

# THE NEED TO INCREASE SAFETY AT UNCONTROLLED AERODROMES

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*Summary: This article analyzes the problem of heavy traffic on small uncontrolled aerodromes, which is not solved and due to this arise emergency situations, and suitability of introducing surveillance monitoring system for AFIS officers to increase safety of general aviation. In this article it is also mentioned appropriate procedure for determining on which aerodromes should be obligatory surveillance system.*

*Key words: AFIS, AFIS Officer, ATZ, ADS-B, MLAT*

## INTRODUCTION

There are three types of aerodromes in terms of providing information and control services. These are controlled and uncontrolled aerodromes where the uncontrolled ones can be divided into aerodromes with AFIS and without it. At controlled aerodromes air traffic control service, emergency service and search and rescue are provided. At uncontrolled aerodrome with AFIS (AFIS Aerodrome) aerodrome flight information service and alerting service are provided to all known flights. And just in terms of traffic density AFIS aerodromes are very busy in nice weather and AFIS officer may have a problem with keeping overview of aircrafts falling within its scope, in other words, of aircrafts in Aerodrome Traffic Zone (ATZ). Therefore it would be useful to determine if he should not have information from surveillance system.

## 1. AFIS AERODROME

AFIS aerodrome is defined in Annex 11 Appendix N – “Aerodrome Flight Information Service (AFIS)” as an uncontrolled airport, where was decided that flight information service (Aerodrome Flight Information Service) and emergency service to known operations will be provided at the aerodrome.

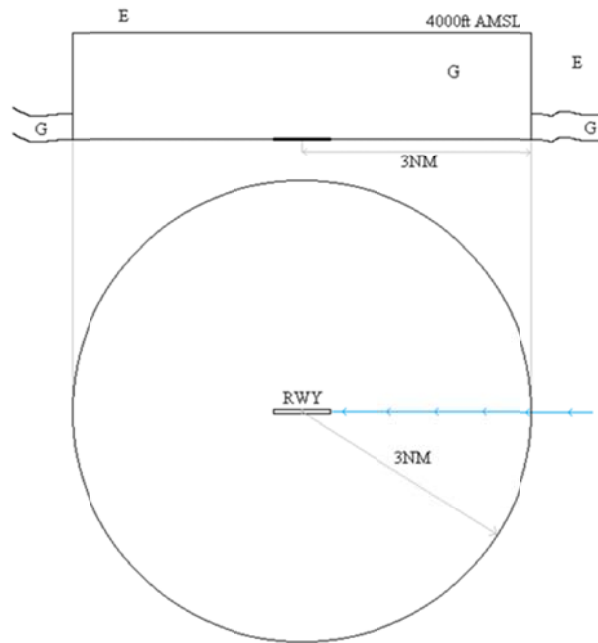
### 1.1 Communication

Aircraft entering the ATZ and intending to move on the aerodrome (departure) must report to AFIS Officer. This is the basic procedure, which indicates that the AFIS officer must have a complete overview of the operation which monitors. At the present, all transmission of information take place only via radio communication, where AFIS Officer must provide information about the surrounding traffic, distribute meteorological information, "manage" the use of runways and initiate and assist rescue forces in case of an air accident or incident.

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Source: (Authors)

Fig.1 – Aerodrome Traffic Zone

## 1.2 AFIS Officer's Rights and Obligations

AFIS officer is responsible for providing aerodrome flight information service and alerting service to all known operations at the aerodrome and in ATZ. This is his sole duty, but from which came heavy workload on his person, because, as specified in the regulations, there is only one officer and in the same time the number of aircraft may reach two tens. This poses a problem mainly in terms of keeping overview of situation while still averting imminent danger. All of this must be done only from the perspective of information services, therefore by using command and prohibition. AFIS is not authorized to issue clearance.

## 2. COMPARISON OF THE PRINCIPLE OF PROVIDING SAFETY AT AERODROMES

At controlled airports safety is given by the presence of ATC, issuing clearances and providing separations. ATC therefore ensure that no two aircraft converge or even crash. ATC also ensures separation between aircrafts and ground vehicles. This safety is maintained thanks to surveillance systems, which outputs ATC operator can see on the screens in front of him. At the same time ATC operators on tower have possibility to compare this information with the position reported by radio and with the visual information from the window, when visibility is good.

