Mil Mi-24 Hind

MIKE SPICK

With full colour artworks and photographs

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MIKE SPICK has had a lifelong interest in military aviation, and is the author of several technical books and articles in aviation magazines covering various aspects of the subject. One of his leisure pursuits, wargaming, led him to a close study of air warfare, combat aircraft development and the evolution of air combat tactics, on all of which he has written extensively. His other books in this series are *F-15 Eagle, American Spyplanes* and *Modern Soviet Fighters*.

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Origins and Philosophy

A LEADING CONTENDER for the title of the ugliest flying machine of all time, the Mi-24 series of helicopters is known by many names. To its designers, the Mil OKB, it was first known as the A-10. Some Western writers have referred to it as the flying battlecruiser. NATO has given it the codename of "Hind". The Mujahideen guerrillas of Afghanistan are reported to call it "The Devil's Chariot". Its Soviet crews are known to refer to it as *Gorbach* (Hunchback), while it is also known in Soviet circles as the Sturmovik helicopter. While it seems certain that early versions carried the official designation of Mi-24, the latest variants are believed to be the Mi-25, or even the Mi-27. The Soviets, who know, aren't telling, while the West, which isn't sure, is guessing. What is certain is that it is a most remarkable machine, which in the right circumstances can do an excellent job despite the fact that it is now getting rather long in the tooth. Judging it is difficult, as there is no close Western equivalent to use as a yardstick. Hind is a true one-off.

At first sight, the helicopter appears to be a poor relation in the aviation world. It lacks both speed and altitude performance, is complicated both to fly and to maintain, and generally cannot carry very much for very far, compared with a fixed wing aircraft of similar weight and far less cost. Aerodynamically it is inefficient, and it is difficult to protect against even small arms fire. What makes it special is just three things. It can take off vertically, can hover, and can land vertically.

Initially used only for rescue, reinforcement, supply, and casualty evacuation, the battlefield helicopter came of age in Vietnam in the mid 1960s, where it conferred a greater degree of mobility on the ground forces than had hitherto been the case. In addition to their other functions, battlefield helicopters now took raiding forces to reported enemy locations, providing fire support and defence suppression during and after the landing; then extracted them at the conclusion of the operation. In addition, armed helicopters provided escort to road convoys, ranging ahead to spring possible ambushes. From this point, it was logical to equip helicopters with an ever-increasing variety of weapons in order for them to undertake an even wider variety of battlefield tasks.

Stalin's edict

Very little is known for certain of the development of the Hind, and much perforce must be speculation. What is certain is that the Soviet Union was quick to see the military applications of the helicop-

Below: Similar in appearance to the Sikorsky S-55, but bigger, the Mil Mi-4 Hound was the direct result of Stalin's 1951 request for bigger and better helicopters.

Above: Hound's successor was the large Mi-8 Hip, which can carry 28 fully armed troops. This is Hip E, the world's most heavily armed helicopter, with outrigger weapons pylons and a traversing 12.7mm machine gun in the nose.

ter. As long ago as 1951, the late unlamented Iosip Stalin summoned the Soviet helicopter designers to the Kremlin and requested that they build larger and more capable machines. Most found acceptable reasons not to comply, but Mikhail Mil and Alexsandr Yakovlev produced competing designs, of which the Mil offering was selected for production as the Mi-4, similar in general appearance to the Westland/Sikorski S-55.

With new turbine engines delivering far more power than the traditional reciprocating engine, it was soon obvious that an Mi-4 successor was needed, able to carry a greater payload faster over a longer distance. This duly emerged as the Mi-8, code-named Hip by NATO, which first flew in 1961. Hip could carry 28 fully armed troops in its capacious cabin in its basic transport version, while the later Hip C was an assault transport, with a heavy weapon load carried on two outriggers fixed level with the centre of gravity, typically four pods of 57mm rockets.

Still later came Hip E, with a steerable 12.7mm machine gun aimed from the cockpit, six pods of 32 rockets, and four AT-2 anti-tank missiles, which made it the world's most heavily armed helicopter. It was also large, and its flying characteristics could only be described as sedate. Despite the missiles, it was not really suited for anti-tank work, while its unprotected fuel system was very vulnerable to small arms fire from the ground, as has been demonstrated in Afghanistan and other places. Hip has been built in enormous numbers, over 11,000 to date, and production continues in 1987, albeit in the more powerful Mi-17 version.

But despite the undoubted usefulness of Hip, its weaknesses made it suspect on a modern battlefield, the most serious doubts concerning its survivability. Something better, both to replace and support Hip was needed, a true battlefield helicopter rather than an armed transport.

Operational philosophy

In order to understand Soviet military helicopter design, it is necessary to know just a little of the operational philosophy that drives it, as this differs greatly from that of the Western nations. In the main it derives from Soviet war experience, and is tempered by the Eastern European terrain over which it was gained between 1941 and 1945, with a tendency to apply chess similes, which Russian military commentators are prone to use in abundance.

Unlike most Western nations, the Russian battlefield helicopter force is an air force asset rather than belonging to the army. On the other hand, the air units of Frontal Aviation are subject to army control at high level, both fixed and rotary wing. Having been savaged by the fast-moving armoured columns of the Wehrmacht in 1941 and 1942, the Soviet army is committed to the *Blitzkreig* concept and to the benefits of shock action.

Shock action is carried out by using a combination of firepower and mobility, to disrupt the enemy defence or attack, not only in the front line, but by deep penetrations into the rear areas which damage and disorganise reinforcements, supplies, and communications. There is little subtlety about it. It is just a series of sledgehammer blows throughout the entire depth of the opposing force. During the Great Patriotic War, as the Russians call World War 2, this consisted of powerful armoured columns operating on a fairly narrow front to apply the principle of concentration of force, backed by tactical airpower. Current Soviet tactical doctrine calls for the same methods, with an overwhelming emphasis on attack.

The Great Patriotic War experience was gained to a large degree over gently rolling, rather featureless plains which for all practical purposes are without natural cover. With few natural strongpoints, deployment in both attack and defence tended to be geometric, a factor which has encouraged chess analogies. Armoured warfare consisted of wheeling and probing by entire armies trying to find a weak point or turn the enemy flank. Rivers were the only real obstacles, which explains the modern Soviet preoccupation with cross-river assaults, but even they are mainly wide but shallow, with gently shelving banks which allowed easy access for AFVs, unlike most steep-banked rivers in Western Europe. The vast distances involved placed a premium on speed and mobility.

The helicopter promised a whole new dimension on the battlefield. It could switch pressure from place to place very quickly at the front, and rapidly penetrate to enemy rear areas, decanting specially trained squads at critical points, such as communication centres, supply dumps, bridges, etc. It could carry weapons to clear the landing area and suppress the defences, then with the troops safely on the ground, could provide close air support, evacuating them when the mission was complete.

To reach the landing zones safely helicopters would have to work their way along "the seams" of the defences, but they were intended to fight their way through using their organic weaponry if necessary. This concept of "vertical envelopment", if successfully carried out, could have an effect on the opposition out of all proportion to the number of troops involved.

Speed and armour

The almost complete absence of cover on the steppes made the Western-style accent on terrain masking and nap of the earth flying superfluous. The Soviet battlefield helicopter would have to move in the open, and so high speed and armour protection were much more important. The Mi-8 was basically just an armed troop carrier; something more suitable was needed, as was confirmed during a series of exercises commencing with Dnepr in 1967, using armed Mi-4s and Mi-8s.

Soviet doctrine for the land battle has always embraced the "combined arms" concept, wherein armour and motorized infantry, reconnaissance, artillery and fixed-wing air assets, operate in unison to a common battle plan, the strength of the homogenous whole being greater than the sum of its

Below: Soviet troops advance across a typically featureless eastern European plain as troop-carrying Hips leapfrog them to set up an advanced strongpoint ahead.

constituent parts. With a purpose-designed helicopter, the rotary wing element could at last take a full place in the striking power of the Soviet order of battle.

At some point in the late 1960s, the OKB (experimental design bureau) named for Mikhail Mil, based at Zaporozhe and led by Marat Tishchenko, commenced work on a new design for a battlefield helicopter. It was to be fast, heavily armed, and have a measure of protection against small arms fire. It also had to carry a squad of eight fully armed troops, which while far fewer than Hip, was sufficient to compromise it in the close air support role. But as compromises go, it was a good one. It emerged as the Mi-24, NATO codename Hind.

It was not until late 1971 that the West got a sniff of the project, and by the end of that year, there were three prototypes available for operational testing. Of these, two underwent development, becoming known in the West as Hind A and Hind B, of which only the former entered production. Hind A entered service in 1973, achieving initial operational capability in the same year.

By the spring of 1974, two helicopter regiments with about 50 Hind As each were based at Parchim and Stendhal in East Germany as part of the 16th Soviet Tactical Air Army, and the first photographs of the type reached the West. They aroused little interest at first; other more exciting things were around at that time.

Then in 1975 a stripped-down Hind, bearing the designer's reference of A-10, set a series of world records, all with women pilots. These included two time to altitude records, and both 500km and 1,000km closed circuit records, the recorded speeds for which were 205.688 ml/hr (331km/hr) and 206.697 ml/hr (332.64km/hr) respectively. The pilots in all cases were Galina Rastorgoueva and Ludmila Polyanskaya. The world sat up and took notice.

While the figures achieved by a stripped and optimised flying machine bear little resemblance to the military article's capabilities, the inference was obvious that Hind A was probably the fastest military helicopter in service and by quite a healthy margin. This was reinforced on 21 September 1978, when an uprated engined A-10, flown this time by test pilot Gourguen Karapetyan, set a new absolute speed record for helicopters over a 15/25km course of 228.9 ml/hr (368.37km/hr), which stood for eight years until broken by the BERP (British Experimental Rotor Programme) Westland Lynx, which clocked up 249.1 ml/hr (400.87km/hr) in 1986.

Below: Airmobile troops spill from a heavily armed Hip E during an exercise in February 1987. This machine has an infra-red jammer and a flare dispenser to protect it from heat-seeking missiles.

2

Hind A Described

THE FIRST Mi-24 variant to see widespread service was the type described by NATO as Hind A. While popularly supposed to be derived from the Mi-8, there is only a vague resemblance, the pod and boom "tadpole" layout of the earlier machine having given way to a more streamlined shape more resembling a pike, and with a similar predatory appearance. Only the engine/gearbox/rotor layout was retained from the earlier design, and even this was subject to detail changes.

