

## SUPPORT FOR PERSONNEL OF AIR TRAFFIC SERVICE

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### Abstract

*What should be done reasonably to control flight safety is to follow carefully and in real time all, the undesired air events and results thereof, any actions undertaken at individual air bases and the effectiveness thereof. Measurable effects in this field (including the economical ones) could be provided by a computer-based system, and only. Such a system is intended and expected to provide analyses and assessment of different hazards. Both should be based on actual information, possibly of immediate access. Lack of such a system practically prevents us from any complex analyses and assessment of the safety level, and precludes any forecasts in this field. One of the elements of maintaining a high level of safety is to have the air traffic controllers required level of knowledge, skills and experience necessary to ensure safe and efficient air traffic services in a specific organ ATC. The article presents the elements of the system of support Authorities Aerodrome Air Traffic Services TURAWA<sup>MATS</sup> that uses algorithms to maintain a high level of competence of the groups of controllers.*

**Keywords:** ATC, flight safety, computer support, LOSRL

### 1. Introduction

Currently, the documentation is conducted in both article and electronic format (based on an Excel spreadsheet). Implementation of supervision over the maintenance of competencies of air traffic controllers requires continuous monitoring of the existing deadlines for the assessment of work technique (OTP), methodological training, aero-medical examinations as well as maintenance allowances. Objective of the designed system is first of all:

- Computer support for SRL of Polish Armed Forces in exercising oversight over the training process and the level of training of personnel,
- Enabling effective management of safety and preventative actions,
- Ensuring the possibility of a comprehensive analysis and assessment of the activities of SRL of Polish Armed Forces,
- Keeping a register of airports, airstrips and airport infrastructure, which is within the competence of SRL of Polish Armed Forces.

### 2. System division into functional modules

TURAWA<sup>MATS</sup> system will be implemented using the concept of architecture Model-View-Controller (MVC), which is used to create network-oriented database applications. MVC architecture assumes the division of the components of the application system into three categories:

- Model (model components): components representing data, on which are operating applications; model components also offer methods of accessing data,
- View (presentation components): components representing visualization (presentation) of data for the user; presentation components retrieve data from the model components, and then

display them on the user's screen,

- Controller (control components): components intercepting user requests and mapping them to call the methods of model components; then control components transmit control to the presentation components.

Taking into account the specificities of the system and Implementation capabilities provided by Oracle JDeveloper tool, the distribution of TURAWA<sup>MATS</sup> system into program units would be as follows:

- Database subsystem,
- Communication with the customer subsystem,
- Data processing subsystem.

### *2.1 Database subsystem*

The database a basic place where you can permanently store data in the system. Control and presentations components during the work refer to the database in order to implement requests of the user of the system, both for read and write [1, 3]. Dictionaries are arrays of database filled with the values determined during the design stage of the application. These dictionaries will serve as a data source for user interface elements such as drop-down list or a list of multiple choice. This approach ensures, by narrowing the range of limit values minimization of data entry errors by the operator and significantly speeds up and facilitates its work.

### *2.2 Communication with the customer subsystem*

This module will be designed to support the direct process of data input by users. It will provide to create the client-side interface (dynamic pages generated in a web browser), oriented quickly and reliably data adding to the system. Obtaining this functionality should provide components facilitating selection or describing the type and scope of the appropriate values. This module will also be realizing bi-directional access to the database. Thanks to it, conducted the preliminary data validation and directing to the correct record. A special form of data entry is the process of a user logs on into the system, during which is being verified his identity and related permissions.

### *2.3 Data processing subsystem*

The module analyses and assessments will be an implementation of algorithms and processing rules existing in the data system TURAWA<sup>MATS</sup>, specified at the stage of analysis of the needs of future users of the system. The result of the module will be reports and data profiled according to preset, possible modification criteria. For readability of received summaries, you will be able to choose the form of their presentation (table, list, chart).

