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AERO-2 AIRCRAFT IN THE SPORTS AVIATION OF YUGOSLAVIA

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Apstract: When in 1957, the delivery of Aero-3 school airplanes to JRV began (in addition to two prototypes in 1954, 55 in 1957, 36 in 1958, and the last 20 in 1960, i.e. a total of 113 with prototypes), it was decided to most of the remaining Aero-2 aircraft were given to the Air Force of Yugoslavia. Already in 1957, the first 23 Aera-2Cs were delivered to VSJ, in the following year 1958, 20 Aera-2Ds were delivered, in 1959, 42 Aera-2Cs, in 1960, 38 Aera-2DEs, and finally in 1961, another Aero- 2DE, i.e. a total of 124. However, the technical inspection of the Aero-2 aircraft was still not carried out by the Civil Air Force, because these planes were not registered with the Administration, but were kept in the registry of the JRV Command. However, the dualism regarding the control of the Aero-2 aircraft led to the fact that the control was not effective and that again to frequent accidents. Therefore, the Aviation Material Inspectorate proposed appropriate measures to the JRV Command. It was requested that the command decide or that the military control take care of the pilots who fly on these planes, regardless of whether the pilots are civilians or military personnel, or that the planes be registered in the civil registry so that all the measures that are applied to them also apply applied in the civil registry. The Command decided on the second solution, that is to register the Aero-2 aircraft in the Civil Aircraft Register of the SFRY. However, the scrapping of Aero-2 aircraft was also high in VSJ, so that in 1963 only 75 of them received civil registration. The very next year, in 1964, another Aero-2 (YU-CVN) was registered as the last 76th registered.Aero-2 airplanes were withdrawn from use in VSJ very quickly so that on 12/31/1967 there were only 10 of them and on 12/31/1970 only one more YU-CRC in Sarajevo. He will remain in the register until December 31, 1975, while he will no longer be in the register for the following year.

Keywords: Aero-2 Aircraft, Sports Aviation, Yugoslavia, Civil Aviation Register

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Introduction

The Aero-2 aircraft played a significant role in the sports aviation of Yugoslavia during the mid-20th century. Initially utilized by the Yugoslav Air Force (JRV), these planes were later transferred to the Yugoslav Sports Aviation (VSJ) between 1957 and 1961. Despite their widespread use, issues related to dual control and registration posed challenges, leading to frequent accidents and debates over regulatory measures. This study explores the operational history, technical challenges, and eventual withdrawal of the Aero-2 aircraft, shedding light on their contribution to the development of sports aviation in Yugoslavia.

Aircraft Aero – 2

The Aero-2 training aircraft is one of the most important domestically designed and manufactured aircraft, although it was a relatively unsuccessful design. Namely, it is not only one of the most mass-produced Yugoslav aircraft, but it is also an aircraft that left a strong impression not only in the Yugoslav Air Force (JRV) but also in the Yugoslav Air Force and even in the commercial aviation of JAT.

The problem of modernizing pilot training immediately before World War II was discussed throughout the world, including in the air force of the former Yugoslavia. With the introduction of the free-floating low-wing aircraft as the dominant concept for fighter aircraft at that time, it was believed that the basic training aircraft should also be transformed from a biplane to a low-wing aircraft.

In 1938, a group of junior aeronautical engineers and officers from the Army Air Force Command launched an action to convince the authorities of the necessity of replacing the already relatively outdated Fizir FN training biplanes with more modern low-wing aircraft that would facilitate the transition to fighter aircraft. Due to the great resistance of some conservative circles in the Command, the advantage of the low-wing aircraft had to be demonstrated in practice. Taking advantage of the fact that the Aeroclub also wanted a similar training aircraft, an agreement was reached on its production, so at the end of 1938, the Central Administration announced in the newspaper "Naša Krila" a competition for "the development of a project for a training and training aircraft for initial training in piloting for junior pilots" of wooden construction with a 75-95 hp engine and the ability to perform basic aerobatics. The works from the competition were submitted on March 15, 1939, and the only work that met the competition requirements was the Aero-1 aircraft project, which was developed by two young engineers, Boris Cijan and Đorđe Petković. It was the first powered aircraft project for both of them, although Cijan had previously designed gliders. Their work was awarded

25,000 dinars and the development of documentation for a prototype was requested. Under the influence of the aforementioned competition and the tendencies in most foreign air forces, during the spring of 1939, the Command's position on low-wing training aircraft changed, which was confirmed at a conference held on July 7 with representatives of the domestic aviation industry and universities. At that conference, a decision was made on the program for the development of domestic training, training and reconnaissance types. Among other things, a future initial training aircraft with a 120-135 hp engine was defined and a decision was made for the VV Command to announce a competition for its production with a deadline of 7 months, which it did on September 29, 1939. (Đokić, 2004, 34-35)