Hind A was still very obviously an armed transport, although the needs of a fighting helicopter had been compromised by the requirement to transport troops; conversely the number of troops that could be crammed into the rear compartment was equally limited by the needs of a fighting helicopter. In short it was large for the battlefield mission and small for troop carrying.

Hind is a "low risk" design, of conventional metal semi-monocoque construction using frames and stringers. Four heavy main frames in the central fuselage, supplemented by a really massive bulkhead behind the crew compartment provide the attachment points for the undercarriage, which is retractable, the engines and main gearbox, and the cantilevered stub wings. The tail boom is virtually an extension of the fuselage, with a much greater cross-

Below: An early Hind A with a starboard-mounted tail rotor. The missing access hatch beneath the tail boom reveals the GIK-1 gyromagnetic compass unit.

Above: Hind A from head-on showing the bulged transparency to the starboard sliding entry hatch, a feature not repeated on the other side. An unidentified sensor, possibly a gun camera or a laser seeker, is on the port inboard pylon.

sectional area than that of earlier Mil helicopters, and appears to have been adopted as a drag-reducing measure.

The two Isotov TV2-117A free turbine turboshaft engines are mounted side by side on top of the troop compartment but ahead of the rotor, with the intakes set just behind the flight deck; the effluxes exhaust outwards at right angles, and to judge from some photographs, slightly upwards. Above and between them is what looks very much like a third intake, set back towards the rotor pylon. This is actually the oil cooler intake and fan, while set in line behind the rotor, in a streamlined fairing, is a small auxiliary power unit, with its intake set flush on the starboard side, and the efflux to port. This provides power not only for starting the engines, but keeps all systems operational during extended spells of ground loiter. The triple intake appearance given by the engines and oil cooler is very reminiscent of that used on Hip, but there are few other similarities.

Just astern of the engines, situated on a reinforced deck, is the massive reduction,gearbox, supported by struts, which drives both the main and tail rotors. Like Hip, the main rotor is five bladed, although the disc diameter is smaller; 55.75ft(17m) as opposed to 69.9ft(21.29m).

The rotor is strictly conventional in design, with a fully articulated head. This has the disadvantage that reaction to control inputs is slow; while this hardly matters at high speeds, it makes the big helicopter difficult to handle at the lower end of the performance scale, and rather unsuitable for Western-style nap of the earth flying, or manoeuvre in confined spaces. On the other hand, gust response is low, and this makes for a stable weapons aiming platform.

The rotor blades consist of titanium alloy main spars with honeycomb-filled fibreglass skins, and a titanium alloy strip on the leading edge. Contrary to the practice of most Western nations, but standard in the USSR, the main rotor turns in a clockwise direction when viewed from above. Electro-thermal de-icing is fitted to the rotor blade leading edges, while small fixed balance tabs are located well outboard on the trailing edges.

The tail rotor is of similar blade construction to the main rotor but is three bladed, and is mounted near the top leading edge of a cambered pylon which extends upwards from the tail boom at a 45 degree angle. It is believed that in early model Hind As, the shaft-driven tail rotor had blades of aluminium alloy; what is however certain is that in early models, the tail rotor was mounted on the starboard side in a "pusher" configuration.

In common with previous Mil helicopters, all Hinds have an all-moving hydraulically actuated horizontal tail surface located at the junction of the tail boom and pylon, and extending on both sides. This is used for fine trimming at high speeds, in addition to giving pitch control in forward flight without having to use engine power to alter attitude in the vertical plane. The most radical departure from Mil tradition is the use of stub wings, which fulfill a variety of functions. Of thick aerofoil section, and with a span of 24.28ft (7.10cm), they are mounted in a mid position, level with and slightly behind the cabin roof.

Whereas the Mi-8 had perforce to carry its weapon load on tubular pylons projecting from the fuselage sides, the Mil OKB made a virtue of a necessity and used stub wings, not only for weapons carriage, but to give added lift. In high speed forward flight, the wings offload the rotor by up to 25 percent, releasing power that would otherwise have been needed to keep the machine in the air by creating lift and enabling it to be used for either greater speed or greater load carrying. Alternatively it would extend the range by using less power to achieve a desired speed, thereby saving fuel, and increasing endurance.

Faired wings

In keeping with the accent on high performance and drag reduction, the wings are carefully faired to the fuselage, with a curving fillet at the trailing edge. They are set at an incidence of about 20 degrees, which improves their low-speed lifting ability, and they are drooped downwards to an angle of about 16 degrees anhedral.

On a fixed wing aircraft, anhedral is generally used to provide extra keel area, and with it, stability in the lateral plane. While this may be a factor with the Hind, it seems far more probable that it was adopted to reduce the interaction with the downwash from the main rotor. This interaction would seriously degrade slow flight and hover performance, making more power necessary to keep the machine airborne, and leaving less for acceleration. A certain amount of evidence exists for this assumption. At the early development stage another variant, subsequently codenamed Hind B existed. Often referred to as a pre-production series aircraft, Hind B featured level wings, with little or no anhedral.

Above: From this angle the high angle of attack of the stub wings is apparent, as are the very deep endplate pylons. The arrangement may have been adopted for aerodynamic reasons, or simply to facilitate weapon loading.

Wind tunnel testing is tricky at the best of times, and helicopters are more difficult machines on which to gather reliable data than fixed wing aircraft, as a general rule. In the case of the Hind, the interference of the stub wings with the rotor downwash was complicated still further by the positioning of the turboshaft engine effluxes slightly ahead and just above the top surfaces of the wings.

In fast foward flight, one could speculate that the efflux-wing juxtaposition might be an advantage, with the hot exhaust gases streaming rearwards to minimise the rotor downwash effect. Also, the hot gases passing over the upper surfaces would tend to aid the creation of a low pressure area, thus increasing lift. In the hover, or more importantly, in the transition to forward flight, things would be far

Above: Hind A, showing the various pitot tubes and access steps to the front. Details of the main gear doors are apparent, and the exact angle of the port engine exhaust is clearly shown, along with details of the sliding entry hatch.

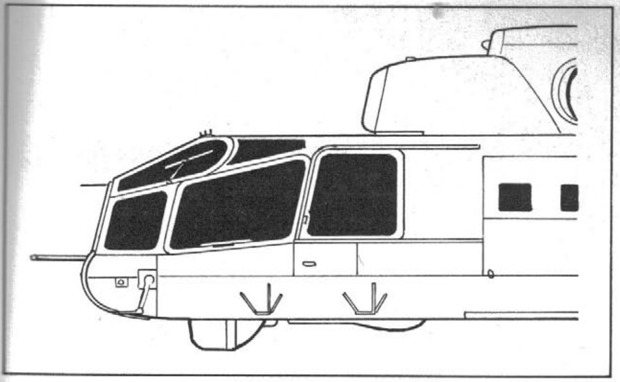
more complicated, and the only real way to find out would be to build the helicopter and fly it. Be that as it may, Hind B has never been heard of since, so we may assume that the steep anhedral was necessary to counter the downwash interaction.

It is probable that all Hind Bs were reconfigured into Hind As, as the change would be minimal. On the other hand, there is just one small factor pointing the other way. This is the use of endplate weapons pylons on the wingtips. These pylons carry twin missile launcher rails, and appear to be rather deeper than is absolutely necessary. The flat endplates would also give extra keel area if stability was lacking, as would the very deep weapons pylons carried on the wing underside.

There are two other possibilities. The first is that there were both downwash interaction *and* stability problems. The second is far too simple, and may therefore have some truth in it. The mid-set wing position raised it fairly high off the ground, and this may not have suited existing Soviet weapons loading kit. A touch of anhedral, plus deep pylons may have been the answer, although the weapons would still have been much further above ground level than those of the Hind's predecessor, the Hip. Inboard of the endplate pylons are two more weapons pylons on each side, which are also deep, and project back past the trailing edge, using a fairing which extends back over the wing surface a little way to smooth the airflow. These pylons, which are stressed to carry bombs of up to 550lb (250kg) weight, are permanent fixtures, and cleared to carry a variety of weapons, of which the UB-32 rocket pod is the most widely used.

The accent on speed in the design of the Mi-24 is also shown by the use of a retractable wheeled undercarriage. In many helicopters of the period, the extra drag of a fixed undercarriage was considered an acceptable tradeoff against the added weight, complexity, and space necessary to house retractable gear, weight in particular tending to degrade performance in the slow flight and hovering regimes. This was considered acceptable for the Hind in order to screw those extra few knots of speed and extra few miles of combat radius out of it.

The single leg, twin nosewheel, which features a towing attachment, retracts rearwards into a compartment beneath the crew cabin floor. The main gears, which are single wheel, and located just aft of



Above: Scrap view of Hind A cabin area shows the steeply raked pilot's windshield complete with wiper. In darkness or adverse weather, forward visibility must be inadequate.

the main cabin, retract rearwards and inwards, turning through 90 degrees to stow in the lower aft fuselage, where they are enclosed by clamshell doors which open sideways and outwards.

Fat, low pressure tyres are used, which allow rolling takeoffs from rough grass surfaces to be made, a desirable feature at maximum all-up weight in a machine as compromised in the hover as is the Hind. Finally, on the underside of the tail rotor pylon, there is a tubular metal bumper to guard against rough landings or uneven ground, which consists of two sharply raking tubes forming a V strut meeting a heavier section main strut at the foot, which is a circular metal plate.

Hind A has a crew of either three or tour, depending on the mission. They are the aircraft commander/pilot, the engineer/co-pilot, the gunner/weapons system operator, and when necessary, a loadmaster in the rear cabin. Some sources also state that an observer is carried on the flight deck, but this seems unlikely.