## **3. An example of the functional analysis of the proposed solution**

One of the elements to maintain the required level of security is to have the air traffic controllers required level of knowledge, skills and experience necessary for the safe and efficient provision of air traffic services in a specific ATC organ. In this article, it is presented an algorithm for air traffic controllers i.e. approach control entities (APP) and the authority of aerodrome control (TWR).

A common feature for both groups of controllers beyond maintaining a high level of competence, is to maintain knowledge of English, where at the moment is applicable international ELPAC exam (the system takes into account the date and reminds of the "outlet" of the news 6 months before the expiry), health requirements (obliging the date of the next survey recalled to

three months before the end), a collection of current information (updated by the severance office crews necessary to carry out the position of the operating controller).

In the event of an interruption in the operational work longer than 3 years, rating endorsements at the entity or operational/additional authority of the air traffic controller expire and cannot be their resumption. Another determinant is the fact that the main authorizes of OTP are valid for two years and must be restarted after the above period.

In Fig. 1 is presented an algorithm defining readiness to perform operational activities by the controller. In case of not fulfilment of any of the criteria controller cannot perform his duties.

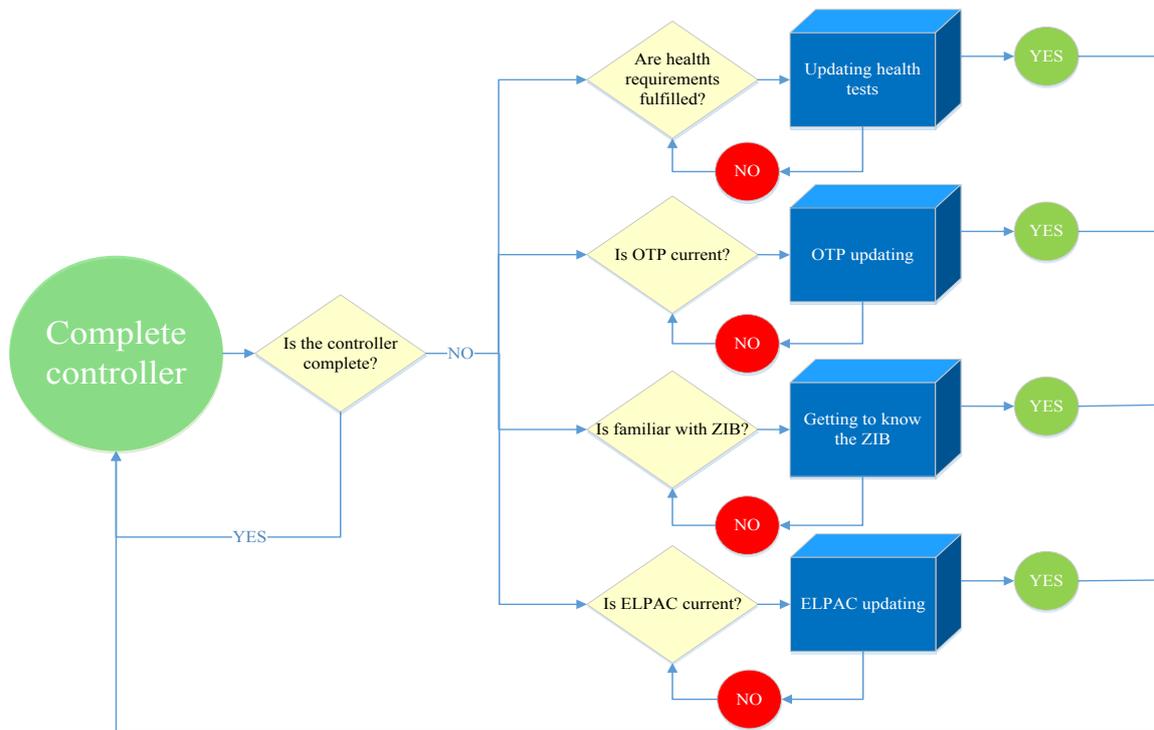


Fig. 1. Algorithm for determining updates for Complete Controller

An air traffic controller has the necessary competence to work at operating positions of ATC entities, if its competences (Fig. 2) during the last assessment of work technique (OTP) have not been in doubt (competence in doubt), and he himself performed airlines activities in the position of operating in accordance with their permission, at least for a period of 20 hours every 3 months. In the case of complementary permissions approach control with the use of precision approach radar it is considered that the air traffic controller has the necessary competence to work as a PAR controller, if he completes at least 5 radar approach controls with the use of PAR in a series of 3-month (APP controller).

