

THE HISTORY OF MI-24 DEVELOPMENT SEEN IN DR. MIL DIARIES AND PICTURES

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Abstract

In 1965 M.L. Mil suggested that a transport and combat helicopter should be designed for military application only. That armoured helicopter armed with cannons and rockets would be capable of attacking targets.

In designing the Mi-24 M.L. Mil took into account his work in aerodynamic, development and controllability of military fixed-wing aircraft, as well as improvement of flight and combat performance of military aircraft of World War II. Reflecting over the idea of the new helicopter, he compares military fixed-wing aircraft bearing Northrop insignia, Air Cobra and a small tailless UT-1 in his sketches made in 1965-1966; at the same time he defines preliminary parameters of the attack helicopter, such as the cockpit dimensions, pilot station, wing position.

To increase its rate of climb it was fitted with wings accommodating different kinds of suspended weapons systems. The helicopter would be capable of carrying eight soldiers enabling them to start fighting directly from the helicopter. The concept used an idea of redundancy of the most essential systems and protection of the most vital systems by less vital ones. The helicopter should have special flooring; it should have a capability of aerial refueling. All systems should be reinforced to withstand higher g-loads generated in maneuvering. One of the design features (patented in the UK and USA) was the main rotor mast and the whole power plant tilt by 2.5° relative to the airframe vertical axis, another one was non-symmetrical LG legs. That was used to reduce the helicopter bank and slip angles in forward straight flight. At the same time fire from the fixed weapons system became more accurate.

Fixed-wing Attack Aircraft were First

As far back as the late 1950s Mikhail Mil wrote, "Modern army units are inconceivable without a wide use of helicopters." And life has

proven that he was absolutely right: if before the 1960s helicopters were mainly used to carry troops, equipment and transport means in military operations, during the Vietnam war the first combat helicopters, i.e. US Iroquois and Cobra helicopters, appeared.

Working out the concept of a helicopter capable of conducting autonomous combat operations, Mil proceeded from his research work and experience at improving the flight performance of attack aircraft and fighters, such as the Il-2 and Il-4. At first, the flight control of the above highly maneuverable aircraft faced many problems: in case of a speed drop the aircraft carrying bomb load entered into spin and very often this resulted in a catastrophe. And Mil invented a special device to avoid this phenomenon.

It was Mil's belief that the success of any air combat was defined by the advantage of the initial position in any attack. In his work "Some New Criteria for Evaluating Combat Flight Performance and Analysis of Modern German Fighters" written in the war years with P.I. Fiodorov as his co-author (Air Force Research Institute engineer), a special attention was paid to maneuverability of the aircraft, its rate of climb, turn radius, i.e. those factors that in combination with the armament determine, in general, the fighter combat qualities. In his work "Aircraft Disturbed Motion and Selection of Longitudinal Static Stability Level" Mil determined the principles making it possible to select parameters of the horizontal stabilizer, as well as the required CG to design an aircraft that would be safe, easy and "pleasant" to pilot.

Attack Rotorcraft

The idea of designing an attack helicopter was finalized by M.L. Mil after his visit to the Le Bourget Air Show (France) in 1965. Mikhail Mil closely following the development of all new helicopters in the world described the situation existing in our country at that times in the following way, "We have already made a

stock of helicopters that will allow us to last for 3-4 years more, but we have nothing in the category of military helicopters similar to the Iroquois."

In 1965 Mil suggested that a dedicated combat helicopter armed with cannons, as well as missiles and rockets, protected by armour and capable of attacking targets should be designed. This helicopter, like the Il-2 (the latter fought during the whole war accurately destroying different targets, tanks included, and flying very low) would support the ground forces hitting enemy tanks and personnel.

It goes without saying that the experience gained by Mil from his work at fixed-wing aircraft came in handy in his work at the armed helicopter. Military fixed-wing aircraft of World War II can be seen in his drawings made in 1965-1966: Northrop, Air Cobra and a small tailless UT-1. Mil drew fixed-wing aircraft in his notebooks, carefully drawing cockpit dimensions, pilot position, wing location. It is clear that the first parameters of the attack helicopter, as well as its cockpit were determined with due account of the above sketches.

