aviation Administration⁹ includes the departments of inspection and safety¹⁰, but does not specify the extremely important integral departments for system safety analysis and promotion of safety programs. The existence of these departments in particular, is a necessary precondition for implementing safety standards.

The source of relevant data for evaluating the level of safety and the implementation of safety programs would be provided by the national air transportation safety board by operationalising the confidential reporting system about incident circumstances, with the exclusive purpose of improving national air traffic. The operation of the national air transportation safety board would include also the aspect of safeguarding civil aviation against unlawful interference, thus meeting the requirement of developing a national security program.

Regarding the relatively small volume of air traffic, number of carriers and the size of the fleet, Croatia may consider the option of an integrated national board for the safety in all transportation forms.

Based on the analysis of tendencies in the safety level of national air traffic systems using as example the countries with high safety standards, i.e. operationalised safety systems, according to the presented indicators of the size of aircraft accidents depending on the realised transportation efficiency¹¹, it can be estimated that the introduction of the suggested model in Croatia would result in an increase of the national air traffic safety level by 4-7%. During the first phase the most part of the safety programs would have

to concentrate on intensifying the control of implementing the standards of certification and licensing, inspection of the maintenance system and regular servicing, mainly the categories of general aviation¹², inspection of pilot's flight operations (procedures) and the control of social and medical indications of the flight crew. The supporting studies should include primarily the issues of optimising the approach routes, maximally taking into consideration the ecological aspects of air traffic exploiting.

The analysis of tendencies in the air traffic safety level in Croatia, using the method of linear regression correlation¹³, has shown that without the application of the suggested model, and taking into consideration the predicted traffic growth (the minimum expectation), the level of national air traffic safety would decrease during the first three years by 15.8%

SAŽETAK

KONCEPCIJA PROGRAMA SIGURNOSTI ZRAČNOG PROMETA U HRVATSKOJ

U radu se analiziraju konceptijske smjernice razvoja zračnog prometa Hrvatske sa stajališta sigurnosti te upućuje na potrebu izradbe nacionalnog sigurnosnog programa. Pretpostavka izradbe i operacionalizacije programa je utemeljenje nacionalnog odbora za sigurnost zračnog prometa, koji bi djelovao potpuno nezavisno od civilnih zrakoplovnih vlasti. Djelokrug rada takvog odbora bio bi ispitivanje nesreća i nezgoda odnosno okolnosti koje bi ih mogle uzrokovati, analiza podataka te predlaganje sigurnosnih preporuka i normi odnosno preventivnih programa. Sljedeća je premisa u modeliranju programa osiguranje pravnih i administrativnih pretpostavki za uvođenje sustava izvješćivanja o incidentnim okolnostima na načelu povjerljivosti i imuniteta. Primjena modela sigurnosnog programa u zračnom prometu Hrvatske najuže je vezana za implementaciju europske zrakoplovne normative.

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1. In 1993 e.g. a total of 30,498 reports were processed within the ASRS: 20,659 being reports submitted by pilots (68%) and 1,356 reports by air traffic controllers (4%).
2. The studies carried out for the purposes of developing *Strategije prometnog razvitka Hrvatske* (Traffic Development Strategy of Croatia), confirm the prediction that the air traffic through airports will return to the pre-war volume sometime between 2003 and 2005, with an additional increase of about 50% by the year 2010.
3. FSF - Flight Safety Foundation, USA.
4. CASA - Civil Aviation Safety Authority, Australia.
5. This causal category, originally: CFIT (Controlled Flight into terrain), is in the focus of interest of all the national air safety programs. Globally, the FSF prevention program is widely supported.

6. Category of aircraft dangerously approaching in flight, originally: NMAC (Near Mid-Air Collision) in the USA, according to the analysed reports, is increasing by 23% (48% in commercial traffic).
7. This causal category is originally called "runway incursion". According to the actual data, the rate of the annual increase of collisions on manoeuvring surfaces at US airports amounts to 15%. The primary cause of accidents and incidents of this category is attributed to the pilot's failure to act upon instructions given by the air traffic control.
8. The causal category of pilot's fatigue is becoming increasingly important in the national safety programs with related "Fatigue Management"-recommendations and control of implementing the normative of work - off-work hours ratio.
9. The data on the re-structuring of the Civil Aviation Administration have been obtained at the Ministry of Maritime Affairs, Transport and Communications, Zagreb, 1998.
10. The draft of the organisational structure of the Civil Aviation Administration plans a department of Aviation Standards and Air Navigation Safety, as well as of an independent department for Aviation Violation.
11. The analysis is based on the statistical data for the USA, Canada and Australia.
12. According to the statistical data at the world level (ICAO-region), the share of general aviation in the total number of aircraft accidents is about 90% (in the USA it is 93%).
13. For calculating the tendencies of air traffic safety on the example of Croatia, the following references have been taken: basic year 1998 with unit index and the annual traffic growth rate of 5%.

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