After a break in operational work longer than 30 days, the air traffic controller reports to a designated by the head of LOSRL OJT instructor to undergo familiarization interview and complete operational knowledge. After a break in operational work longer than 3 months and shorter than 6 months, air traffic controller takes at least 10 hours of familiarization practice at the operating position or in the case of PAR - 5 radar complementary permissions an approach control with the use of PAR under the supervision of a designated OJT instructor and then is subjected to OTP (APP controller). A positive OTP result determines competence restoration. A positive result OTP determines restoration competence. After a break in operational work longer than 6 months and shorter than one year air traffic controller takes at least 20 hours of practice familiarization at the operating position or in the case of PAR - 15 radar complementary permissions an approach control with the use of PAR under the supervision of a designated OJT instructor and

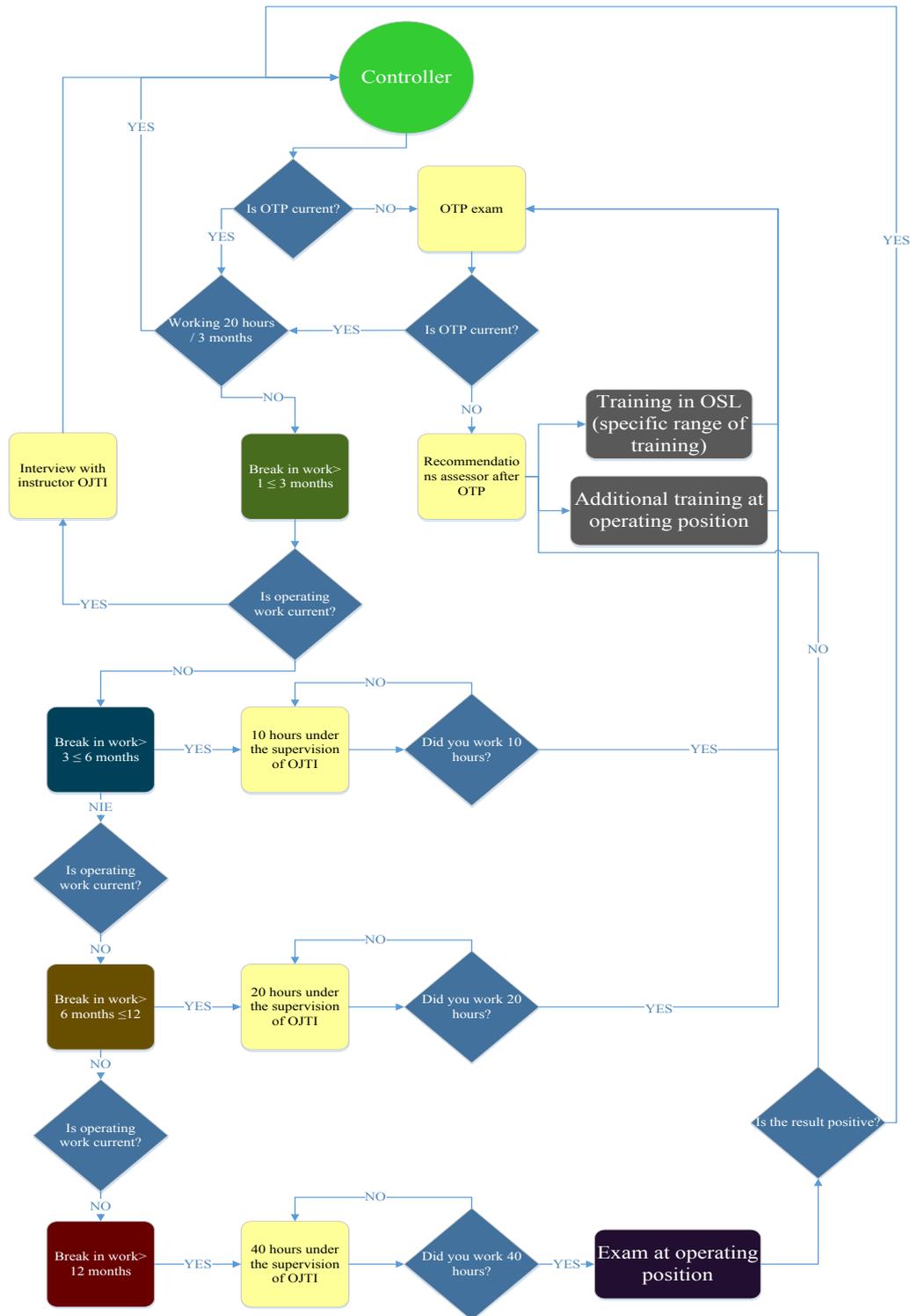


Fig. 2. An exemplary algorithm for determining competence for the TWR controller

then is subjected to OTP. A positive OTP result determines competence restoration. In the event of a break in operational work longer than 1 year, a complementary competence in the entity or operational/complementary permissions of air traffic controller will expire, and their resumption could take place:

- After completing at least 40 hours experience at the operational position or in the case of PAR complementary permissions - completing 25 controls of radar approach using PAR under the supervision of a designated OJT instructor,

- After obtaining a positive OTP result,
- After passing a practical test at the operational position before the SRL Examining Board.