The competition required the design of a modern "wooden low-wing aircraft with an engine power of 120-135 hp". Three domestic aircraft factories participated in the competition: "Ikarus" (with the Aero-2 aircraft), "Rogožarski" (with the Brucoš aircraft) and "Albatros" from Sremska Mitrovica (with the Alka aircraft). All three prototypes had the reliable British de Havilland Gipsy Major engine of 130 hp, which the Army Air Force Command had planned to be the standard engine for future Yugoslav training aircraft. Otherwise, none of the prototypes received national markings (except for the national flag) or the insignia, i.e. the Army Air Force serial. It is interesting that the "Zmaj" factory also unofficially participated in the competition with its unsuccessful prototype of the biplane training aircraft Zmaj N. All three monoplanes were designed as cantilever low-wing two-seaters with a tandem seating arrangement and an open cockpit. In terms of aerodynamic and structural solutions, they were in no way inferior to, for example, the Soviet UT-2. Since they already had a project for an aircraft with similar flight characteristics, Cijan and Petković took advantage and immediately began work with the support of "Ikarus". This enabled "Ikarus" to complete the prototype designated Aero-2 on time. That factory, which in the spring of 1940 had brought the licensed production of the Bristol Blenheim to an end, developed a lively activity of building prototypes. Of the four "Ikarus" prototypes (at that time, the bomber Orkan, the experimental B-5 and the trainer MM-2 were also being built), the first to be completed was the Aero-2. Factory pilot Vasilije Stojanović performed the first test flight on April 24, 1940, and completed factory tests by May 24. The aircraft was immediately handed over to the Experimental Group. Tests and trials continued throughout the summer and autumn, and skis were also tested in the winter. (Janjić, 1984; Đokić, 2004, 35)

The Aero-2 prototype was purchased in early 1941 while negotiations were underway for the production of a series of 50 aircraft. The factory confidently counted on this work (the production of tools and some positions began), but serial production did not occur, for several reasons (difficulties in procuring Gypsy engines, the introduction of a large number of German Bicker Jungmann training aircraft and, of course, the most

important reason, the German attack). After the war, the two designers renewed their pre-war project and their aircraft was produced in large series in several versions, again by "Ikarus". (VA, P. 17, K. 39, F. 1, D. 9; Đokić N., 2004, 34 – 35)

In April 1941, the Germans seized the prototype of the Aero-2 (although it is not on the German list of seized aircraft from 20 May 1941) and then handed it over to the Air Force of the NDH, where it was used until the end of the war. In the list of seized aircraft from 17 September 1941, the Germans state that a Schullflugzeug AERO 2 mit Motor Gipsy Major 130 HP was seized in the "Ikarus". An unknown Croatian pilot defected to Klagenfurt on 7 May 1945 in an Aero-2 and left it there. (VA, P. 17, K. 372, F. 6, D. 2, sheets 45 - 46; Frka, Novak, Pogačić, 1998, 31; Mikić, 2000, 145; Likso, Čanak, 1998, 25)

The National Committee for the Liberation of Yugoslavia had already pointed out the need to restore aircraft production in September 1944. Just two days after the liberation of Zemun, on October 24, 1944, a meeting of representatives of aircraft factories was held to restore aircraft production. The removal of rubble, repair of installations and collection of machines, tools and materials began immediately.

In order to resolve the dilemmas regarding future aircraft for basic and transitional pilot training, and to elaborate in more detail the already announced competition, the study department at the RV Command had already formed a special working group in mid-1946, which later became part of the VTI, to develop tactical and technical conditions for the entire range of new domestically designed aircraft.

It was decided to design the following aircraft: (Arhiv VTU 1)

- an aircraft for the needs of the Yugoslav Air Force, with a 44.2 kW (60 hp) engine, in the category of tourist-sport aircraft found in flying clubs around the world;
- an aircraft for basic training of military pilots, with a 107 kW (145 hp) engine, and later with a 118 kW (160 hp) engine;
- an aircraft for transitional training for single-engine fighter aircraft with a 330 kW (450 hp) engine on the ground;
- transitional - combat twin-engine aircraft with two 330 kW (450 hp) engines for pilot retraining for bomber aviation.