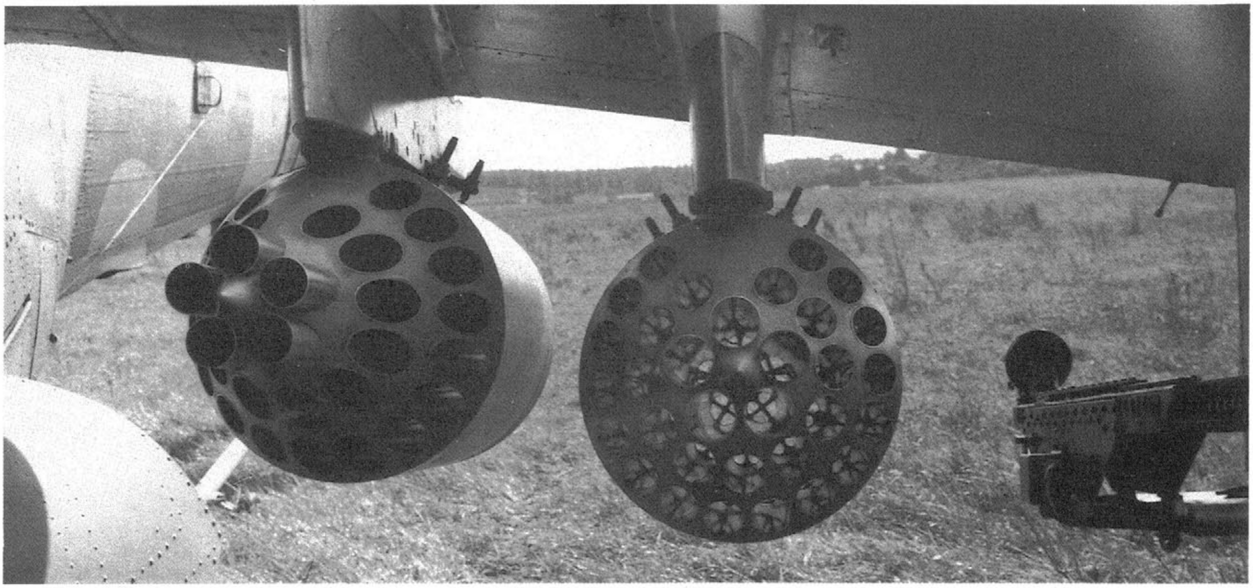
Crew cabin

The crew cabin of Hind A is enclosed by 11 panes of bullet-proof glass, most of which are optically flat, held by heavy framing which must obscure the view more than a little. The gunner is seated centrally, in front and at a lower level than the pilot and co-pilot who are seated well back, level with the engine intake nozzles. Their view upwards is restricted, most of the rear cabin roof being metal clad.

The gunner's view forward is through a church door-shaped optically flat panel directly in front of him, which has only a slight rake. The pilot, who contrary to Western practice for helicopters, sits in the left hand seat, has what appears to be a poor forward view under anything but ideal weather conditions, looking through twin "Mickey Mouse" optically flat panels, reminiscent of the windscreen of the Grumman A-6 Intruder, but raked and canted back at a very steep angle. Both of these panels have a windscreen wiper fitted.

The cabin cills are cut low to the sides which gives a reasonably good view sideways and downwards, but at night or in murky weather, the plethora of panels, all set at different angles, and all a considerable distance from the pilot's eyes, appear to have

Below: Sun glint on the port access door shows the extent to which transparencies are a liability in combat, making unobserved approach to a target much more difficult.



Above: A close-up view of two UB-32 rocket pods beneath a Hind's port wing. Each pod holds 32 S-5 unguided rockets of 57mm calibre. An example of coarse riveting can be seen on the main gear door at bottom left.

been designed to catch every annoying reflection from the cockpit lighting and instruments, as was the case with the Bristol Blenheim or Heinkel He 111 back in 1940. Access for the gunner is through an upward hinged glazed panel on the port side, while the other crew members enter through a sliding hatch, also glazed, and also on the port side. Stirrup type steps are provided to assist access to both positions.

Cargo compartment

The troop carrying/cargo compartment is located behind the flight deck and beneath the engines and gearbox. It can seat eight fully armed troops, or at a pinch can carry 16 lightly armed ones, probably in the utmost discomfort, or four stretcher cases. Supplies can also be carried, or reloads for the Hind's pylons, although lifting them into position without special equipment might be a problem with some weapons. Access is by horizontally split doors on both sides, the top half, which has two small vision ports, hinging upwards, while the bottom half, which has a folding boarding step, opens downwards. Two more vision ports are located on each side of the fuselage in the fixed section behind the doors.

The main fuel tanks are located beneath the troop compartment floor, which cannot be too comforting to the passengers if they know about it, although they are armoured and otherwise protected, and further fuel tanks, also well shielded, are believed to be in the bulkhead astern of the troop compartment. The only other armour believed to exist on Hind A is a sheet steel panel on the front frame as protection against fire from head-on, while the crew seats may also be protected in this way.

The main oil tank is reported to be located just beneath the usual position for the red star insignia on the fuselage, which makes a convenient aiming point for small arms gunners on the ground. Most of the avionics black boxes are also situated in this area, as are the two 28V battery powered starter generators used for engine starting, and the 30kW generator used to run the electrical systems, instruments, and de-icing. Warm air blowing is used to keep the cockpit transparencies free of ice, while a full cockpit air conditioning system is fitted.

The avionics fit on Hind A is fairly basic. The communications set consists of a Mikron UHF radio, a Landysh 5 VHF radio, and an SPU-7 intercom. For navigation, the GIK-1 gyro compass and ARK-15 radio compass are fitted, as is the RSBN-2S short range navigation system and the SP-50 instrument landing system. Other items include the RV-5 radio altimeter, and SRO-2M identification friend/foe, known to NATO as "Odd Rods".

The gunner, or perhaps he should be called the weapons operator, has a wide variety of offensive

Above: A Hind A accelerates away after liftoff, showing details of the fully articulated rotor head. This makes Hind sluggish in response and unsuitable for NOE flight.

nasties at his disposal. For defence suppression, he has a traversable 12.7 single barrel DShK machine gun mounted low in the nose, fed with belt magazines of about 250 rounds each. Aimed by a magnifying optical sight system located under the nose, the gun is moveable through roughly plus 15 and minus 30 degrees in elevation, and 30 degrees to either side of the aircraft centreline in azimuth. Effective range is approximately 2,450ft (750m) and rate of fire about 16 shells per second. Both high explosive and armour piercing ammunition is loaded, and traditionally every fifth projectile is tracer.

The same sighting system is used to launch and control the main anti-tank weapon, the AT-2 Swatter. Swatter is a cruciform winged missile which is carried in pairs on dual rail launchers fitted to the outboard endplate pylons. Unusually it sits on the rails, rather than being suspended from them, and each rail is mounted on top of two bearing plates which fix to the underside of the pylon. Swatter uses manual command to line of sight control via a radio link, the aerial for which is on the starboard side of the nose.

Swatter statistics

Weighing just 25lb (11.3kg), Swatter is 3.71 ft (1.13m) long, with a calibre of 132mm. Its hollow charge warhead can penetrate over 400mm of homogeneous armour. Minimum range is 1,970ft (600m), and while stated maximum ranges vary, the true figure is probably about 8,200ft (2,500m). Its flight speed is slow, about 490ft (150m) per second, duration to maximum range probably being in the region of 20 seconds or more. As the missile is aerodynamically controlled, its manoeuvre capability diminishes sharply towards the end of its run. The lengthy flight time coupled with the low-set sighting system means that Hind must expose itself for considerable periods at fairly close range to use Swatter, while the manual command system is difficult to use accurately.

The other guided weapon seen on early Hinds, although infrequently, is AT-3 Sagger. Similar in general configuration to Swatter, Sagger is slightly smaller and lighter than the earlier missile, and uses manual command to line of sight guidance also, but with a wire link. A slower missile, it has slightly shorter minimum range and slightly longer maximum range. In other respects it is similarly effective. Sagger first gained its reputation in Egyptian service as a man-portable weapon following the crossing of the Suez Canal during the October War of 1973.

While the inboard pylons can be used to carry bombs of varying sizes, napalm tanks and chemical weapons, four pods of unguided rockets are most often seen in these positions. Pods are invariably of UB-32 type each of which holds 32 S-5 rockets of 57mm calibre for a total of 128. The S-5 is believed to have an effective (i.e. the range at which one can reasonably expect to hit a target) range of about 3,950ft (1,200m), and while it can be fitted with warheads of many types, depending on the mission, an anti-armour hollow charge type is often loaded, giving armour penetration of up to 200mm, or 1,000mm of concrete. Larger rockets can be carried, either singly or in pairs. These include the 160mm calibre S-16, the 210mm calibre S-21, and the 240mm calibre S-24. Cluster bombs are another possible load, and have been used in Afghanistan. Attack accuracy is recorded by gun camera located at the top of the port inboard pylon.

While it seems obvious that bomb dropping and unguided rocket launching is the responsibility of the gunner, as the pilot's view is really not good enough, (although it might be by Russian standards), there is a problem. For all unguided weapons, aiming is done by aiming the aircraft, which should be done by the pilot. There are various solutions. Firstly, the pilot has some sort of rough sighting system which he uses intially, then "fine tunes" the aim in accordance with instructions from the gunner. Although with these weapons we are not talking about a high level of accuracy—rockets and cluster weapons spread, while bombs are essentially an area weapon anyway—aiming would still demand a very high level of crew co-operation, and take time, which on the modern battlefield would be unhealthy, to say the least.

The "rough sighting system" might of course only need to be the pilot's view through the windscreen! Secondly, the gunner could have secondary controls with which to take over the attack for a few seconds, although there is no evidence for this, and with both a pilot and co-pilot aboard, it seems rather like overkill. Thirdly, the "dumb" weapons are used by the gunner at targets of opportunity only, those that happen to get into the sight. The most likely solution appears to be the first, but the setup does not appear to make for high levels of effectiveness.

Below: One of the first views to be released of a Hind A with the port-mounted tractor tail rotor, indicating more powerful engines. Note that the "buzz" number is now located on the tail boom instead of forward.

The Mi-24 family of helicopters is notorious for its crop of external warts and excrescences, and Hind A is no exception, although it is much simpler than the later versions. The steerable nosewheel is not enclosed when retracted, and is only semi-recessed: Even though the main gear is fully enclosed, the clamshell doors to the wheel compartment have had to be bulged to accommodate the thick tyres. The remotely controlled nose gun projects from a small opening just beneath the windshield, and seems to be backed by a mantlet of some sort. Small pitot tubes drop vertically on each side of the nose before turning through 90 degrees to point forward, level with and below the rear frame to the first side transparency. The transparency on the pilot's access door is heavily bulged out to give a minimal rear view.

Nose antennas

Apart from the stirrup-type steps mentioned earlier, a small radome is located under the nose, level with the rear of the gunner's seat. Aerials proliferate. From a small lead-in just ahead of and below the troop cabin door, an aerial stretches back to just ahead of the main gear compartment, while from another lead-in set just behind the rotor fairing, twin HF aerials extend to the extremities of the horizontal stabiliser. Two whip VHF aerials extend from the dorsal surface of the tail boom, while a "towel rail" for the radar altimeter is situated on the ventral side of the boom.

