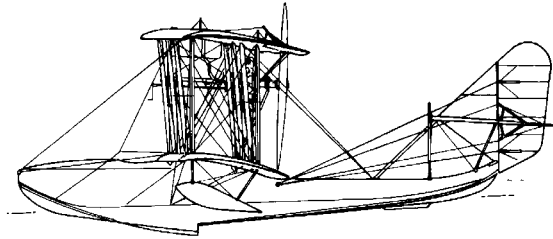


THE GRIGOROVICH FLYING BOATS



by Colin Owers

On 26 March 1917, Flying Sergeant Julius Thur and his observer, Naval Lieutenant Alexander Sergeev, were flying their Grigorovich flying boat over Lake Terko, on the Turkish mainland, when they were hit by anti-aircraft fire. They were part of a force of 12 Imperial Russian flying-boats launched by the Black Seas Fleet to carry out the attack on the Turkish capital, Constantinople⁽¹⁾. Four of the flying boats had attacked the dam on Lake Terko with bombs in an attempt to damage the city's water supply and now Thur was separated from his three companions with a holed fuel tank.

Sighting a small coastal sailing vessel, Thur landed nearby and Sergeev raked the deck with fire from his short barrelled 37 mm Hotchkiss cannon. This caused the Turkish crew to abandon the ship and the two Russian airmen boarded the vessel. After sailing for five days and nights through storms and heavy seas, they made landfall at Pereekop on the Russian coast, having journeyed the length of the Black Sea.

Such exploits seem to have become common for the products of the fertile mind of Dmitrii Pavlovich Grigorovich (1883 - 1938). Grigorovich graduated from the Kiev Polytechnic Institute in 1910 and was an aviation journalist before being employed by S.S. Shchetinin in January 1913.

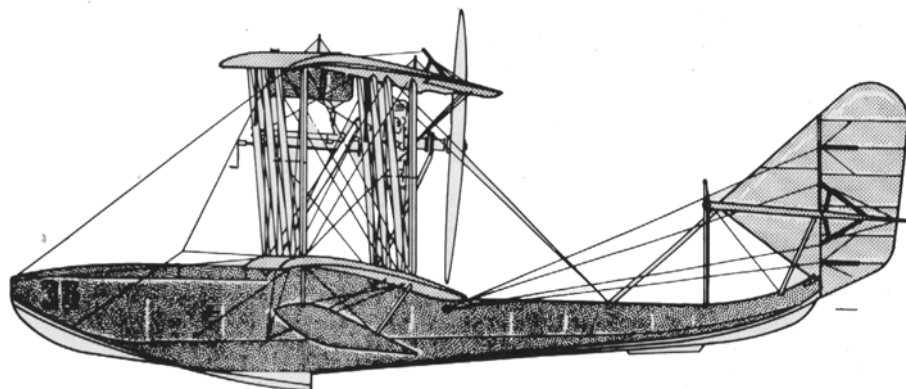
In 1909 the First-All Russian Aviation Limited Stock Company had been founded in St Petersburg by Shchetinin, a lawyer who was fascinated by aviation, and M.A. Shcherbakov, a wealthy businessman, with money borrowed from the Imperial War Department. The Technical Manager was P.A. Kharlamov, a polytechnic graduate. Grigorovich, on joining the company, was appointed to the position of Chief Constructor.

The company does not seem to have had much work until 1913. After building small batches of Nieuport IV and Farman F16 aircraft, they were approached by Commander D.N. Alexandrov to repair his damaged FBA flying-boat, which had sustained a crushed nose and other damage. Grigorovich tendered the lowest price and got the contract. It has been stated that the price was low because Grigorovich wanted to study the design of the French flying-boat. One story says that the repair work was so extensive that the flying-boat was re-designated as a Grigorovich design, the M-1, 'M' denoting *Morskoi* or 'Naval'. Grigorovich took about one metre (3.28 ft) off the nose, redesigned the wings and reduced the height of the step. This resulted in the aircraft exhibiting improved flying capabilities. It appears that the company received an order for a flying-boat of the Donnet-Leveque type and so it was no surprise that the boat which did emerge was of the FBA type.

The M-2 followed, being based on the M-1, which had proved acceptable to the Navy. First flown in 1914, it had an improved planning bottom for the hull. Four were ordered. The M-3 and M-4 were also designed in 1914 although the latter did not fly until the spring of 1915. Essentially they were refined M-2 'boats. Naval records contain no references to these two 'boats and they must have been factory prototypes.