The engines for the above-mentioned aircraft were intended to be procured from Great Britain or Czechoslovakia, while the 450 hp (330 kW) Ranger engine could be procured from American war surplus stocks in Western Europe. It was a single-stage compressor engine with an operating altitude of about 3,000 meters.

The Air Force announced an internal competition for the design of these aircraft. In addition to our design groups, designers from Bulgaria were also eligible to participate. Only the Lazarov design group from Bulgaria applied for the competition, with an aircraft for basic pilot training.

Even before the formation of the tactical and technical requirements for the aircraft to be built under the competition, a prototype of the Aero-2 aircraft was under construction, a project by engineers Boris Cijan and Đorđe Petković. It was a continuation of work on the pre-war project of the Aero-2 basic school aircraft with a 107 kW (145 hp) Gipsy Major engine. This aircraft fully fit into the category of basic school aircraft according to the competition requirements. The first flight of the prototype was made on October 22, 1946. (Arhiv VTU 3, 4) At a short ceremony after the first flight of the Aero-2 aircraft, General Eng. Mijalko Todorović emphasized in his short speech that based on the position of the Supreme Commander Marshal Tito, projects and production of certain types of new aircraft of our own design were being started, and that the Aero-2 was just one of them. This clearly shows that, contrary to some opinions, two years before the IB Resolution, there was a clear intention to develop the aviation industry in the country, and the Resolution itself only accelerated the implementation of those plans.

The category of aircraft for basic training meant an aircraft for basic training of professional pilots. In our conditions, at that time, it was an aircraft for basic training in military pilot schools. At that time, such aircraft were also used in military pilot schools around the world, but often also in civilian pilot schools. As a result of the competition, three types of aircraft appeared: Aero 2B, 211 and LAZ – 7.

The Aero-2 aircraft won the competition, the serial production of which began in 1947. Interestingly, on May 31, 1948, in order to accelerate the delivery of the Aero-2 aircraft, a contract was signed with the Bulgarian aircraft factory in Lovech for the production of 30 Aero-2D aircraft with a delivery deadline of December 1949. Of course, after the adoption of the IB resolution, this order was canceled by the Bulgarians. (Grupa autora, 1989, 245)

Incidentally, due to the delay in the delivery of Walter Minor engines from the export, the deliveries of Aero-2 aircraft equipped with this engine were also delayed. (Grupa autora, 1989, 245)

The original military registration numbers were: Aero – 2B (0401 – 0430), Aero – 2C (0431 – 0510), Aero – 2D (0511 – 0577), Aero – 2DE (0578 – 0591), Aero – 2BE (0851 – 0899), Aero – 2F (9761 – 9771 and 9773 – 9785) and Aero – 2E (9772).(Đokić, 2014, 175)

There were 151 Aero-2 aircraft in the JRV on January 1, 1958, and 141 on January 1, 1959. During 1958, 10 aircraft were written off. On January 1, 1962, there were a total of 93 Aero-2 training aircraft, of which 92 were in the Air Force (83 serviceable) and one serviceable in the Institute. (Arhiv VTU 7; Arhiv VTU 9)

The prototype of the Aero – 2B aircraft was completed on 19 October 1946. The first flight of the prototype was made on 22 October 1946. A series of 30 aircraft was put

into production on 1 January 1947 and production was completed on 31 March 1948, and all 30 aircraft were introduced into service during 1948. The prototype of the Aero-2C aircraft was completed on 17 July 1947. A series of 80 aircraft was put into production on 14 July 1947 and production was completed on 15 November 1948. All 80 were delivered to the JRV in 1948. The prototype of the Aero-2D aircraft was completed on 9 September 1948. A series of 120 aircraft was put into production on 1 January 1948. However, the production of these aircraft was quite late (the prototype was only completed on September 9, 1948!!!) and not all of them were completed as Aero-2Ds, but only 67 of them (all handed over to the JRV in 1949). During 1950, 13 of them were completed as Aero-2DEs, during 1951-1954, 39 of them were completed as Aero-2BEs, and in the meantime, in 1953, another one was completed as Aero-2DE. Interestingly, in 1957, one Aero-2BE was converted into Aero-2Ds. Meanwhile, in 1952, 18 Aero-2Ds were converted into Aero-2DEs, and since many aircraft of this version were written off (primarily due to accidents), on 31 December 1953, only 30 remained in the JRV. Aero-2E two-seater for courier service, with a closed cabin, with a Gipsy Major 10 engine, with 145 hp. Only a prototype was produced. The prototype of the Aero-2E aircraft was completed on 28 December 1948. It was delivered to the JRV in 1949. The aircraft was not mass-produced because it was decided to enter mass production as a courier modification of the Aero-2D, which was designated Aero-2DE. The Aero-2E remained in service until 1955, when it was converted into the Aero-2B. Single-seat agricultural aircraft Aero – 2F, with an open cockpit and dusting device, with a Walter Minor-6/III engine, power 160 hp. A series of 25 aircraft was ordered and production was completed on May 14, 1949. 24 aircraft were completed (military registration numbers 9761 – 9771 and from 9773 – 9785) while one was completed as Aero – 2E (military registration number 9772). Of these 24 aircraft, 21 were delivered in 1949 (16 to JAT commercial aviation and 5 to JRV) and 3 the following year in 1950 (all 3 to JRV). The first prototype of the Aero – 2H training and liaison seaplane was completed on August 14, 1949. The Aero-2H1 prototype was delivered to the JRV in 1949, the Aero-2H2 in 1950, the first Aero-2H3 in 1951 (converted into Ikarus in 1951 from the Aero-2D) and the second Aero-2H3 in 1952.(Arhiv VTU 1; Arhiv VTU 3, 4; Arhiv VTU 6; Arhiv VTU 8; Đokić, 2014, 157 - 160)