It is important to note that at controlled airports the responsibility for the safety of air traffic lies on the ATC controllers.

AFIS aerodromes are greatly disadvantaged in options of check and ensuring safety of air traffic, because safety is the responsibility of each pilot and AFIS officer cannot really

intervene to their intended movement. On the other hand, AFIS officer has a duty to prevent aircraft collisions. Therefore, he must rely on position reports from each aircraft and maintain situational awareness.

Tab. 1 – Comparison of aerodromes in Czech Republic

Type of aerodrome	Number of AD in CR (3)	Maximal number of aircraft „controlled“ by one controller/AFIS officer
Controlled	8	Up to 7
AFIS	84	Up to 20

Source: (Authors)

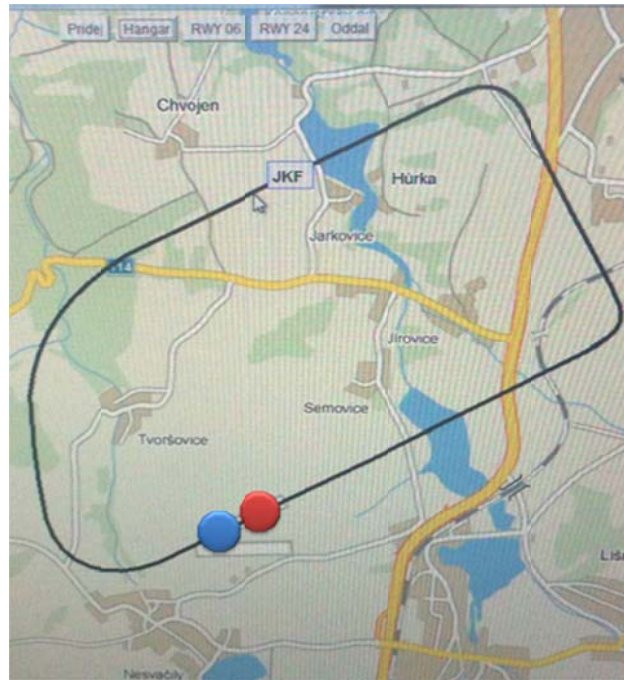
### 3. INCREASING SAFETY

Main direction, which could be taken to increase safety at uncontrolled aerodromes, results from different conditions for "control". As mentioned above the situation overview is provided to controller by means of screen situated in front of him. As far as AFIS officer is concerned, he has not such equipment. Therefore the introduction of surveillance information appears to be the correct system to introduce.

By now, some uncontrolled airport work on this problem and tries to reduce the workload of AFIS officer, through inventions of various simple solutions, which unfortunately in certain cases brings more problems than they are able to solve.

#### 3.1 Example of current efforts to reduce the workload of AFIS officer

One such solution is a primitive application for the computer. As a foundation is used map freely available on the Internet, on which is drawn the traffic circuit. Furthermore, database of the most common types of aircraft with their average speed characteristic is created. Based on the position reports from pilots AFIS officer adds dots in the map and they follow the indicated traffic circuit. This should lower the workload of AFIS officer with remembering all aircrafts in the ATZ. Unfortunately it is not so, because AFIS officer "plays" with the computer and does not have time to check the reported positions from aircraft by looking out the window. So playing with the system creates a situation where the officer can "lost" some aircrafts or have no time to communicate and transmit information to pilots.



Source: (Benešov Aerodrome)

Fig. 2 – Primitive surveillance information

### 3.2 Other existing options

From the above it can be seen that ensuring the acquisition of surveillance information should take place on a more professional level. It is clear that the use of information (i.e. data sharing) from the classical surveillance infrastructure operated by ŘLP ČR, s. p. (the Czech ANSP) is unusable for AFIS in most cases because ATZs are generally located under the coverage map of these systems. For this reason it is necessary for the purposes of ATZ coverage install other surveillance systems.

There are two problems, funding of such system and attitudes of CAAs, which don't currently plan that introduction of a "transponder for GA" should be mandatory.