Another element of the system supporting the work of controllers is the crews briefing Office (BOZ). For the proper organization of BOZ, work is responsible the BOZ head, which reports directly to the LOSRL chief. The basic tasks of BOZ should be collecting, processing, distribution and sharing of information or aeronautical data essential for the safety and regularity of air navigation.

The duties of the non-commissioned officer for aeronautical information should be:

- Acceptance and distribution of flight plans,
- Acceptance and distribution of messages of air traffic,
- Publication of aeronautical information,
- Sharing for crews of aircraft available aeronautical information including en-route information bulletins (PIB) for VFR and IFR flights,
- The current update of documents held,
- Supervising the correctness of published aeronautical information,
- Detailed BOZ operating procedures shall be published in INOP BOZ.

In order to meet these elements in the system of information support of air traffic services was introduced the role of the crews briefing office. This element is the “fundamental role” because through it the system will be provided with information related to the operating state of LOSRL. This information shall constitute the basis for the operation of air traffic control services and are part of a set of current information. Information at the LOSRL level will be presented in a format of independent briefings journal where operational staff will be able to see the initial information and the situation in a given LOSRL. In the data entry part the following information are introducing into the system: executor of the document, date and time, status, closed taxiway (the date, until when), closed apron areas, airport information, approach procedures, runways, the degree of activity of birds, radio beacon, comment, recipients.

