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## Road and Rail Infrastructure IV

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## CROATIAN AIRFIELDS – POTENTIAL FOR AVIATION TOURISM DEVELOPMENT

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### Abstract

Similarly to potential of nautical tourism, which was unexplored until the construction of ACI marinas in the 80s, aviation tourism is insufficiently exploited branch of tourism in Croatia. The potential for aviation tourism development lies in the existing market potential of the European Union with about 100 000 registered private sport aircrafts (general aviation) and 300 000 pilots and potential of annual indirect income of approx. 40 mill. €. Great potential for development of aviation tourism in Croatia lies also in already available infrastructure. Namely, there are 20 airfields in the Republic of Croatia among which some are only insufficiently exploited, while others are abandoned and undeveloped. In this paper, project “FLY Croatia” will be presented, project with the of enhancing the development of aviation tourism in Croatia. The main emphasis in the paper will be given to an overview of the current state of Croatian airfields. Studies assessing the state of three existing airfields: Osijek-Čepin, Pokrovnik and Vis as the potential for its reconstruction will be also presented.

*Keywords: FLY Croatia, airfield, airfield study, general aviation, tourism*

### 1 Introduction

With an exceptional number of natural beauties on a relatively limited territory and with favourable climate conditions, Croatia has the potential of being the one of the most competitive countries on the European Union aviation tourism market. However, similar to potential of nautical tourism which was unexplored until the construction of ACI marinas in the 80s, aviation tourism is insufficiently exploited branch of tourism in Croatia. If we compare airports (Zagreb, Dubrovnik, Split, Osijek, Rijeka, etc.) in which classic passenger aircrafts are operated, with ports that handles large cruisers, then the potential network of airfields can be compared with the ACI marina network.

The potential for the development of aviation tourism is reflected in the considerable number of private, sport aircrafts and pilots and the fact that Croatia can be reached by a general aviation aircraft from any European destination in few hours’ time and up to two stopovers. According to available data presented in Table 1, within our region there is great aviation tourism potential reflected in number of private general aviation aircrafts, as well as registered general aviation pilots.

**Table 1** Number of licensed pilots and general aviation aircrafts in surrounding countries [1]

Country	Licensed Civil Pilots	Active General Aviation Aircrafts
Germany	87 894	20 687
Austria	3 000	893
France	41 000	2 800
Poland	4 030	907
Slovenia	2 500	144
Spain	2 500	4 500
<b>Total:</b>	<b>140 924</b>	<b>29 931</b>

Within 3 hours of flight time, a small, single-engine general aviation aircraft can cover a distance radius of about 1 000 kilometres, and the average number of passengers in these planes is 2-4 persons. Beside classic vacation periods, private aircraft allows for shorter weekend breaks in distant destinations, which is very difficult to achieve by a classic land transport. Favourable weather and climate conditions in Croatia enable prolongation of the aviation tourism season to almost all year round. Aviation tourism involves service offers for guest aviators who use private or club-owned general aviation aircraft for the arrival / departure or sports activity. General aviation include commercial, private or training flying by sailplanes (hang-glider and paraglider), skydiving aircraft, ultralight aircraft, as well as kit-built (so called experimental) crafts for recreational flying. The category of general aviation planes (Figure 1) includes all single-engine or two-engine minor piston and turboprop aircraft. The most recognised manufacturers are Cessna, Piper, Cirrus Design, Diamond, Mooney, and Beechcraft.



**Figure 1** General aviation aircrafts

Although somewhat similar, the concept of aviation tourism is essentially different from the well-known concept of fly-in community or Airpark. Fly-in community or Airpark refer to a community specifically designed around an airport and features one or more runways with homes adjacent to the runway. Within this concept, each resident would own their own airplane and park it in their own hangar usually attached to the home or integrated into their home. This parks are usually privately owned and restricted to use by the property owners and their invited guests and do not include commercial businesses. A large number of such settlements are organized in the United States (Figure 2).

