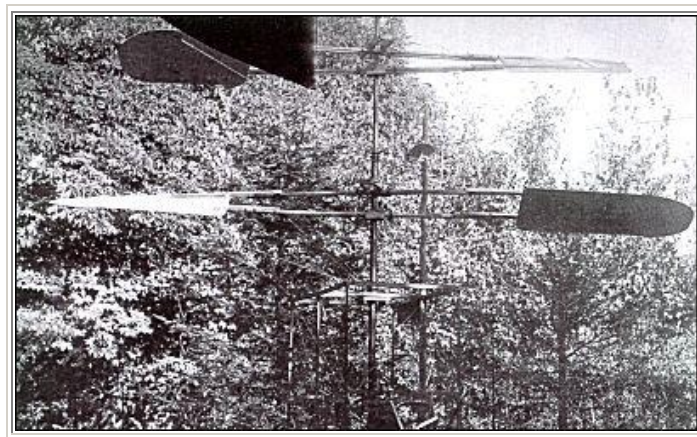


RUSSIA – the birthplace of the co-axial helicopter

At present aviation enthusiasts and even specialists often ask why the Kamov company is the only design bureau in the world to design co-axial helicopters. It is impossible to find an answer to this question in existing publications on rotorcraft, and thus the history of the creation and refining of co-axial layout helicopters is undoubtedly of interest.

In the middle of the 18th Century the Russian scientist and encyclopaedist Mikhail Lomonosov put forward a scientific hypothesis concerning the possibility of conducting research in the upper layers of the atmosphere with the help of a specially built flying machine capable of lifting meteorological recording devices. The archive of the USSR Academy of Sciences possesses several documents devoted to Lomonosov's work on creating an "aerodromic machine", as he put it, for these purposes. Thus, M.V.Lomonosov was arguably the first to propose the construction of a compact co-axial layout helicopter.

In 1784, the French Academy of Sciences officially recognized the helicopter as a possible means of aerial navigation. Until the middle of the 19th century, however, works on rotary wing craft were published only sporadically and contained fragmentary information. In Russia the first mention of research on rotary-wing flight made by our countrymen after Lomonosov's discovery dates back to the end of the 1860s. In the 1870s, projects of rotary-wing machines were created, featuring a sufficiently well thought-out general layout and detail design. Subsequently Russian inventors and scientists proposed different layouts of rotary-wing aircraft: co-axial, tandem-rotor, transverse twin-rotor and single-rotor.



Sikorsky S-1
(1909)

Russian designers made a major contribution to the development of the co-axial helicopters in the period between 1870 and 1917. In 1907, Vygornitsky built the first compact co-axial helicopter powered by an internal combustion engine. Later, full-scale prototypes of co-axial helicopters were created by Ch.Tan'sky (1905), I.I.Sikorsky (1909 and 1910), K.A.Antonov (1910), V.N.Levitsky (1911), K.Ye.Moroz (1914) and I.A.Eida (1915). Conversely, only two full-scale prototypes of single-rotor helicopters and one prototype in each of two other categories - tandem-rotor and transverse layouts - were built during the same period.

The increasing number of co-axial helicopter projects and their growing level of perfection created the prerequisites for the emergence in Russia at the beginning of the new century of a flight-capable helicopter of this configuration. However, due to certain historical conditions that had arisen in Russia and in the world community as a whole, it was not until 1947 that the first experimental flight-capable co-axial layout helicopter was built in the USSR in the Yakovlev OKB (Design Bureau). The experimental EG helicopter had two co-axial contra-rotating rotors of 10m diameter and was powered by a 140hp Shvetsov M-11FR-1 radial engine. Its take-off weight

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was 1020kg. This helicopter performed 75 test flights. However, further work on this machine was discontinued because of insurmountable (in the opinion of its designers) difficulties which were due to the lack of the necessary scientific knowledge and experimental research in the field of co-axial rotor aeromechanics.

The co-axial layout has invariably attracted the attention of designers because, unlike the single-rotor layout, it enables engine power to be used rationally due to the absence of losses caused by counteracting main rotor torque. Some well-known designers abroad, such as L.Breguet, D.Perry, S.Hiller, G.Berliner, R.Pescara, C.d'Ascanio, the Kellett brothers etc., also resorted to the co-axial layout. Among the co-axial helicopters of the '40s - '50s vintage possessing sufficiently high performance by the standards of the time, one should note the Breguet GIIE (France), the Hiller XH-44 and Bell 49 (USA) and a number of others. Nevertheless, all the foreign companies had to abandon further development of this layout because of the same difficulties as encountered by the Yakovlev OKB.

By the end of 1945, building on his own experience in autogyro design and on the study of scientific and experimental materials on Soviet and foreign rotorcraft, N.I.Kamov came to the decision to busy himself in real earnest with the problem of designing a helicopter. As a result of lengthy research and analysis he rejected the single-rotor layout, then the tandem-rotor layout and gave his preference to the co-axial configuration. Apparently it was exactly this difficult final choice that harbored the sources for confidence, inspiration and perseverance of the world-renowned designer of co-axial helicopters.

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In 1946, N.I.Kamov started design work on an ultralight single-seat co-axial helicopter powered by a motorcycle engine, the Ka-8. In October 1947 test pilot M.D.Gurov flew it for the first time. At the Aviation Day fly-past at Moscow's Tushino airfield on July 25, 1948, the Ka-8 helicopter piloted by Gurov took off from the cargo platform of a ZIS-5 truck, made a circuit of the field and landed on the same truck. The aircraft's take-off weight was 320kg, engine power was 42hp. The helicopter reached a top speed of 80km/h.

The helicopter's development team consisted of three groups. The group of designers was headed by A.N.Konarev, the calculations group by V.B.Barshevsky and the flight test group included V.A.Karpov (chief), M.D.Gurov (pilot) and an aircraft mechanic. Structural strength issues were the responsibility of V.V.Persiyanov, the co-axial rotors and the rotor mast were designed by N.G.Rusanovich, the aerodynamic design was accomplished by B.Ya.Zherebtsov and V.P.Bakhur. The team also included P.S.Serkov, M.N.Lebedev, V.N.Ivanov, P.O.Yurchenko and others. Acknowledged as the indisputable leader was N.I.Kamov who had defended a dissertation for the degree of Candidate of Science. He had the power to personally take the final decision on any issue. The Ka-8 was his brainchild. Small wonder that Kamov's co-workers suggested that the mini-helicopter be dubbed "Irkutianin" (inhabitant of Irkutsk) in honour of the designer's home city.

The Ka-8 became the object of close interest on the part of the Navy. Naval seamen duly appreciated the exceptionally small dimensions of the machine, its high manoeuvrability and good take-off and landing performance. A proposal came up to use a rotorcraft of that kind on ships for liaison, reconnaissance and surveillance duties. The idea seemed attractive - first of all because it did not require modifications to small ships from which the helicopter would operate.

After the abovementioned fly-past the Commander-in-Chief of the Soviet Navy, Fleet Admiral N.G.Kuznetsov, got an idea to set up a design bureau under the leadership of N.I.Kamov specifically for designing and building a shipboard liaison helicopter. From that day on, the professional activities of the designer came to be closely connected with naval requirements.