In one of the drawings of possible versions of the combat helicopter designed for an airspeed of 400 km/h Mil makes a note: "Isn't it an attack aircraft? And if it could be more powerful and capable of carrying troops for assault?"

The first sketches of combat single-engine helicopters made in the Designer's diary in 1965 already contain some ideas implemented in the Mi-24 later (Fig.1). Here is a version of a single-seat, single-engine helicopter whose engine is protected similar to that of a fixed-wing aircraft, but it has a tilted rotor axis and a fuselage equipped with a powerful tail. Another drawing shows a helicopter performing a maneuver. Soldiers using their small arms for firing from the helicopter during flight can be seen. And here is still another sketch: a helicopter cockpit having tandem seats for the pilot and the gunner (Fig. 2).

Mil proposed to design a helicopter carrying a powerful integrated armament system, having high performance and possessing enhanced survivability. According to Mil's idea, the attack helicopter should be powered by a powerful engine, a shortened fuselage of fixed-wing aircraft type, wings to increase the rate of climb (they could be also used to carry different weapons systems). It should be armoured, have special flooring, in-flight refuelling capability. All systems to be installed in the helicopter should be reinforced to withstand high g-loads; drawing structural components in his notebooks, Mil crossed out

some of them making a note: "It would be able to make the machine fly, but not fight".

What kind a Military Helicopter Should be?

The principle that Mil used in designing this particular helicopter was as follows: the helicopter should be produced in great quantities, be cheap and easy to fly. He supposed that the Mi-24 could be used to carry troops, heavy loads and armament. He offered to install the TV-117 engines on the new helicopter. However, it was necessary to improve the engine (to save time, it was decided to carry out the process of development in the helicopter Design Bureau). He made an entry in his diary: "If the TV-117 engine is available in 1967-1968, the aircraft will be put into production at once with the first units manufactured in 1969-1970."

Initially the Designer planned to build two prototypes of the helicopter –single-engine (Mi-22) and twin-engine armoured (Mi-24) (to be produced in Poland and in our country respectively). The airframe for the armoured version should be greatly modified. The single-engine helicopter required a new main gearbox, new main rotor hub and blades.

The Design Bureau headed by Mil developed both versions as Mil considered that both would be in great demand in the armed forces. But in November 1966 Mil concentrated his attention on the Mi-24 as it was of utmost importance to the Army. Here is the diary entry made by Mil, "It is possible (i.e. there are forces, to be exact) to build only one type of the helicopter. If it is an armoured machine, it should be put into quantity production. The engine power is 2,200 hp based on the R-7 main gearbox".

The idea of the armed helicopter capable of attacking autonomously while carrying a troop unit was not adopted at once. A sarcastic remark made by one of the generals is widely known: "Just take that designer and put him into the helicopter!" At first, the government members kept laughing, "Mil is going on a march! However, as the Americans make combat helicopters, the idea is worth considering..."

To receive recognition of his concept, Mil conducted a great many meetings, scientific and technical conferences. To promote his idea, he spared neither energy nor effort. He made entries in his diary about everything he was doing, "I made a report about the necessity to develop helicopters and proved that modern engines are required. The report was made in the Design Bureau in the presence of the

Deputy Defense Minister, General Headquarters Chief and other VIPs. I published an article entitled "Engine Having a High Power-to-Weight Ratio" in the "Aerospace" magazine" (No.8, 1966).

To achieve the target, Mil planned to visit the country leaders, such as Kosygin, Malinovsky, Ustinov, Brezhnev.

At last in 1967 the then First Defence Minister Deputy conducted a research council devoted to the Mi-24 design. To get the military interested, Mil ordered to make photos of new helicopter mockups, as well as posters showing the Mi-24 in real combat actions.

And Mil's concept was adopted. After that on March 29, 1967 the Design Bureau was assigned to prepare a statement of work for a combat twin-engine helicopter.

The helicopter whose design had been worked at since 1966 was 18 m long (one third shorter than the Mi-8), had a narrow fuselage, a five-bladed main rotor whose diameter was smaller than that of the Mi-8 (17.1 m) and whose blades were reinforced with glassfibre. The helicopter was powered by the Izotov TV3-117 engines that had been tested on the Mi-14; their power was 2,200 hp each.