The Odd Rods IFF aerials are located just behind the cabin main transparency arch in front, and at the very tip of the underside of the tail boom; the ILS aerial extends from the rear underside of the main fuselage section where it joins the tail boom. Navigation lights are located on the tips of the stub wings and at the bottom of the trailing edge of the tail rotor pylon, while anti-collision and station-keeping lights appear on both sides of the extreme nose, dorsally halfway down the tail boom, and on the outside rear of the central stores pylons.

Finally, a small air scoop for cooling the gearbox that drives the engine accessories and the generators, appears on top of the engine nacelles. Viewed from close-up, the Hind's surface finish is rather rough, with holders for items such as Odd Rods, or the navigation lights which are just rivetted on to the surface, almost as an afterthought. In any close view, coarse dome-headed rivets and countersunk, slotted bolts are well in evidence. Of course, fine finishes reduce drag and increase performance, but they cost more to produce. At typical helicopter speeds, any drag reduction obtained through a high quality smooth surface would hardly be worthwhile.

Below: A crudely retouched side view of an early Hind A showing the predatory if massive fuselage/tail boom lines. Like almost all photographs of the period, rocket pods are carried, but the missile rails are empty.

3

Hind Series Development

THE OFFICIAL Western estimate of the maximum take-off weight of the original Hind A is 18,520lb (8,400kg). While there is some evidence to show that this is considerably on the low side, possibly by as much as two tonnes, this is the figure which we must work to. Rotor disc loading based on this weight comes out at 7.59lb/sq.ft (37kg/sq.m), which is not all that heavy by contemporary standards. Power loading is another matter. The original Isotov TV2-117 engines (often misidentified in the early days as modified Gluschenko GTD-3Fs), carry a rating of 1,500 shaft horsepower each. This is an emergency rating for short periods only.

Standard Soviet practice is to down-rate engines by between 12 and 15 percent in order to get standard performance over a wide range of altitude and temperature conditions. Normal take-off rating of the TV2-117 is therefore only about 1,300shp, which gives the unimpressive power loading of 7.12lb (3.23kg) per shp. For comparison purposes, the Westland Lynx AH.1, a smaller anti-tank helicopter, which also has a limited troop-carrying capability, has a power loading of only 5.25lb (2.38kg) per shp at maximum take-off weight, over one third better. It was obvious that more power would be welcome in Hind A. Then in 1976 a new variant appeared.

Surprisingly, this was not allotted a new suffix, as it varied from the original in at least one radical external way. The tail rotor, previously a pusher located on the starboard side of the tail pylon, was now moved to the port side and became a tractor. This was a direct result of new engines being fitted; the Isotov TV3-117, which had a normal take-off rating of 1,900shp, increased the power loading to 4.87lb (2.21kg)/shp—a considerable improvement—which may also have been accompanied by an increase in the permitted maximum load. Assuming that the two tonne estimate of maximum weight shortfall was correct, this would move the power loading from the pathetic to the reasonable. The maximum emergency rating of the TV3-117 was 2,200shp for a maximum of 150 seconds. A further effect, not previously touched upon here, is that the "hot and high" performance would also have received a useful improvement. Tail rotor configuration apart, the more powerful Hind A was unchanged except for a slight shortening of the engine nacelles. One effect of the tail rotor change was to reduce rotor "slap" and noise.

Hind C

Built only in small numbers, and first appearing in

Below: Hind As demonstrate their ability to set down troops quickly, and incidentally provide an excellent target for any roving fighter on this featureless plain.

about 1974, Hind C is a bit of a mystery. Externally it is similar to Hind A, but lacks the nose gun with its associated undernose magnifying optical sighting system, and also the endplate stub wing pylons and missile mountings. Like the preproduction straight winged Hind B, it has only the four inboard stores pylons, which it is conjectural are plumbed for external fuel tanks. Generally stated to have been intended as purely an assault troop carrier and as a battlefield supply transport, it is reported to have ceased production in the same year that it entered service.

The carriage of external fuel tanks would have usefully extended its radius of action, but the extra vulnerability of these would have told against it in the battle area. In the purely supply or troop transport roles it was less effective than the much larger Hip, even though considerably faster. A specialised trainer variant of a helicopter that already carries two pilots is hardly credible, while a reconnaissance version is hardly less so. It may just have been intended for special missions in country where tanks were unlikely to have been encountered, but the omission of the nose gun does not support this. Whatever its intended role, and those who know aren't saying, it seems to have been a failure, and was quickly dropped, perhaps in favour of the vastly different Hind D, which entered production in 1974.

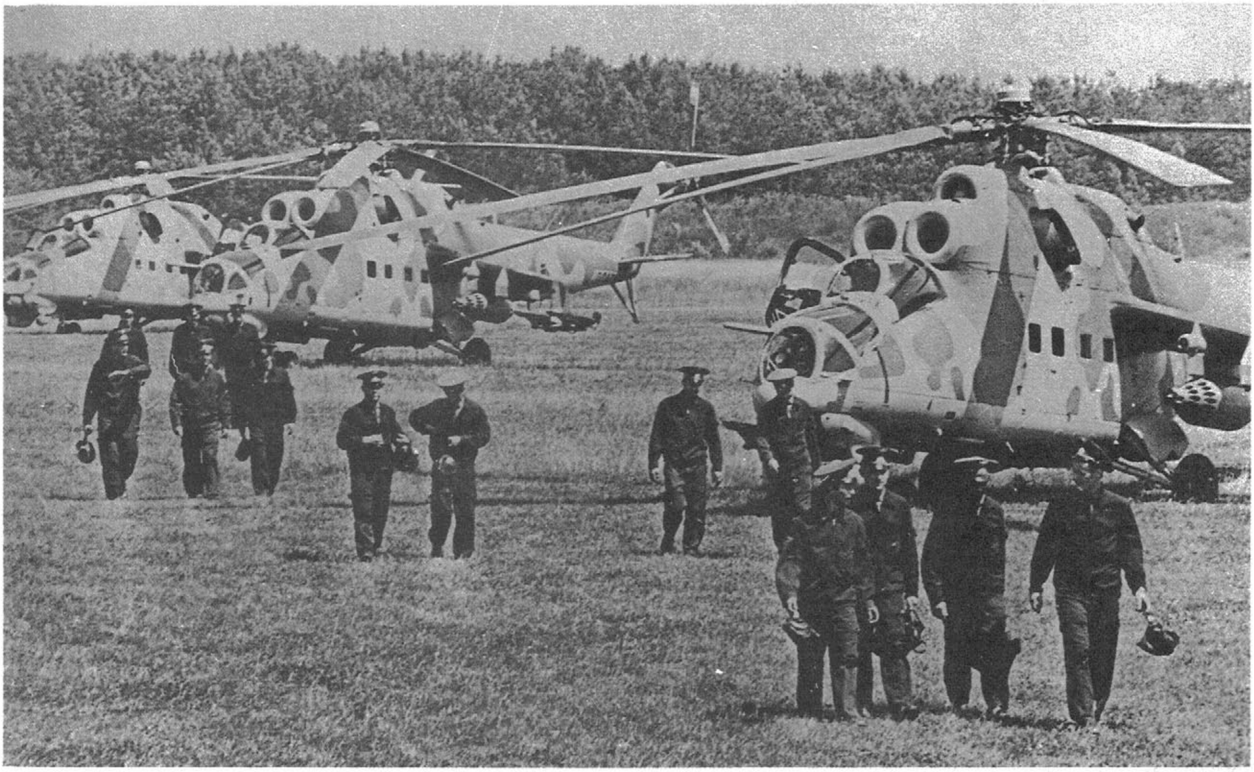
Hind D

At some point in the early 1970s, the Soviet Union redefined helicopter roles in order of priority. They now became:

1) The destruction of battlefield forces.
2) The destruction of equipment and reinforcements.
3) Reconnaissance and general intelligence gathering.
4) Artillery spotting.
5) The setting down of anti-tank squads, raiding or demolition parties at critical points on or behind the battlefront.
6) The transfer of weapons and equipment where no other viable methods existed.
7) Delivering supplies.
8) Casualty evacuation.

This represented a considerable change in priori-

Below: Flying helmets in hand, Hind D crews relax as they come off duty. Unusually, these aircraft have the camera (or laser seeker) on the port inboard pylon, like Hind A.



ties for the rotary wing units, which up to this point had been regarded more as support assets than front-line battlefield units.

While Hind A had been able to bring small squads of men to the battlefield, and provide defence suppressive fire during the landing and close support fire after it, compromises inherent in the design limited its effectiveness. Firstly its troop carrying capacity was too limited to influence anything but relatively small-scale actions. Secondly it was too vulnerable to be allowed anywhere near a modern adversary, even those of nearly 20 years ago. The change in priorities merely accentuated these shortcomings.

Perhaps what was really needed was an altogether new machine, dedicated to attack, close support, and anti-tank work, to operate in combination with the Mi-8 Hip armed transport. This was certainly the way the West would have gone. It was equally certainly not the way that the Soviet military thought. What they had was the world's fastest service helicopter, which whatever its faults was a good all-rounder, a first-class multi-role machine, and the last thing they were going to do was to scrap it for a new design which would take years to reach fruition, leaving a gap in the inventory. The USSR has long been noted for screwing the last drop of capability from an existing basic design, and so they passed the problem, with the new priority list, back to Marat Tishchenko and the Mil OKB.

Below: A close-up view of the new nose grafted onto the Hind airframe to form Hind D, showing the four-barrel 12.7mm machine gun, the FLIR/LLTV sensor to its right and the AT-2 missile radar director to the left.

Above: It can be seen that both pilot and weapons officer are seated well back in their cockpits in Hind D, with no rearward and poor sideways and downward view.

At this point there existed a proven helicopter design with a high performance and the requisite load-carrying capability, (even though this last had slipped down the list of priorities) the basic armament of which was adequate for the tasks it would be called upon to perform. On the other hand it was too vulnerable to small arms fire, which it would always be likely to encounter near the forward line of troops (FLOT), while a shell bursting in the flight deck area would kill or incapacitate the entire crew. Furthermore, the limited view available to the pilot, which was poor directly ahead, fairly good to the left and downwards, non-existent to the rear, and totally inadequate to the right due to the presence of the co-pilot/engineer, was not at all suitable for the battlefield role. The difficulties of aiming unguided weapons has already been touched upon.

The fuselage cross-section was fixed and immutable, due to the size of the rear cabin, and was therefore retained, together with the engine/gearbox/rotor assembly, the tail unit, undercarriage, and stub wings. What Tishchenko and his team did was to graft a completely new nose onto the existing mid and rear sections. Rumoured to be the Mi-27 (although never confirmed), the result became the Hind D.