The first Grigorovich flying-boat to be built in quantity for the Imperial Russian Navy was the M-5 of 1914. It was more commonly known as the Shchetinin 5, ShM-5 or Sh-5, after the constructing factory, the designer's name being rarely used. The M-5 was the first mass produced marine aircraft in Russia, some 300⁽²⁾ being constructed up to 1923.

The M-5 was a two or three-seat trainer and reconnaissance three-bay flying-boat of all-wood construction. The high-set fabric-covered tailplane had a large triangular fin and rounded rudder. The wings were of conventional construction around two spars, with wire trailing edges which developed a scalloped effect when covered with fabric and doped. Ailerons were mounted on the upper wing only. The hull was constructed of ash with a plywood covering. The upper surfaces of the hull were covered with 3 mm ply while the bottom had a thickness of 5 mm and 6 mm ply. The sides were made from 5 mm ply.



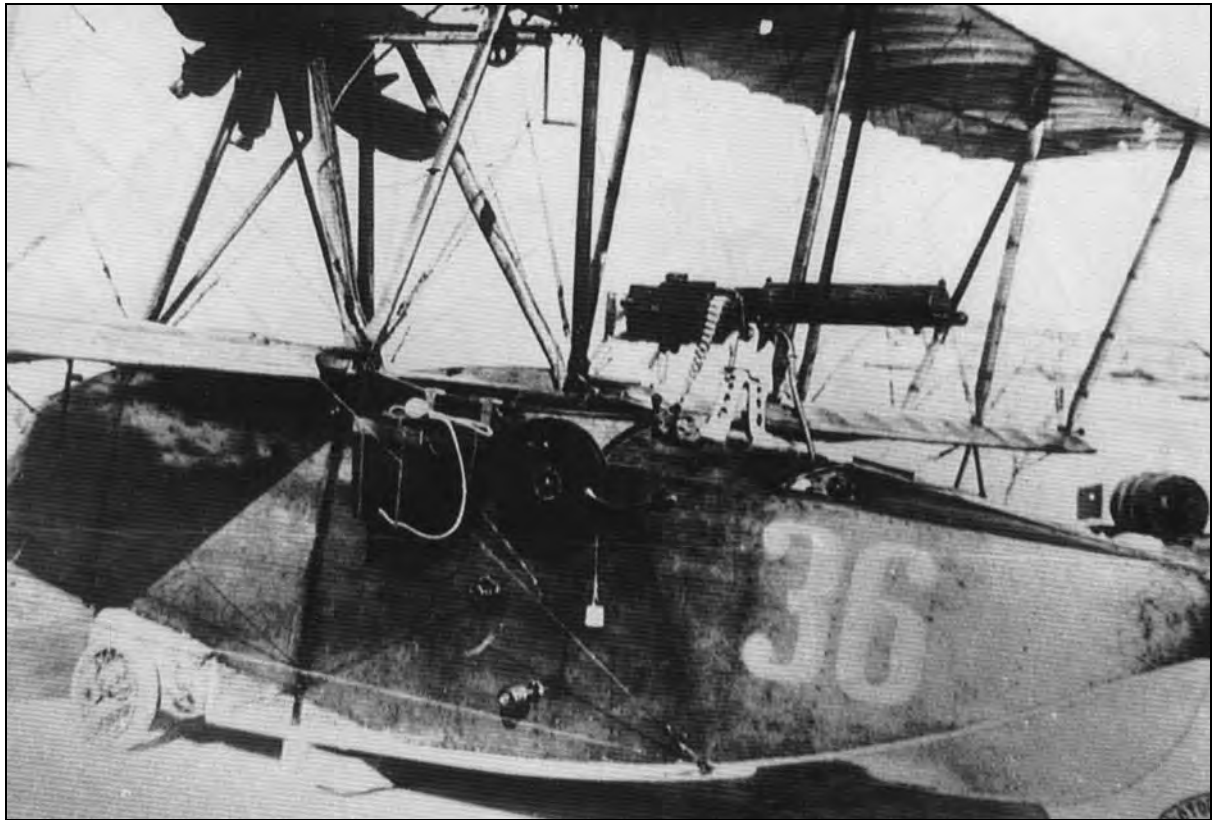
An Imperial Russian Naval M-5 with dark (grey) painted upper hull and white lower surfaces. Wings were clear doped fabric. The fleet number on the bow was highlighted.

The majority of M-5 boats were fitted with 100 hp Gnome Monosoupape rotary engines. However, some were fitted with the 110 hp Le Rhone and 130 hp Clerget. The engines were mounted in the pusher configuration. After the October Revolution in 1918 any engine which could be fitted was utilised.