Initially Mil designed a cockpit where pilot's and gunner's seats were side by side with the pilot's seat a bit displaced to the left and inside (to provide a good all-round view for each crew member). The gunner's task was to detect and identify targets, launch and guide antitank missiles. At the same time, the gunner could take over the control, if necessary, as a dual control system was installed. The pilot could fire from the fixed weapons located under the wings, from the machine gun fixed along the helicopter centre line. The cargo cabin could accommodate 8 troops with full ammunition (seating back-to-back and facing the cabin windows). The cargo cabin had clamshell doors opening up and down making it was to fire from automatic weapons. Machine guns were installed in each fuselage compartment. The height stops installed made it possible to fire avoiding the main and tail rotors.

The helicopter featured a tilt of the main rotor and the whole powerplant axis by 2.5° relative to the helicopter vertical axis, and asymmetrical main landing gear struts. It was made to reduce bank and sideslip angles in forward straight flight, to increase the fixed weapons firing accuracy. The innovation was patented by M.L. Mil and S.A Braverman in the USSR in 1965, and later, in the USA and UK (Fig.3).

The nose section has a narrow shape to reduce drag, and the shape of the fuselage itself with a wide beveled tail has become common for Russian helicopters of the latest generation.

The fixed-wing aircraft type airframe and a powerful tail boom equipped with a swept vertical stabilizer served to ensure stability of the attack helicopter in bombing and provide comfortable piloting at different angles of attack. To reduce drag and increase airspeed, the main landing gear was retracted inside the fuselage. The maximum airspeed was 330 km/h and the Mi-24 remained the fastest military helicopter in the world until the advent of the UK Lynx.

The helicopter was built very quickly – a year later after the resolution about it was adopted. This could mainly be explained by fact that principal drawings were already available in the Design Bureau and components used in the structure of the Mi-6, Mi-8 and Mi-14 helicopters were used in the new design, such as main rotor hub, tail rotor, rotor drive and hydraulic system elements that, according to Mil's statement, "had been designed originally for helicopters and not for fixed-wing aircraft".

Survivability is the Key Feature

"Any modern helicopter capable of conducting combat operations above the battlefield," wrote M. Mil, "must be survivable". To do that, it should be armour protected. Powerful armour protects the Mi-24 hydraulic system, engines, gearboxes, cockpit and compartment accommodating troops.

Some of the systems were redundant, the fire protection system for the fuel tanks was carefully thought out. Mil also proposed to use special flooring protecting from firing at the bottom.

To accelerate the Mi-24 launch into production, it was initially thought that it would be armed with the cannon and missiles similar to those used by the Mi-4, and then the required weapons systems would be added. During the design stage large margins of safety were taken with due account of those g-loads that would be applied to the aircraft in combat.

The Mi-24 made its maiden flight in September 1969. Mil was present at the event. However, further flights were made without his presence. The first prototype we can see at Fig.4.

In 1970 the Design Bureau was headed by Marat Tischenko, Mil's follower. And the aircraft further modification, its preproduction development were carried out under Tischenko guidance.

At the time the NATO had no counterpart of the Mi-24 in terms of dimensions and weapons systems. The NATO leaders highly appreciated the Mi-24 capabilities, its formidable firepower, high speed and ability to appear very suddenly.

And the helicopter got its NATO code name Hind.

Formidable Enemy

The Mi-24 took part in many fights. Its Designer's hopes came true: it became a helicopter that could win in air-to-air battles. The Mi-24 participated in 30 armed conflicts waged at the end of the 20th century, the Afghan war included. The Western press reported that during the conflict between Iran and Iraq an air-to-air combat between a fixed-wing aircraft and a helicopter happened in the skies of Iraq, and the helicopter won. It was the Mi-24 flown by Iraqi pilots that shot a Phantom fighter with a missile. It was reported that the Iraqi AF Mi-24 helicopters shot 53 US helicopters 10 of which were combat ones.

Three months later after the Soviet Army was brought into Afghanistan a team of the Mil Moscow Helicopter Plant specialists headed by M. Tischnenko visited the country with the aim to inspect the units flying the helicopter. After that a number of measures aimed at improving the helicopter performance in combat conditions were made. Gurgen Karapetian, test pilot, Hero of the Soviet Union, flew together with military pilots showing them the most efficient flight manoeuvres and taught them on site.