The first step was to reduce the three/four man crew to two/three. The co-pilot/engineer was dispensed with and the crew chief/loadmaster was only to be carried on missions where he was specifically needed. In the battlefield role, Hind D was operated by two men only—the pilot/aircraft commander and the weapons officer, as the gunner now became known. A stepped tandem crew layout was adopted, with the pilot seated above and behind the gunner, a configuration that may have been influenced by the American HueyCobra.

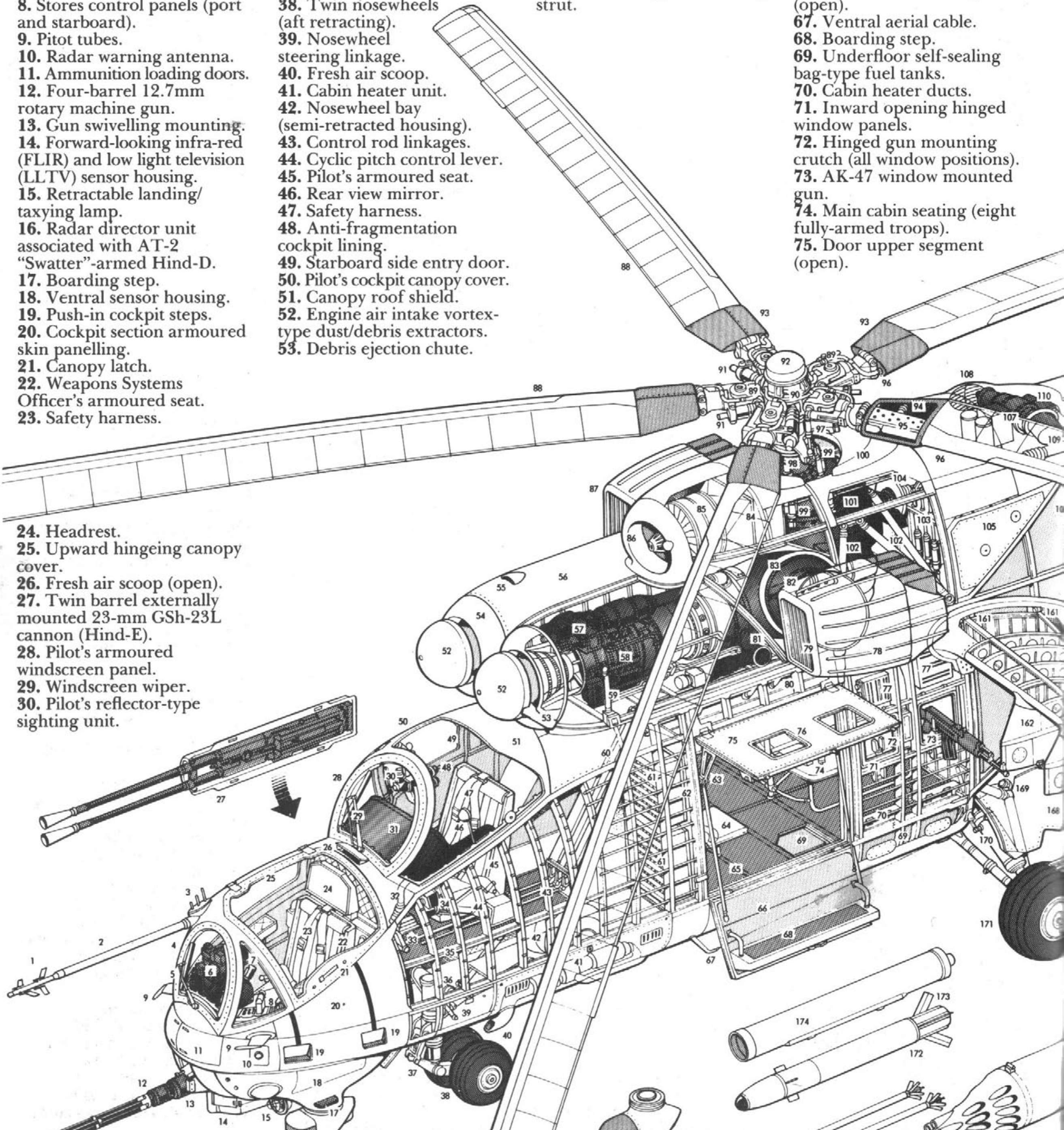
Pilot's cockpit

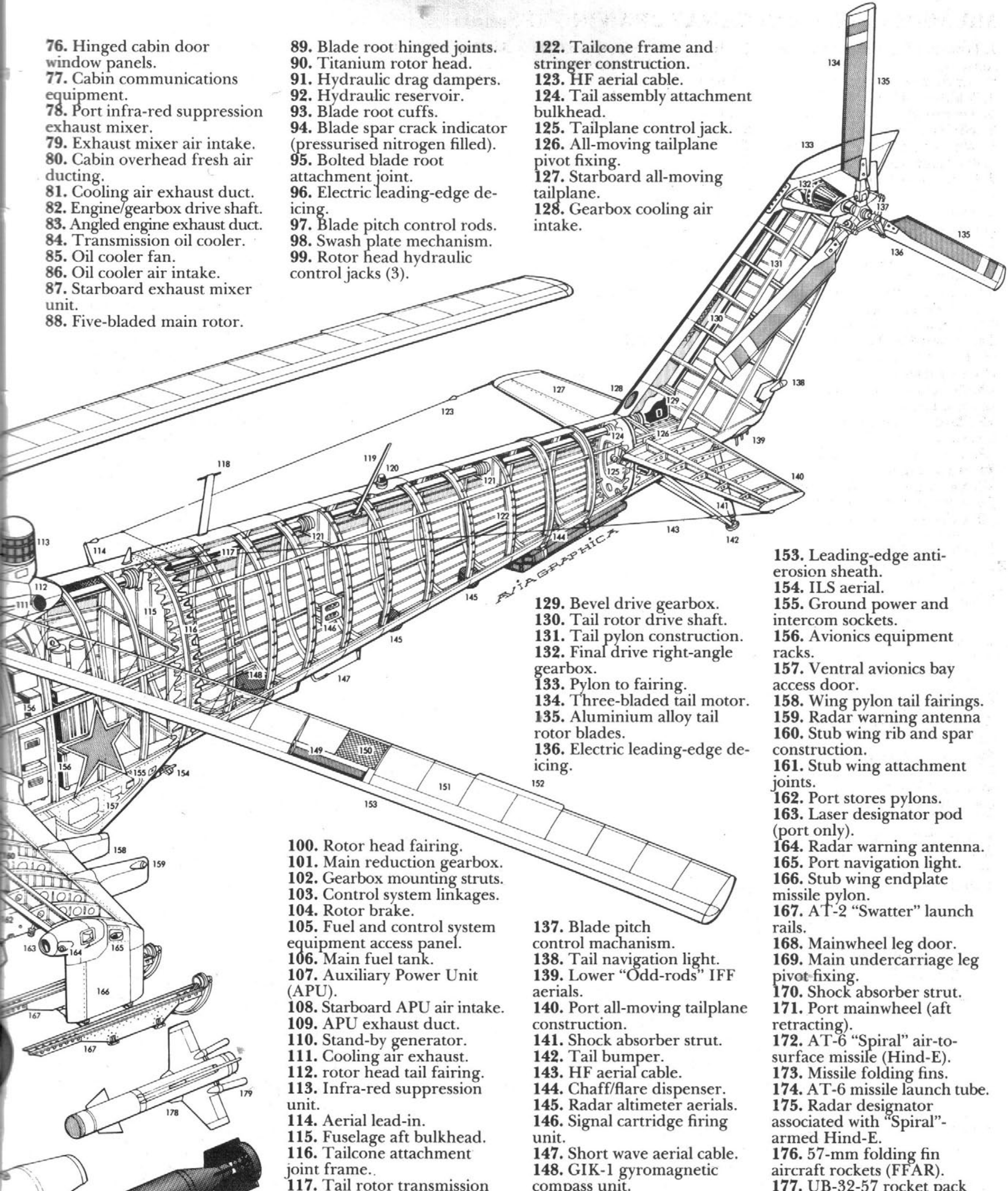
The armoured pilot's seat was centrally placed in a roomy cockpit from which he has an excellent forward view over the top of the weapons officer's position, plus a reasonable view to each side, although not so good downwards. Mirrors mounted on the transparencies to each side give a marginal view to the rear, although this feature only appeared later. The windscreen is optically flat bullet-proof glass, held at a slight rake angle by a truly massive horseshoe-shaped canopy bow. There is just one quarterlight, situated on the starboard side just ahead of the rearward-hinged door which also contains a transparency.

The rear of the cockpit is covered by a metal shield which is connected to the canopy bow by a single frame at the top of the door. The remainder is a one-piece, deeply curved transparency that is highly bullet-resistant, but which gives a distinctly lopsided effect when seen from head-on.