Armament was usually a single Maxim 7.62 mm machine gun mounted on the nose of the aircraft. Bombs could also be carried under the lower wings. The M-5 had a useful payload of approximately 350 Kg. They were steadily improved over the years, with many minor variations being made. Used mainly for short reconnaissance missions along the coast, the type was also carried by the ships of the Black Seas Fleet until mid-1916, when they began to be replaced by the more powerful M-9.

The Grigorovich M-5 holds the distinction of sinking the largest merchant vessel to be sunk by aircraft during the 1914-1918 War. This occurred on 6 February 1916. The M-5 flying-boats were launched from the seaplane carriers *IMPERATOR NIKOLAI I* and

IMPERATOR ALEXANDR I during a raid on the Turkish Black Sea coal port of Zonguldak. The former German collier *IRMINGARD*, a vessel of 4,211 tons, was struck by one or more bombs and sunk. The vessel was raised on 25 February, repaired and put back into service, only to be sunk again by a Russian submarine in October.



A M-5 showing the standard armament of a single infantry Maxim 7.62 mm machine-gun

In 1915 the Imperial Navy required a larger and more powerful observation and light bombing flying-boat for their coastal bases. They ordered the Shchetinin company to develop a bigger flying-boat, to be powered by the 150 hp Salmson engine. The basic design was developed throughout the M-6 to M-8, in which Grigorovich tried out various experimental hulls and wing cellules to achieve the best hydrodynamic and aerodynamic design compromise. The M-6 is unknown, while the M-7 had a 150 hp Sunbeam water-cooled engine and rounded hull. It could not rise from the water, even when lightly loaded. It is not known if the M-8, a large 'boat, was even constructed.

The M-9 was quickly designed and the prototype was ready at Petrograd in December 1915. Testing took place from 25 December to 9 January 1916⁽³⁾, at Baku, on the Caspian Sea. The prototype was flown with a 140 hp Salmson *Canton Unne* radial engine. However, most production aircraft had 150 hp Salmson radials, which were imported from France in large numbers.

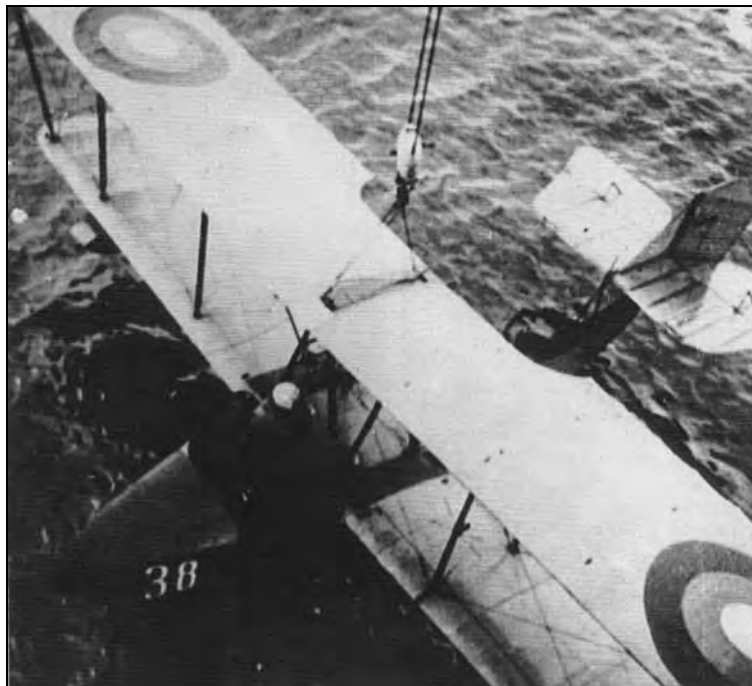
Construction was similar to the M-5 but the aircraft was larger overall. The fabric covered unequal span wings were constructed around two spars using plywood ribs with spruce caps and wire bracing. The rudder was fitted with a large horn balance. The hull was constructed of ash with a thicker plywood skin than before. The single stepped keel broadened at the front to give an unusual nose profile. The planing bottom was no longer concave, but Vee shaped. Although the crew compliment was officially three,

two were usually carried, the gunner moving forward to the front cockpit to operate the moveable Maxim 7.62 mm via a gangway inside the nose. Sometimes a cannon was installed. They were equipped with a Ruze wireless transmitter for communication with ship or shore bases.

The engine was again mounted in the pusher configuration, the high drag of the engine and large flank radiators being detrimental to the aircraft's performance. This was especially so because the rated 150 hp of the Salmson radial was not often achieved in fact. The top speed did not exceed 110 km/h (69 mph) and it's maximum ceiling was 3,000 m (9,800 ft).