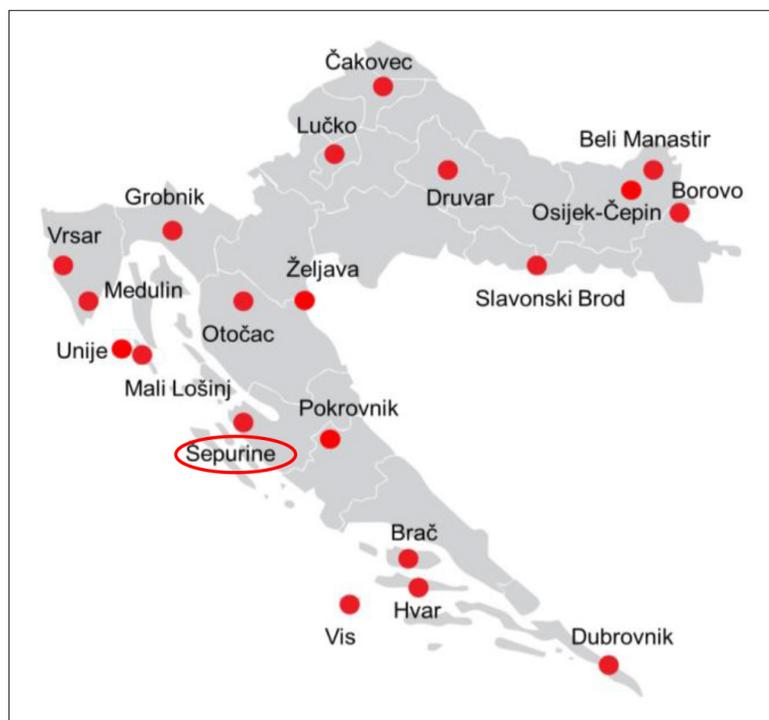


**Figure 2** Fly-in community in the USA [2]

The concept of aviation tourism does not include the construction and sale of real estate (such as the concept of Airparks), only the construction of infrastructure necessary for the reception

of the guests, secure parking for general aviation aircrafts and smooth running of flight preparation and operation (i.e. briefing rooms). This means that the potential for development of aviation tourism in Croatia is already available and lies in all locations wherever airfields exist or may soon be revived.

The potential for aviation tourism and needed infrastructure development has been identified in the project FLY Croatia, Croatian aviation tourism program. Within the project, the ground idea for aviation tourism development in Croatia is based on the activation of existing (abandoned or underused) airfields and construction of the first specialized aviation tourist resort in Šepurine airport near the city of Zadar (base airport). Šepurine as a former military airport, although today abandoned and completely devastated, poses the existing runway and accompanying facilities. It is located at the central position of the Croatian territory, and all other airfields are quickly and easily accessible (Figure 3). Another very important determination in the development of aviation tourism is the fact that this is an area with a pleasant medium-Mediterranean climate and area with the least foggy days a year. This resort would serve as a starting-point from where incoming tourists will be able to travel by their private airplanes, rent-a-car vehicles or charter vessels, all over Croatia and visit our cultural and natural heritage through an organized system of tourist and sports trips. The network of existing airfields in Croatia is shown in Figure 3.



**Figure 3** Croatian airfields map and Šepurine – the base airport

Although there are runways of sufficient length (more than 600 m) at all existing airfields, only few of them have modern pavement (asphalt) and supporting infrastructure is generally poor or non-existent. In order to satisfy aviation regulations and increase tourism competitiveness, all these airports should standardize equipping and maintain to a specific technical level. Within this paper, possible reconstruction of 3 existing airfield will be presented in order to meet technical requirements for potential aviation tourism development.