Aero – 2 in Yugoslav sports aviation

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When the delivery of Aero-3 training aircraft to the JRV began in 1957 (in addition to two prototypes in 1954, 55 in 1957, 36 in 1958, and the last 20 in 1960, i.e. a total of 113 with prototypes), it was decided to hand over most of the remaining Aero-2 aircraft to the Air Force. Already in 1957, the first 23 Aero-2Cs were handed over to the Yugoslav Air Force, the following year, in 1958, 20 Aero-2Ds were handed over, in 1959, 42 Aero-2Cs, in 1960, 38 Aero-2DEs, and finally in 1961, another Aero-2DE, i.e. a total of 124. However, the technical inspection of Aero-2 aircraft was still not carried out by the CV Administration Commission because these aircraft were not registered with the Administration, but were kept in the register of the JRV Command. In accordance with the CV Administration Act No. 09 – 2059/2 of 1 July 1959, the issuance or extension of airworthiness documents, as well as the technical inspection and control of these aircraft were carried out by military authorities, and in this regard, military documents were valid. (Arhiv VTU 5; ZA 3; Đokić, 2014, 161)

The entire series of Aero-2 aircraft delivered to the Yugoslav Air Force had their wings replaced, eliminating the unfavorable flight behavior at increased angles and the problem of streamer separation that had previously existed. The Aero-2 aircraft in service with the Yugoslav Air Force behaved completely normally in the air over the entire range of permitted operating speeds if the pilots adhered to them. (ZA 3)

On February 16, 1961, the Aviation Material Inspectorate allowed Po-2 and Aero-2 aircraft to drop containers weighing 50 kg (total maximum 100 kg) from their original bomb racks. The same decision allowed Roda aircraft to only be used for transporting materials but without ejection. As for the ejection itself, it could only be done from heights greater than 50 meters to prevent the container from bouncing. The Inspectorate also recommended that this approval be made mandatory by insurance against damage to a third party that could occur if the container were accidentally unhooked. (ZA 1)

Since the entire FNRJ began to talk about a market economy in the early 1960s, attempts were also made in the then VSFJ to make money on a commercial basis. Thus, in the spring of 1961, the Federal Aviation Center in Vršac installed a fogging device on two Aero-2 aircraft. One of these aircraft was, in fact, the original agricultural Aero-2F (military registration number 9765, later converted into Aero-2C) and the other was the original Aero-2C (military registration number 0451). Otherwise, the fogging devices were built according to the original drawings of Eng. Bratislava Petković, which were submitted by the Air Force Command of the Vršac Air Force. Accordingly, on June 24, 1961, Vršac requested the Civil Aviation Administration to grant them permission to operate them. (ZA 2; ZA 3)

Regarding the fogging treatment, testing was carried out in Vršac throughout 1961. According to the test results, approval was given that fogging could be carried out ex-

clusively for the purpose of further field tests, on three aircraft, one of which was stationed in Novi Sad, the second in Titograd and the third in Vršac. (Đokić, 2014, 162)