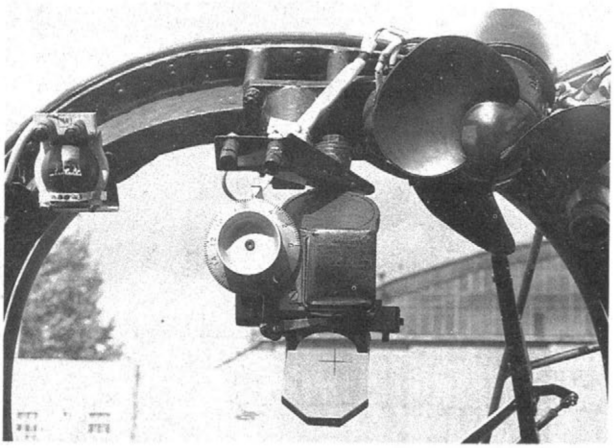
MIL Mi-24 HIND-D/E CUTAWAY DRAWING KEY

1. Low speed precision airflow sensors.
2. Air data sensor boom.
3. "Odd-rods" IFF aerials.
4. Armoured windscreen panel.
5. Windscreen wiper.
6. Weapons Systems Officer's instrument panel.
7. Gun control and sighting unit.
8. Stores control panels (port and starboard).
9. Pitot tubes.
10. Radar warning antenna.
11. Ammunition loading doors.
12. Four-barrel 12.7mm rotary machine gun.
13. Gun swivelling mounting.
14. Forward-looking infra-red (FLIR) and low light television (LLTV) sensor housing.
15. Retractable landing/taxying lamp.
16. Radar director unit associated with AT-2 "Swatter"-armed Hind-D.
17. Boarding step.
18. Ventral sensor housing.
19. Push-in cockpit steps.
20. Cockpit section armoured skin panelling.
21. Canopy latch.
22. Weapons Systems Officer's armoured seat.
23. Safety harness.
24. Headrest.
25. Upward hingeing canopy cover.
26. Fresh air scoop (open).
27. Twin barrel externally mounted 23-mm GSh-23L cannon (Hind-E).
28. Pilot's armoured windscreen panel.
29. Windscreen wiper.
30. Pilot's reflector-type sighting unit.
31. Instrument panel shroud.
32. Cyclic pitch control column.
33. Yaw control rudder pedals.
34. Instrument panel.
35. Pilot's cockpit floor level.
36. Nose undercarriage pivot fixing.
37. Levered suspension axle beam.
38. Twin nosewheels (aft retracting).
39. Nosewheel steering linkage.
40. Fresh air scoop.
41. Cabin heater unit.
42. Nosewheel bay (semi-retracted housing).
43. Control rod linkages.
44. Cyclic pitch control lever.
45. Pilot's armoured seat.
46. Rear view mirror.
47. Safety harness.
48. Anti-fragmentation cockpit lining.
49. Starboard side entry door.
50. Pilot's cockpit canopy cover.
51. Canopy roof shield.
52. Engine air intake vortex-type dust/debris extractors.
53. Debris ejection chute.
54. Engine intake cowling.
55. Generator cooling air intake.
56. Starboard engine cowling/hinged work platform.
57. Engine accessory equipment gearbox.
58. Isotov TV3-117 turboshaft engine.
59. Forward engine mounting strut.
60. Rotor head control rods.
61. Electrical equipment racks.
62. Forward fuselage frame and stringer construction.
63. Door operating and interconnecting linkage.
64. Aft facing troop seats (port and starboard).
65. Main cabin floor level.
66. Main cabin door segment (open).
67. Ventral aerial cable.
68. Boarding step.
69. Underfloor self-sealing bag-type fuel tanks.
70. Cabin heater ducts.
71. Inward opening hinged window panels.
72. Hinged gun mounting crutch (all window positions).
73. AK-47 window mounted gun.
74. Main cabin seating (eight fully-armed troops).
75. Door upper segment (open).





76. Hinged cabin door window panels.
77. Cabin communications equipment.
78. Port infra-red suppression exhaust mixer.
79. Exhaust mixer air intake.
80. Cabin overhead fresh air ducting.
81. Cooling air exhaust duct.
82. Engine/gearbox drive shaft.
83. Angled engine exhaust duct.
84. Transmission oil cooler.
85. Oil cooler fan.
86. Oil cooler air intake.
87. Starboard exhaust mixer unit.
88. Five-bladed main rotor.
89. Blade root hinged joints.
90. Titanium rotor head.
91. Hydraulic drag dampers.
92. Hydraulic reservoir.
93. Blade root cuffs.
94. Blade spar crack indicator (pressurised nitrogen filled).
95. Bolted blade root attachment joint.
96. Electric leading-edge de-icing.
97. Blade pitch control rods.
98. Swash plate mechanism.
99. Rotor head hydraulic control jacks (3).
100. Rotor head fairing.
101. Main reduction gearbox.
102. Gearbox mounting struts.
103. Control system linkages.
104. Rotor brake.
105. Fuel and control system equipment access panel.
106. Main fuel tank.
107. Auxiliary Power Unit (APU).
108. Starboard APU air intake.
109. APU exhaust duct.
110. Stand-by generator.
111. Cooling air exhaust.
112. rotor head tail fairing.
113. Infra-red suppression unit.
114. Aerial lead-in.
115. Fuselage aft bulkhead.
116. Tailcone attachment joint frame.
117. Tail rotor transmission shaft.
118. UHF aerial mast.
119. VHF aerial.
120. Anti-collision light.
121. Transmission shaft bearings.
122. Tailcone frame and stringer construction.
123. HF aerial cable.
124. Tail assembly attachment bulkhead.
125. Tailplane control jack.
126. All-moving tailplane pivot fixing.
127. Starboard all-moving tailplane.
128. Gearbox cooling air intake.
129. Bevel drive gearbox.
130. Tail rotor drive shaft.
131. Tail pylon construction.
132. Final drive right-angle gearbox.
133. Pylon to fairing.
134. Three-bladed tail motor.
135. Aluminium alloy tail rotor blades.
136. Electric leading-edge de-icing.
137. Blade pitch control machanism.
138. Tail navigation light.
139. Lower "Odd-rods" IFF aerials.
140. Port all-moving tailplane construction.
141. Shock absorber strut.
142. Tail bumper.
143. HF aerial cable.
144. Chaff/flare dispenser.
145. Radar altimeter aerials.
146. Signal cartridge firing unit.
147. Short wave aerial cable.
148. GIK-1 gyromagnetic compass unit.
149. Hollow D-section titanium blade spar.
150. Honeycomb trailing-edge panel.
151. Glass-fibre skin panelling.
152. Fixed blade tab.
153. Leading-edge anti-erosion sheath.
154. ILS aerial.
155. Ground power and intercom sockets.
156. Avionics equipment racks.
157. Ventral avionics bay access door.
158. Wing pylon tail fairings.
159. Radar warning antenna
160. Stub wing rib and spar construction.
161. Stub wing attachment joints.
162. Port stores pylons.
163. Laser designator pod (port only).
164. Radar warning antenna.
165. Port navigation light.
166. Stub wing endplate missile pylon.
167. AT-2 "Swatter" launch rails.
168. Mainwheel leg door.
169. Main undercarriage leg pivot fixing.
170. Shock absorber strut.
171. Port mainwheel (aft retracting).
172. AT-6 "Spiral" air-to-surface missile (Hind-E).
173. Missile folding fins.
174. AT-6 missile launch tube.
175. Radar designator associated with "Spiral"-armed Hind-E.
176. 57-mm folding fin aircraft rockets (FFAR).
177. UB-32-57 rocket pack (32 x 57-mm rockets).
178. AT-2 "Swatter" air-to-surface anti-tank missile.
179. Missile launch booster tubes.
180. 550-lb (250-kg) HE bomb.



Above: Two odd features of later Hind Ds are this suspended reflector sight with lots of sharp edges, offset slightly to the right, and the rubber bladed fan on the canopy bow. They would not be inspiring in the event of a crash.

While the canopy curvatures are exteme, and should produce only small areas of sun glint, the general effect is that glint will go in all directions, and make Hind D potentially highly visible on a sunny day. Of course, the current trend is to go for optically flat panels which will only reflect in one direction at a time, the theory being that however little you reflect, if it is at the wrong angle you are going to be seen anyway. Access to the cockpit door is gained by a recessed step on the starboard side.

Hind D's controls are conventional, with orthodox rudder pedals and a centrally-placed cyclic pitch control column. The collective pitch control column is mounted low on the floor on the left hand side of the seat. The instrument panel is shrouded, and contains the usual amount of dials and switches. Early model Hind Ds had a reflector gunsight mounted on top of the shroud, but later aircraft were modified (or retrofitted) with an inverted reflector sight suspended from the canopy bow by heavy bolts. This consists of a heavy bracket fixed to the canopy bow, to which an apparently sharp-edged plate is also bolted and angled towards the windscreen at about 45 degrees. To this is fixed the image-generating unit, to the left of which is a large, about 3in (75mm) diameter control dial, possibly to adjust range bars on the display, or perhaps brightness.

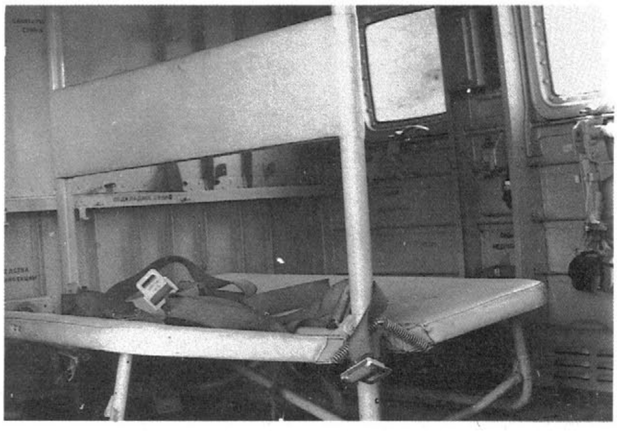
The reflector glass is angled back towards the pilot as normal, but inverted, with cropped corners on the lower edge. This cumbersome arrangement not only obscures an appreciable amount of the pilot's forward view right in the centre of the windshield, but is well placed to do him a mischief in the event of a crash. This contraption seems to have only one thing to commend it. Pilots naturally tend to vary in height and the sight appears to be adjustable to the eyeline of different individuals. The original reflector sight set on the cockpit coaming was rather low, and may well have been inconvenient for the taller pilot.

Cockpit fan

Another odd feature that appeared in the cockpit of later Hind Ds was a three-bladed, broad bladed fan. This was also mounted on the canopy bow, on the right side just where the framing to the top of the door met it. Presumably set to cool the pilot, the fan does not appear to be adjustable. The motor projects on the outside of the transparency to form yet another excrescence. This also is a bit mysterious, as all Hind Ds have air conditioning. Almost certainly it is for use in hot climes, where the air conditioning is less effective, and is probably only found on some export versions, perhaps the Mi-25, as the main export variant is designated.

The front cockpit is occupied by the weapons operator, described in all Soviet literature as the weapons officer. This would be in keeping with Soviet practice, which shows a tendency to use commissioned officers in many positions of responsibility where Western nations would use an NCO; for example a USAF crew chief would typically be a sergeant or master sergeant, whereas his Russian equivalent would most likely be a lieutenant.

Below: Hind D's lightweight folding seats face outward and each man has a gunport in front of him with a pintle mount for his Kalshnikov, though aiming must be difficult.



The weapons officer of the Hind D also has an armoured seat which is set low in the very front of the nose. Like the pilot, his forward view is through an optically-flat bullet-proof windscreen held in position by a massive canopy bow of a horseshoe shape, the only differences being that his screen is smaller, although not by much, and set slightly nearer the vertical. Like the pilot, he has a quarterlight, although this time set on the port side.

Access is via a hinged upward opening canopy to the left of the machine, which like the pilot's main transparency, is highly curved. The hinges are set on a horizontal frame which runs roughly parallel with the frame to the top of the pilot's door. An extending strut is used to keep the canopy open for access. The front cockpit is reached from the boarding step on top of the bracket which holds the anti-tank missile guidance unit, plus two recessed steps low on the port side, with spring loaded push-in flaps.