More than 30 years have passed since the advent of this aircraft but it goes on flying and fighting. It means that its concept was thought out very carefully at the very beginning. This is what the Air & Space Magazine wrote in its

April/May issue in 1998: "Without question, the Hind is an outstanding aircraft. It is also superbly designed for the job it is supposed to do". The same article contains some comments made by the American pilots who flew this aircraft in the USA. Here they are: "It's tractor-tough." "Put it in a barn for a year, then change up its batteries and you can fly away in it. You can't do it with our helicopters." "It rides smooth, just as like and old '62 Cadillac." "Carry along a common-tip screwdriver, a roll of safety wire, and a grease gun and you can fly it for a hundred hours."

It is firm belief of Gurgen Karapetian who was the first test pilot to teach the Mi-24 to fly (he was then the Chief Test Pilot at the Mil Moscow Helicopter Plant) that this helicopter is old in age but not in performance. As for its survivability, reliability and combat efficiency it is second to none even now.

Due to the fact that the helicopter has continuously been improved (from the very beginning), it has enhanced survivability which is a must for military equipment. Known are the cases when the Mi-24 returned from its mission having up to 50 and 20 shot holes in its fuselage and main rotor respectively. And how many soldier lives were saved by these aircraft, how many lives were rescued from situations that seemed to be absolutely hopeless.

The total number of the Mi-24 helicopters produced amounts to about 3,000 units. And the Mil Moscow Helicopter Plant in cooperation with the Rostvertol Production Facility is still on the move to improve the Mi-24.

Figures

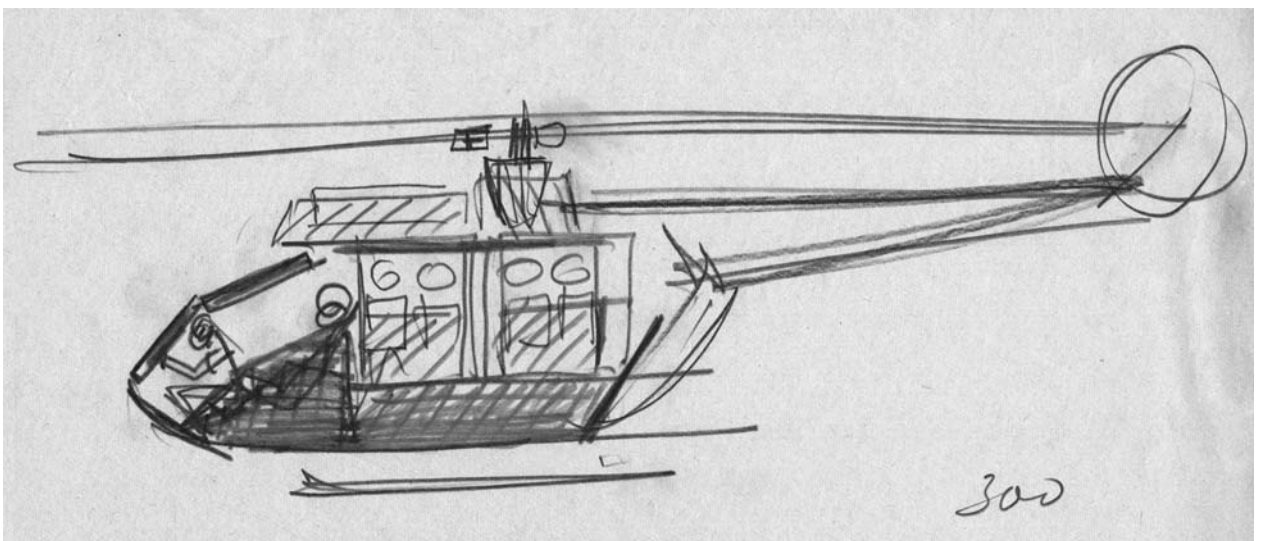


Fig. 1. A sketch of the cockpit accommodating the pilot and the operator.