## 2 Osijek-Čepin airfield

Airfield Osijek-Čepin is located 3 km south-west from the Osijek city centre. It was built in 1962 with unpaved (grassy) runway length of 1 200 m and the width of 60 m. The width of runway strip is 150 m. In order to accompany development of general aviation in East Croatia, but also to take over traffic from Klisa airport closed during the wartime, existing Osijek-Čepin airfield needed to be upgraded to a higher level of equipment and reconstructed. During 1995, the runway was paved; taxiway and apron were built, leading to existing port complex. After the war, Osijek Airport (Klisa) re-established operations and Čepin airfield is now used only for general aviation operation.

Osijek-Čepin airfield is equipped with two non-instrument runways, paved (asphalt) and unpaved (grass) (Figure 4). Paved runway is 1 200 m in length and width of 30 m, with runway end safety area (RESA) length of 30 m from the edge of runway strip. At both ends of the runway, there are turn pads length of 40 + 15 m and width of 15 m. Unpaved runway is also 1 200 m in length and the width of 45 m. Reference code of Osijek-Čepin airfield is B2, according to valid Airports regulation [3].



Figure 4 Osijek-Čepin airfield

Due to the fact that Osijek-Čepin airfield is intended only for recreational and sport activities of general aviation, all movement areas are intended for aircraft of apron (ramp) mass equal to or less than 5 700 kg. Thus the bearing strength of a pavement is defined as 5 700 kg/0,23 MPa. Osijek-Čepin airfield is listed as an aerodrome that has been permanently approved under the Article 74. of Air Traffic Act (Official Gazette no. 69/09, 84/11, 54/13, 127/13 and 92/14). Due to the good condition (Figure 5) of existing movement areas (paved and unpaved) defined and presented in study Proof of Čepin airfield movement areas state (Faculty of Civil Engineering Osijek, 2013), this airfield requires minimal investments in terms of supporting infrastructure modernization to comply with FLY Croatia project requirements.



Figure 5 Osijek-Čepin paved and unpaved runway, current state

### 3 Pokrovnik airfield

The Airfield Pokrovnik is located along the state road D 33, about 20 km from the town of Šibenik which makes this location also very convenient for aviation tourism development. Current state of Pokrovnik airfield movement areas in terms of bearing strength of pavement and surface characteristics (evenness, friction) makes it unsuitable and unsafe for flight operations. Movement areas have macadam surfacing, poorly maintained, with low and medium-high vegetation along and on the runway (Figure 6). The length of the existing runway is approximately 1000 m and the width is approximately 30 m. Taxiway and apron is also in improper condition, similar to the runway. Position of existing taxiway and apron are at the half of the runway. The length of taxiway is approximately 100 m, and the width is approximately 15 m. The apron dimensions are approximately 55 m x 100 m.



Figure 6 Existing Pokrovnik airfield

The airfield is located at one cadastral parcel that was one of the limiting parameters for the determination of basic technical elements. Basic technical elements for Pokrovnik airfield reconstruction and modernization are selected in accordance with the valid Croatian regulations [4]. Due to optimal utilization of available space, airfield reference code is defined as B2. Antonov AN-2 (MTW = 5500 kg) was selected as the critical aircraft type. Instrument runway is designed with length of 840 m and width of 30 m, with RESA in length of 30 m from the edge of the runway strip. New position of apron is defined at the north threshold, in order to allow easier access to existing roads (Figure 7). Apron is designed with the dimensions of 100x70 m. The apron and the runway are connected by a taxiway with length of 75 m and width of 11 m.