Despite the heavy, low-powered engines and inadequate maintenance carried out under primitive conditions, the M-9 was well liked by its crews. It could handle a rough sea with waves up to 500 mm (1.6 ft) high. Like the M-5, they were fitted with lifting gear and were carried by Imperial Naval seaplane carriers. 32 naval flying stations were also equipped with the type. The good flying qualities of the M-9 were demonstrated by Lt Jan Jozefovich Nagorski in June 1916. Nagorski, a Pole, was a pioneer of Russian polar aviation, making five flights in a Farman in 1914, when he reached a position 76 degrees north. Now a Lieutenant in the Russian Navy, he was leading a bombing mission on the German air station at Angern when he was attacked by German scouts. Taking evasive action, Nagorski performed a loop! On 17 September he repeated the performance when he deliberately looped twice over his base, with a passenger and full load on board.

In August 1916 a raid on the U-boat base at Varna, in Bulgaria, was carried out by aircraft of the Black Seas Fleet after an unsuccessful earlier attempt. The raiding force sailed from Sevastopol on the 23rd and included the seaplane carriers *ALMAZ*, *NIKOLAI* and *ALEKSANDR*, which between them carried a total of 19 or 20 M-5 and M-9 flying-boats. The carriers were protected by seven destroyers and the battleship *IMPERATRISTA EKATERINA II*.



An Imperial Russian Navy M-5 being hoisted into the water by it's seaplane carrier.

The harbour had been reconnoitred by a Russian submarine on the 19th and 21st, and at about 0400 on the 25th the aircraft were slung over the sides of the mother ships within 40 km (25 miles) of Varna. However, only three M-9 and one M-5 flying boats were successful in taking off. These made an attack, hitting one vessel and, possibly, a submarine. German aircraft counter attacked the raiders and the destroyer *POSPYESHNI* received a direct hit which caused great damage. Owing to the limited number of aircraft able to participate in the raid, it cannot be considered a success.

A German submarine, the *UB-7*, was reported lost in the Black Sea in October 1917, after sailing from the port of Varna. This may have been the submarine claimed sunk by Russian aircraft off the Crimean coast that month. It is not known what aircraft took part in this action but it is probable that they were Grigorovich flying-boats of the Black Seas Fleet. A 1917 report gave the number of flying-boats with this fleet as 97, with an additional two land-based fighters. The fleet was equipped with Curtiss and M-types at this time and it is unlikely that the Curtiss aircraft could have carried out the attack. About the same time, the Baltic Fleet had 26 M-9, 114 M-5 and eight land-based fighters.

The armament of one machine gun was insufficient, especially when opposed by the German Albatros W 4 floatplane scouts operating in the Baltic. The Grigorovichs were practically defenceless when attacked from the rear. Many field modifications were made to overcome this problem and these included fixed or partially mobile machine guns mounted on the lower wing and firing to the rear. These efforts were not successful and their best defence remained an escort of Nieuport scouts.

Despite these limitations, the M-9 could hold its own in aerial combat when flown by a skilled pilot. Commander Micjail I Safonov gained most of his 11 victories over German floatplanes while piloting a M-9. On 22 March 1917, Ensign Kulevich shot down a German Gotha WD floatplane over the Bosphorus, despite having his aircraft hit 33 times during his attacks. For this exploit he was awarded the St George Cross, 4th Class.

The Shchetinin works put at least four other Grigorovich designs into production. The next in the series, the M-10, was a small boat which was designed by A.N. Sedelnikov. The M-11, which appeared in the summer of 1916, was a small single-bay biplane scout flying-boat. Initially tested as a two-seater, it was not successful and the several M-11's that had been produced were relegated to training duties. Development was concentrated on the single-seat version and this was equipped with a fixed 7.62 mm forward firing machine gun. Considerable armoured protection was incorporated around the cockpit and the front of the engine. The normal windscreen was replaced with a semi-circular armoured shield which had a small aperture for the pilot to sight through. One is reported to have incorporated a sighting periscope. Even though the hydrodynamic qualities of the M-11 were poor, series production of an order for 100 was begun on 6 April 1917, about 60 of these being completed. They were used as escorts for the M-9 in the Black Sea, but were not successful. Some are believed to have been disarmed and converted into tandem trainer configuration prior to the revolution.

The M-12 was a two-seat version of the M-11. Climb rate and ceiling were greatly improved but only a small number of the type were built for patrol and escort duties. The M-12 could operate from ice and snow by attaching skis, designed by Lt Prokofyev-Severski, to the hull.