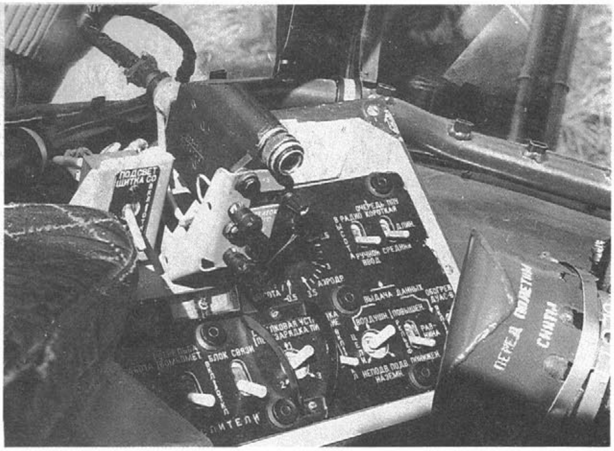
This revised layout seems to have resolved the problem of who had charge of different weapons; the pilot using his reflector sight for bombs and unguided rockets (bombs are generally released in a dive), while the weapons officer took responsibility for the traversable machine gun and anti-tank missiles. In emergencies the pilot could lock the gun to fire straight ahead for his own use, but this would only occur if the weapons officer was incapacitated or otherwise busy guiding missiles.

The weapons officer's position has a central panel from which the machine gun is remotely operated and fired, while a console to its left handles such things as inputs from the radar altimeter, target data, and rate of fire selection. A right hand console is the missile operation station, with ranging data and systems, and the missile sighting and guidance system, which swings out for use.

Enhanced survivability

Having vastly improved the effectiveness of the Mi-24 by getting the crew layout right, the next step for Tishchenko's team was to make it more survivable. The aim was to make Hind virtually impervious to rifle calibre bullets, extremely resistant to heavy (12.7mm) machine gun fire, and tolerant of 20mm shell hits. Anything more than this was impracticable if it was still intended to leave the ground.

A point to be considered here is that even if an



Above: The weapons officer controls the four-barrel machine gun from this panel to the left of his seat, in terms of target data, the required rate of fire, and data from sensors such as the radio altimeter.

ultra-lightweight composite armour was to be developed capable of stopping a really large projectile, a helicopter does not have sufficient mass to absorb the kinetic energy imparted by the impact, without tipping it clean out of control, which at operational altitudes would be enough. Also the rotor head and rotor would remain very vulnerable, as a hit of any substance in this region would almost invariably cause catastrophic damage. Technological progress notwithstanding, the idea of an invulnerable helicopter is an unrealisable dream.

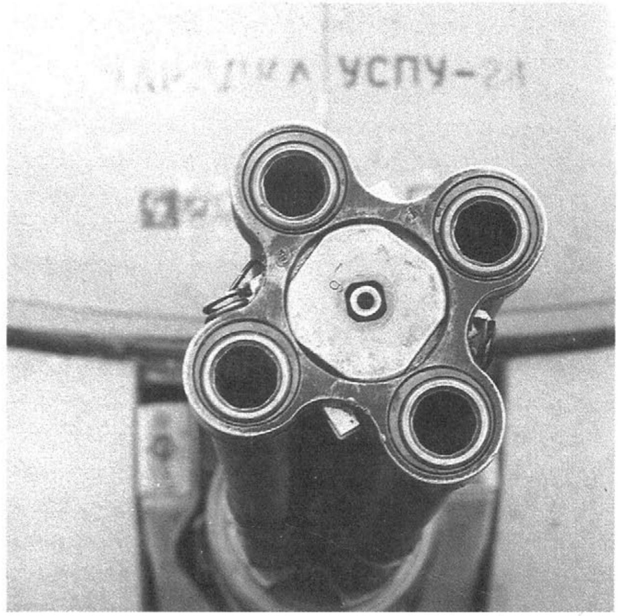
A few critical components of Hind D were manufactured in steel rather than aluminium, but the main metal chosen to give protection was titanium alloy, a substance almost as strong as steel but much lighter, the main drawback being that it is difficult to work and even worse to weld. But at the time, the Soviet Union was beginning to make great advances in the use of this material, and in any case, there was no real alternative.

The weapons officer, in his vulnerable place in the extreme nose, was given a massive armour front shield, while the sides of both cockpits were sheeted with titanium, which in this location became part of the structure. The two cockpits were separated by a shield of sufficient thickness to stop most shell fragments, while the pilot was also protected in this way from astern. All internally exposed cockpit armour was lined with a nylon-type material as protection against spalling effects after a heavy impact. Titanium armour was also used to shield almost the entire underside of the fuselage, and extensively around the fuel tanks, engines and gearbox assembly. The author has no information as to protection to the aft cabin, but considers it unlikely, except for underneath where the fuel tanks are located.

Deadlier weapons

Having given Hind D an unprecedented amount of protection, at a considerable penalty in weight, the final stage was to make it more deadly in terms of weapons and avionics. The most obvious change was to the nose machine gun. The single barrel 12.7mm DShK was replaced by a four barrel Gatling type gun of the same calibre, chin-mounted in a remotely controlled barbette which was hydraulically powered. This gave selectable rates of firing, 4,200 rounds per minute being the maximum cyclic rate, with a maximum effective range of 4,900ft (1,500m). The field of fire was also enlarged to plus 15 degrees and minus 60 degrees in elevation, and about 70 degrees to either side of the aircraft centreline in azimuth. A magazine holding about 2,000 rounds gave a firing time of almost half a minute.

This gun was often misidentified in the early days as being a 23mm four barrelled cannon, but it seems that the stresses that firing a weapon of this size



Above: A close-up view of the muzzles of the four-barrel machine gun carried by Hind D. Defence suppression is the main function of the gun, though it could certainly prove effective against troops caught in the open.

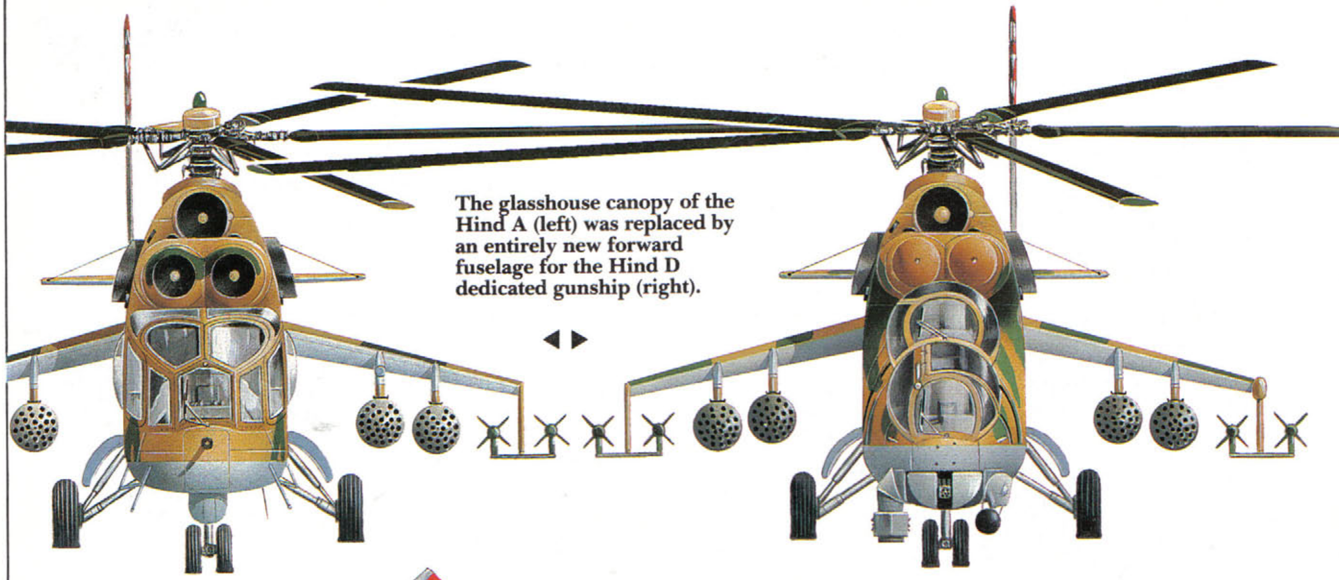
would have involved on what was after all quite a small barbette, would have been unacceptable.

The other change in weaponry was minute in appearance, but significant. The original Swatter guidance system used manual command to line of sight (MCLOS) guidance, which involved the oper-

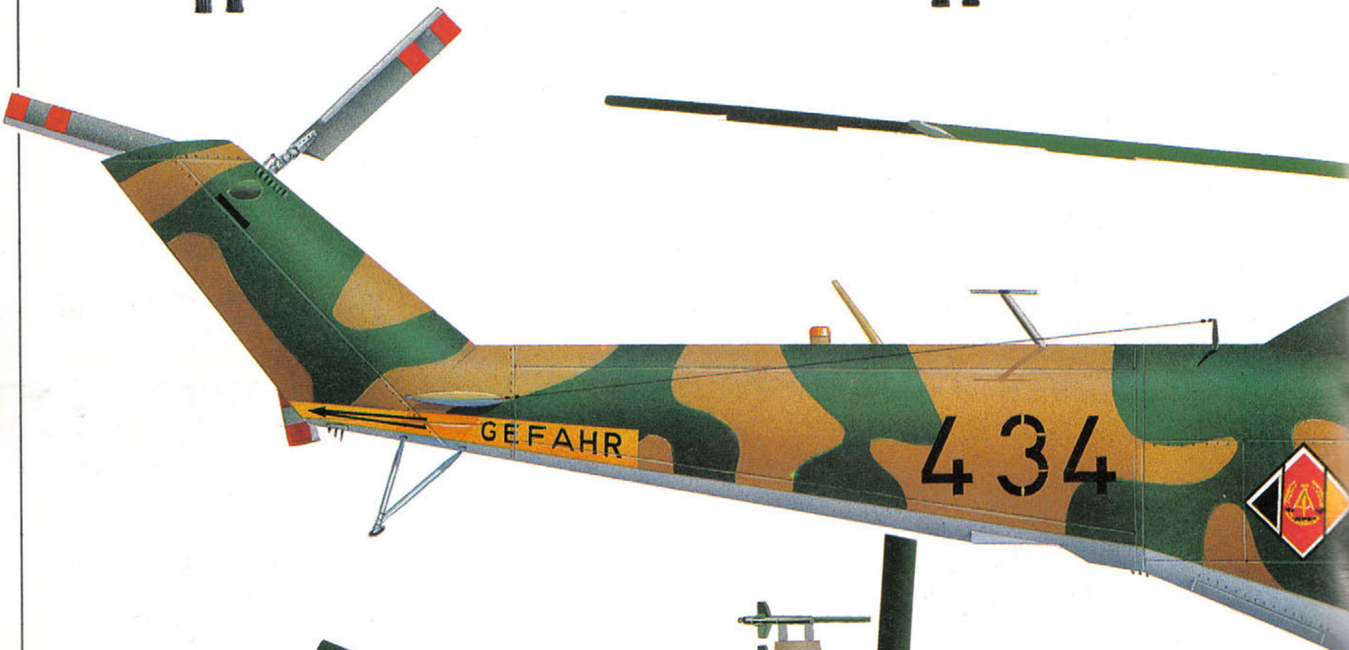
Below: Hind D stands on its toes as the photographer catches it at the moment of liftoff. Like many others, this Hind has intake covers fitted but carries no anti-IR devices.