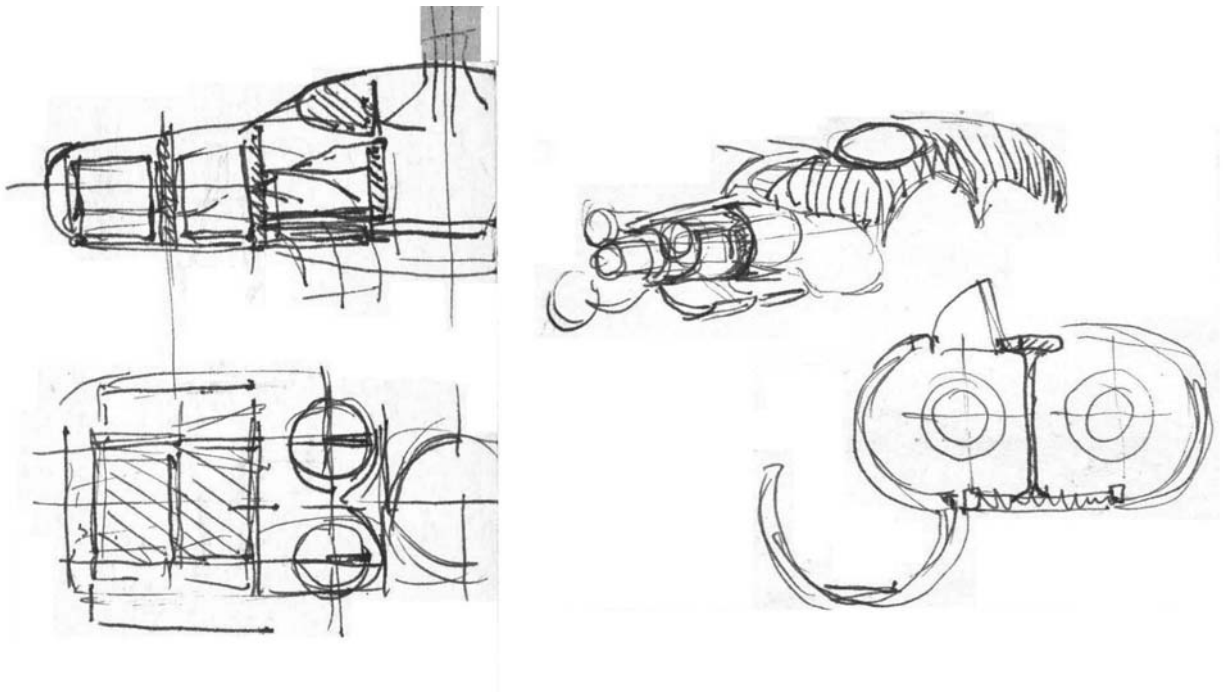
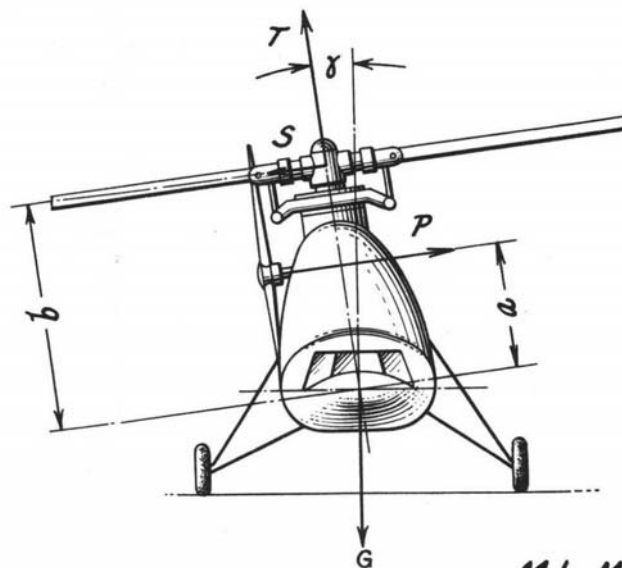


Fig. 2. A sketch of the cockpit and the powerplant arrangement

May 11, 1965

M. L. MIL ET AL
SINGLE-ROTOR HELICOPTER HAVING THE ROTOR
AXIS CANTED TO THE VERTICAL
Filed Dec. 30, 1963

3,182,931



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Fig. 3. US Patent granted to M.L. Mil et al. "Single-rotor Helicopter Having the Rotor Axis Canted to the Vertical"



Fig. 4. Mi-24 Prototype No. 1 (The cockpit accommodates the pilot and operator seating side by side).