The test itself was approved because the wings were replaced on the entire Aero-2 series of aircraft, which eliminated the unfavorable flight behavior at increased angles and the problem of streamer separation that previously existed. The approved speed for terrain treatment was between 160 and 170 km/h at an engine speed of 1300 - 1900 rpm. If the pilots adhered to this, there was a reserve of about 200 to 500 rpm (about 25 hp) at full throttle, which was enough for extractions if necessary. The speeds mentioned were around or above 1.4 Vst (critical speed), which was above the normal speeds used in agriculture, which were around 1.3 Vst. All these data corresponded to terrains up to 1000 meters above sea level. (ZA 3)

Unfortunately, in the spring of 1962, the famous pilot Ivančević died in a plane crash in Žabljak. The terrain at 1500 meters (Žabljak) where the accident occurred was not intended for handling this aircraft because at that altitude there was a significant decrease in traction (engine power), and the safe speed range was different. Pilot Ivančević took off with half the permitted load (100 kg of emulsion), but still at that altitude the Aero-2 aircraft had a maximum climb rate of 1-1.5 m/s, which is absolutely insufficient because at that altitude dynamic updrafts and downdrafts easily occur, which can range from 3-5 m/s, which is far beyond the capabilities of this aircraft. Incidentally, the accident in which Ivančević died occurred on the first flight. Before flying to Žabljak, Ivančević used this aircraft to perform maintenance on the Aero-2 aircraft in Ulcinj, only to obtain the necessary funds for the maintenance of the Aviation Schools in Montenegro, since his republican subsidies were reduced in 1962. In Žabljak, an experimental destruction of locusts that had appeared there was to be carried out. (ZA 3)

After this accident, the Inspectorate, by its telegram, banned the use of Aero-2 aircraft in agriculture, despite the fact that there was no technical justification for this.(ZA 3)

However, the dualism in terms of control over Aero-2 aircraft led to the fact that control was not effective and this again led to frequent accidents. Therefore, the Inspectorate of Aircraft Material, by its order, st. pov. no. 2721 of 1962, proposed appropriate measures to the JRV Command. It was requested that the Command decide either that military control should also take care of the pilots flying on these aircraft, regardless of whether the pilots were civilians or military personnel, or that the aircraft be registered in the civil register so that all the measures that were applied in the civil register would also apply to them. (ZA 4)

The Command decided on the second solution, i.e. that the Aero-2 aircraft be entered in the Register of Civil Aircraft of the SFRY. However, the consumption of Aero-2 aircraft was also high in the Yugoslav Army, so in 1963 only 75 of them received civil

registration. Their civil registrations were as follows: from YU – COJ to YU – CON, from YU – CPN to YU – CPR, from YU – CRC to YU – CRS, from YU – CRV to YU – CRZ, from YU – CSM to YU – CTS (except for YU – CTF which was Kurir), YU – CTW, YU – CTX, from YU – CUF to YU – CUH, from YU – CUN to YU – CUP, from YU – CUV to YU – CUX, YU – CVB, YU – CVI, YU – CVJ and YU – CVM. Immediately following in 1964, another Aero-2 (YU – CVN) was registered as the last 76th registered. (Đokić, 2014, 162 - 163)

Aero-2 aircraft were very quickly withdrawn from service in the Yugoslav Air Force, so that on December 31, 1967, there were only 10 of them, and on December 31, 1970, there was only one more YU-CRC in Sarajevo. It will remain in the register until December 31, 1975, when it will no longer be in the register for the following year. (Đokić, 2014, 163)

Aero-2 aircraft donated to schools and Selenite organizations

At the end of their careers in the late 1950s and early 1960s, many Aero-2 aircraft were donated to elementary schools and Selenite organizations. Here are just a few examples: (Đokić, 2014, 163)

In the fall of 1959, at the RTV Belgrade game competition "Play with Us," a team of elementary school students from Čelarevo won first prize – Aero-2C aircraft No. 0465. The aircraft was exhibited in the elementary school yard.

In November 1959, the Selenite club "Ikar" from Sombor received an Aero-2 aircraft (open cockpit) as a prize for successful participation in the game "Selenite Flight Through Time" in which it placed among the five first-place teams. The aircraft is exhibited in the elementary school yard.

Members of the Selenite Club "Kosmos" from Orašje won the prize competition of Tehnikhe Novine and received a collective prize – Aero – 2 (with an open cockpit) which was presented to them on Aviation Day on May 21, 1960.

The Aero – 2C aircraft No. 0502 was presented, probably in March 1961, to the Selenites of Loznica and placed in the yard of the "Jovan Cvijić" elementary school.

The students of the "Zmaj Jovan Jovanović" elementary school were awarded the first prize in the Zmaj Award competition and received, probably in June 1961, the Aero – 2 aircraft as a gift from the Yugoslav Army.

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