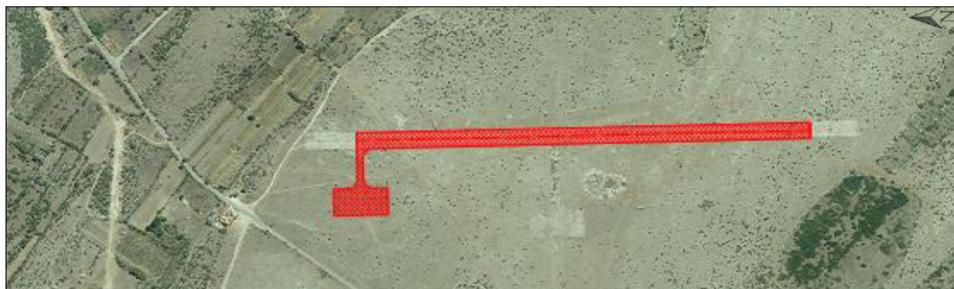


Figure 7 Potential for Pokrovnik airfield modernization

Even though the current state of Pokrovnik airfield does not meet criteria for safe and comfortable flight operations, within short time and reasonable investment it could be brought to satisfactory state with possibility to build unpaved runway in the first stage, followed by future modernization into paved movement areas.

## 4 Vis airfield

The airfield Vis is located on the site of the former Second World War military airport (Figure 8). It is located along the state road D117, the only state road on the island of Vis which makes this location very convenient for tourism development.



**Figure 8** Potential for Vis airfield modernization

The length of the existing runway is about 1050 m and the width of approximately 60 m. Taxiway and apron are not constructed. Movement area of the existing airfield is in unfavourable condition, poorly maintained and neglected, with high vegetation. Vis airfield reconstruction is foreseen in two phases [5]. First, unpaved movement areas are to be constructed and after creation of favourable conditions, paved (asphalt) movement areas are to be constructed.

The main limiting parameter for airfield basic elements definition is cadastral parcel width of approximately 60 m at which existing airfield is located, but also some private cadastral parcels at the apron position. Before any reconstruction works, the ownership relations must be defined.

In accordance with valid regulations [3] and due to the available space, reference code of Vis airfield is defined as B1 while for critical aircraft type DHC6 Twin Otter Series 300 (maximal take-off weight (MTW) = 5600 kg) is selected. Non-instrumental runway, with the length of 799 meters, width of 30 m and RESA length of 30 m is foreseen. Runway strip is foreseen with the width of 60 m and the length of 859 m. At both ends of the runway, RESA is foreseen with length of 30 m and a width of 60 m. Apron is foreseen in the first third of the runway length connected to runway by taxiway with the length of 97 m and width of 11 m.

A prerequisite for the implementation of the second reconstruction phase is resolution of property and legal issues due to the need of increasing runway strip width. Within this phase, construction of paved movement areas is foreseen, as well as geometry correction due to the increasing traffic. Runway with the length of 1020 m and width of 30 m is foreseen, while runway strip is foreseen with the dimensions of 80 x 1140 m. Apron and taxiway would remain at the same position and with the same dimensions.

Due to the current state of Vis airfield movement areas (Figure 9), there is a need for significant reconstruction actions in order to fulfil standards and regulations for safe aviation operations. However, within two reconstruction phases and reasonable investments there is a huge potential for Vis airfield development into desirable aviation tourist destination.



Figure 9 Existing Vis airfield

## 5 Conclusions

Although Croatia has the potential to be one of the most competitive countries within the European Union aviation tourism market due to its territorial shape, natural beauties and favourable climate, this branch of tourism is almost non-existent. The potential for development of aviation tourism recognized within the project FLY Croatia, Croatian aviation tourism program lies in significant number of existing airfields. Although there are runways of sufficient length at all existing airfields, only a few of them have modern pavement (asphalt) and supporting infrastructure is generally poor or non-existent. In order to satisfy aviation regulations and increase tourism competitiveness, all these airports should standardize equipping and maintain to a specific technical level.

In this paper, three existing airfields are presented with different infrastructure quality. Based on the presented studies it can be concluded that within reasonable time and investments, many of the existing airfields could be modernized and developed into desirable aviation tourist destination.

Finally, it is important to mention that after meeting the necessary technical requirements, all airports can be used as a multifunction unit for special purposes of strategic importance such as organization of air ambulance service or services for fire control. From the construction point of view, we can conclude that paving of only 20 km of runways can connect the entire country within itself, but also to the entire region.

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