### 3.3 ADS-B

ADS-B appears as a promising technology for that purpose. It is also clear that the technology cannot be comparable to the systems used by national air navigational service providers, because such systems are very expensive and AFIS aerodromes cannot afford it. Therefore, the path to the solution is moving towards the use of technologies built on the so-called "low-cost" ADS-B receivers that were used only in the "amateur" sphere in the beginning, but over time, the sophistication of these systems reached the level which could be sufficient for the AFIS needs. It is a certain kind of compromise between performance (ie, strict requirements for such systems used by air traffic control) and price.



Source: (6)

Fig. 3 – Screenshot of “low-cost” ADS-B overview information

### 3.4 MLAT

Certain mitigation of ADS-B surveillance technology problems in implementation for AFIS aerodrome could bring a combination of technology, ADS-B and multilateration (MLAT). Multilateration is already managed for many years and surveillance systems built on this principle are normally supplied by a wide range of manufacturers. MLAT systems are commonly used by ŘLP ČR, s. p. as a proper surveillance system, which in many aspects outperform conventional secondary surveillance radar (SSR).

However, price level of currently supplied multilateration system for aviation domain discussed in this paper is unavailable.

Application of MLAT methods would allow:

- Monitor aircraft that are equipped only with the A/C transponder.
- Monitor aircraft that are equipped with Mode S transponder, but for various reasons the transponder does not support 1090 ES on which is based ADS-B in Europe. For example the SSR Mode S transponder is not upgraded to the 1090 ES technology or transponder cannot provide adequate data from on-board avionics systems (e.g., GNSS receiver).

- Verify the information provided in the ADS-B reports. As the experiences from a large aviation suggest many reports are spoiled by wrong information (even dangerously misleading information), despite the strict rules applied in the area of new installations. It could be expected, that this problem will be much greater in general aviation because of the greater variety of avionics systems and their installation in GA aircrafts.
- It can eliminate the risk arising from the possibility of intentional false targets generation.

### **3.5 Other systems**

The above systems are the "professional" solution for obtaining surveillance information. From the perspective of AFIS would be certainly possible to develop a simple transmitter of position information for GA aircrafts and this information would be shown on the screen for AFIS officer. However positional signal still would have to be obtained from the GPS (in combination with SBAS).

## **4. UNCONTROLLED AERODROMES WITH THE SURVEILLANCE SYSTEM**

It is certain that it is not in financial capacity of all GA participants to ensure surveillance system for AFIS at each aerodrome. The main obstacle is the finances of aerodromes, when small aero club aerodromes could barely finance their own operations and investment of tens of thousands is impossible for them. Therefore it is necessary to develop a methodology assessing the safety of aerodromes, ideally with the use of safety indicators, which after its application for specific aerodromes will be able to determine whether it would be justified, in relation to the safety, to introduce a surveillance system for AFIS.

## **5. THE USE FOR FURTHER DEVELOPMENT**

The introduction of any surveillance information for AFIS is essential for further development of General Aviation, which could be the introduction of IFR operations at uncontrolled aerodromes. IFR traffic is currently dependent on air traffic control and at the uncontrolled aerodromes or in uncontrolled airspace could rely on information about the surrounding traffic from AFIS officer, which would be supported by a surveillance device and not just by his memory.

The Czech Republic has already created new guidelines for AFIS certification, providing for this service more difficult conditions and rules which must meet. Force of this directive, however, was postponed because most AFIS aerodromes would not comply with it. So it could happen that the rule "an uncontrolled aerodrome is AFIS aerodrome" will no longer apply in the Czech Republic.

## **CONCLUSION**

In this article, we pointed out the problem of General Aviation, which is heavy traffic "controlled" by one person. From a simple comparison of ATC controller and AFIS officer workload can be seen that officers communicate with many times the number of aircrafts and

still do not have any support in some surveillance system. It is therefore necessary to create a simple surveillance system for AFIS officer, but also to evaluate its positive contribution.

There are two systems that could be used for obtaining surveillance information (ADS-B, MLAT). In the present the price of nowadays installations is the main disadvantage. Here is space for the adjustment of these systems, or creating a new system, which must be mainly characterized by a very low costs and sufficient accuracy.

Before introducing a similar system it is therefore necessary to develop a methodology that would assess the operational safety of aerodromes. The outcomes of this evaluation must be used to developing requirements for the surveillance system, and then enforce its introduction at selected aerodromes.

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