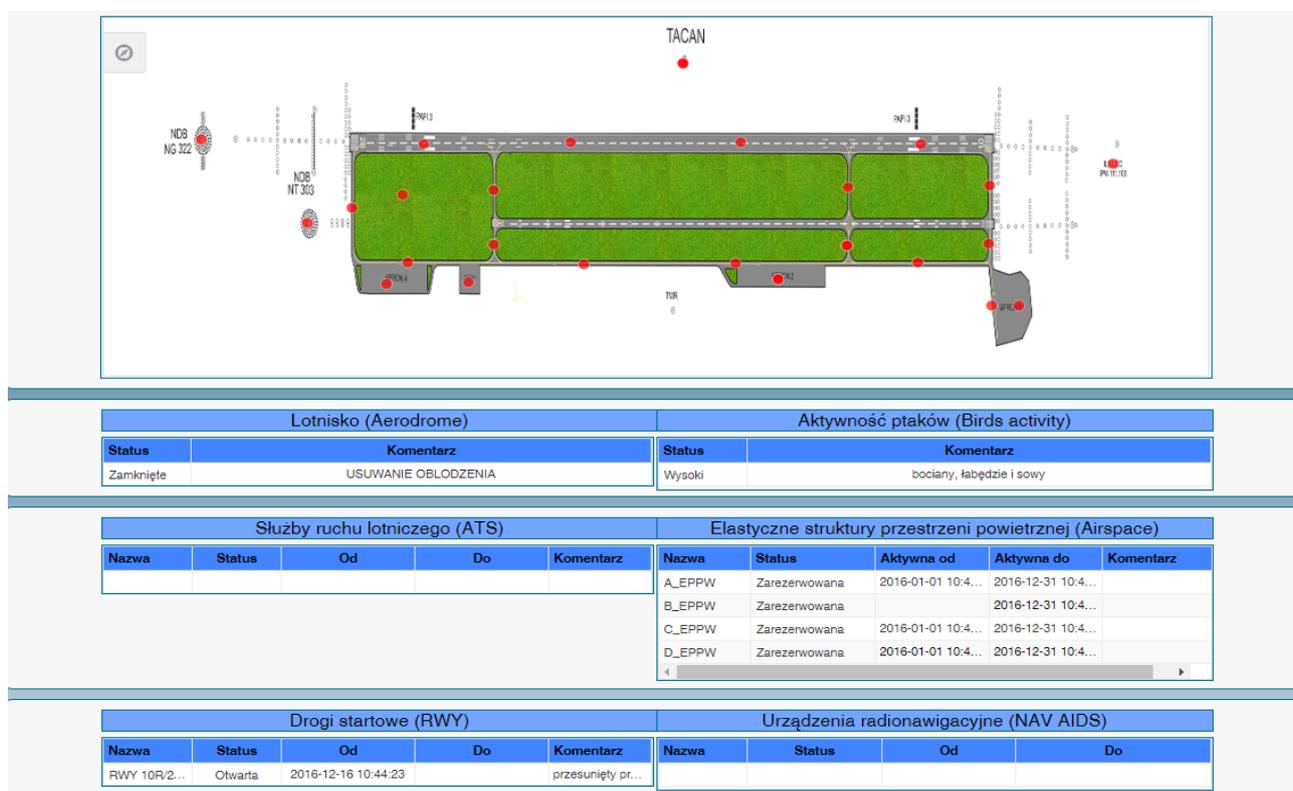


Fig. 3. Illustration of the completed form along with graphical interpretation

#### 4. Conclusions

Analysis and evaluation of the air traffic control system pays particular attention to the level of importance of performed tasks by the entity (organization). Moreover, now there are no IT support tools for security system, which would collect information on incidents, which happened during the execution of the duties of air traffic services controller. Taking into consideration that these operations relate to all air traffic controllers of Polish Armed Forces (over 430 people) having at least one permission, monitoring the respect of deadlines of their implementation is difficult and time-consuming. Also does not offer selective or comprehensive insight into the news of permission or medical examinations of LOSRL personnel, which directly translates into maintaining a high level of security.

It should also be noted that ST TURAWA implemented and functioning since 2011 intended for analysing and evaluating flight safety of aviation of Polish Armed Forces will be additionally increased information on air traffic. Such a broad spectrum of information will allow for planning and forecasting of prevention activities essentially influencing the improvement of flight safety of aviation of Polish Armed Forces. The newly developed system should support SSRL with its functions in terms of the acquisition, processing and storing information relating to direct action of the above-mentioned personnel.

#### References

- [1] Gołda, P., Zieja, M., Zaworski, T., Kurzyk, B., *System informatycznego wsparcia Służb Ruchu Lotniczego*, Prace Naukowe Politechniki Warszawskiej, Transport, Z. 107, 2015.
- [2] *Instrukcja Ruchu Lotniczego Sił Zbrojnych Rzeczypospolitej Polskiej* (IRL-2013) Warszawa 2013.
- [3] Zieja, M., Smoliński, H., Gołda, P., *Information systems as a tool for supporting the management of aircraft flight safety*, Archives of Transport, Warsaw 2015.