The M-15 was a two-seat development of the M-5 to M-9 line. Appearing in 1916, the M-15 was considerably smaller and faster than the M-9, being powered by a 140 hp Hispano-Suiza engine mounted as a pusher, in typical Grigorovich fashion. First flown in May 1916, the M-15 joined the M-9 in Imperial Naval service. Approximately 80 were delivered, engine supply being the limiting factor. By 1917 they were being used mainly in a training role, many surviving until after the October revolution.

In June 1917 Grigorovich had a falling out with Shchetinin and he left the latter's service. He apparently was unwilling to accept any measures to improve the construction techniques utilised by the factory. His last design to be produced by Shchetinin was probably the special M-16, *Zimnyah* 'Winter Farman'. This was a modification of the Farman pusher to a twin-float seaplane. Its name derives from the fact that it could be operated on its floats from snow or ice. First flown in December 1916, about 40 were constructed.

Grigorovich then established his own small factory in Petrograd, where he continued his experimental work. Before being nationalised in March 1918, he had produced three more experimental flying-boats; the M-17 to M-19, all developments of the M-15. The M-20 was a variant of the M-5 with a 120 hp Le Rhone rotary engine. However, his workshop was small and unsuitable for aeroplane construction, and production soon changed to agricultural tools.

Grigorovich was transferred to Aircraft Factory No.3 and in 1922 he designed the M-23 and M-24. The latter was essentially a M-9 with a 220 hp Renault engine. Built in a small series of 20 aircraft in 1924, it served in the RKKA naval air arm until 1926. It was the first genuine Soviet flying-boat.

The Shchetinin works also produced the GASN general purpose torpedo carrying twin-float seaplane in 1916. This aircraft was designed by Grigorovich and M.M. Shishmarev. Flown on 24 April 1917, production of the 10 ordered was interrupted by the revolution. In 1920 the sole prototype was rescued and made a number of test flights before it was damaged on landing and the project was abandoned. Grigorovich was also working on the design of a large three-engined '*Flying Cruiser*' at this time.

The October revolution saw both sides using Grigorovich flying-boats in the civil war which followed. Three M-9 boats flew from Lake Ladoga to Archangel to join the British forces and were probably utilised by the White Russians. The Soviets are known to have used the M-5, M-9 and M-15. The first was confined to training duties exclusively, the others being used against the intervening Allies and White Russian forces in the Baltic, Black Sea and Volga River areas. A force of four M-9 flying-boats, escorted by two Nieuport 17C1 fighters, is known to have carried out an attack on British ships and seaplanes at their base in Biorko, Finland⁽⁴⁾.

In 1918 the former Shchetinin factory, now named the Gamayun factory, assembled some 30 M-9 'boats and repaired several dozen others. Production of the M-9 was continued until 1924, by which time approximately 500 were completed. Late series aircraft were fitted with other engines, predominantly in-line types; one reportedly being of 240 hp. This must have been the best performing of the M-boats.

Germany obtained a large number of Grigorovich flying-boats, particularly the M-9. After the Russo-German Armistice of 1917, over 100 crated M-types were obtained by the Germans in Sevastopol. These were reported as being unsuitable for Black Sea

operations, despite their successful deployment by the Russians, and were apparently not used by the Germans. A M-15 was displayed in the *Deutsches Luftfahrt Sammlung* (Berlin Museum) during the inter-war years. This aircraft was moved to Poland after Allied bombing raids in WW2 had destroyed some exhibits. It remained there after the war and is being restored for the Polish aviation museum at Cracow.

A M-5 is on display at the Turkish *HavaMuzesi* in Istanbul. It was reportedly captured after it landed in Turkish territory. It is not known if this occurred during the 1914-1918 War or afterwards, although the latter seems the most likely. It has a very uncharacteristic hull and it would seem that the wing cellule has been mounted on a locally built hull.

It is reported that, in 1917, Kerensky gave the Allies the plans for the M-9 and that it was built under licence. Confirmation is not available and it is thought that none were built. As good as it was, the Allies had designs which were better. Grigorovich was the most important aircraft designer to have stayed in post-revolution Russia. It is interesting to speculate on what success he might have had if he had the full resources of the Allied nations, which included a plentiful supply of powerful engines, with which to carry out his never-ending efforts to find the perfect flying-boat.

ACKNOWLEDGMENTS

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NOTES

1. Now named Istanbul.
2. The numbers quoted are from published sources but appear to be excessive in the light of recent research.
3. Julian calendar - 13 days behind Western Gregorian calendar.
4. Now Bolshoi Berezoviy in the former USSR.



Grigorovich M-12 captured by the Germans during their invasion of Ösel Island