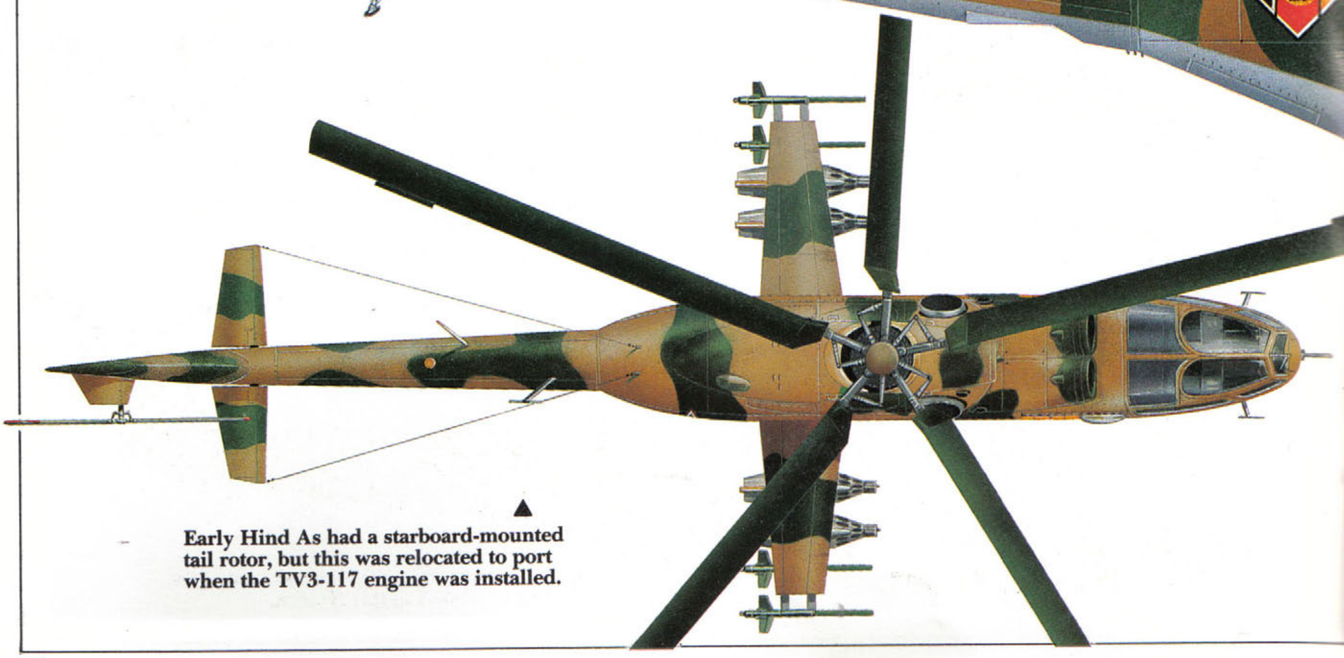
Above: Despite its heavy weapons load, Hind D is not particularly formidable in its own right, as the design is compromised both by the requirement to carry troops and by the limitations of the fully articulated rotor head. It becomes formidable *en masse*, and if used in large numbers would present problems to any defence when used in accordance with typical Soviet combined arms theory.

Right: Soviet crewmen, heavily muffled against the cold, load 57mm unguided rockets into a Hind E's UB-32 pod. Loading appears to be uncomplicated and rapid. To the left is an endplate "H" pylon for the tube-launched AT-6 Spiral anti-tank missiles.

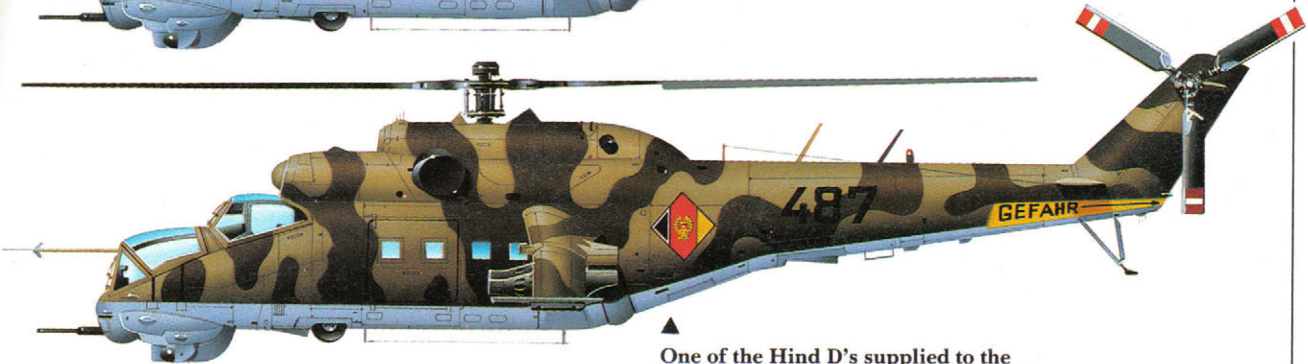


The glasshouse canopy of the Hind A (left) was replaced by an entirely new forward fuselage for the Hind D dedicated gunship (right).





Early Hind As had a starboard-mounted tail rotor, but this was relocated to port when the TV3-117 engine was installed.

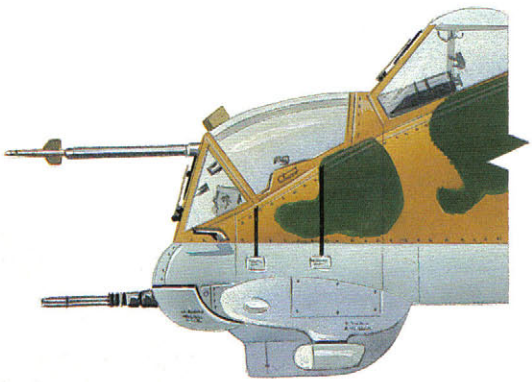


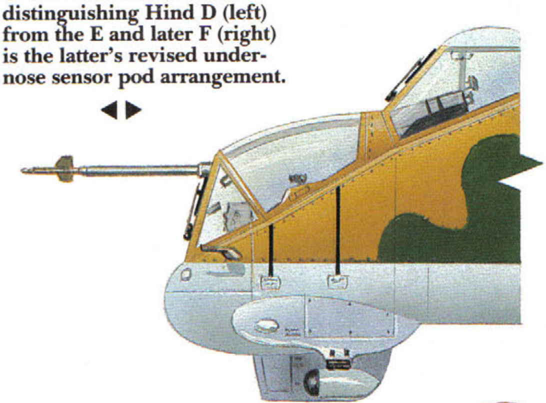
▲ One of the Hind D's supplied to the Nicaraguan Fuerza Aérea Sandinista (top) and a similar model serving with the East German Adolf von Lützow Regiment (above).

Insignia of the East German air force. ▶

▲ Hind E in the markings of the East German air force.

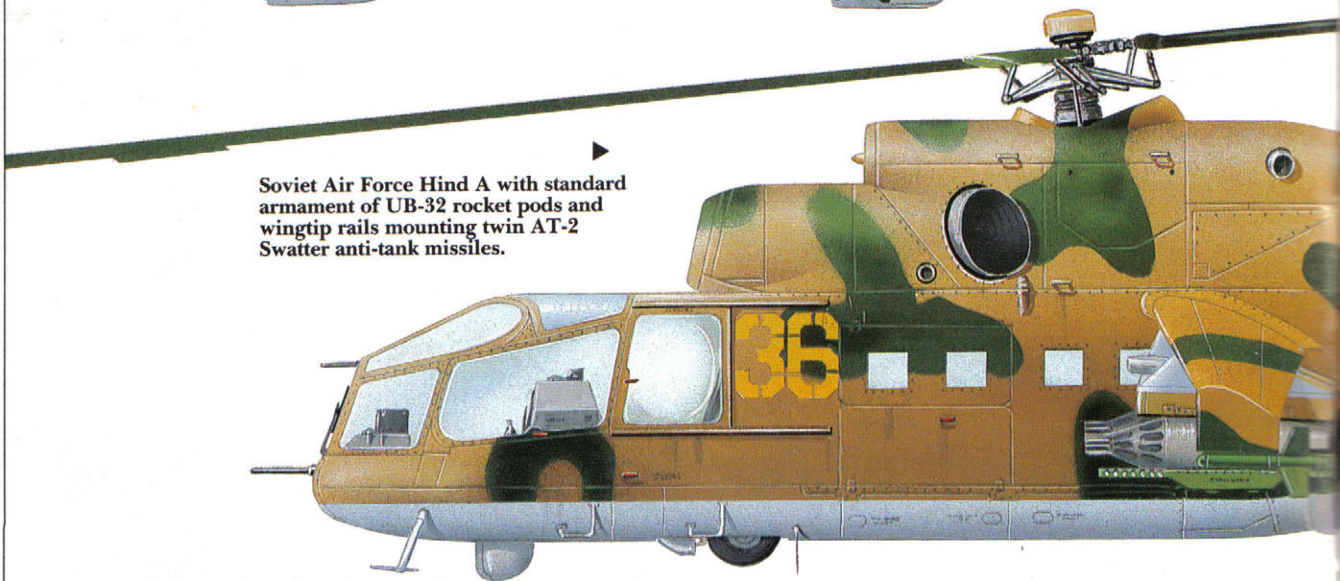
▲ Libya has received a reported total of 26 Hinds, including this Hind A.





One of the main features distinguishing Hind D (left) from the E and later F (right) is the latter's revised under-nose sensor pod arrangement.

◀ ▶



▶

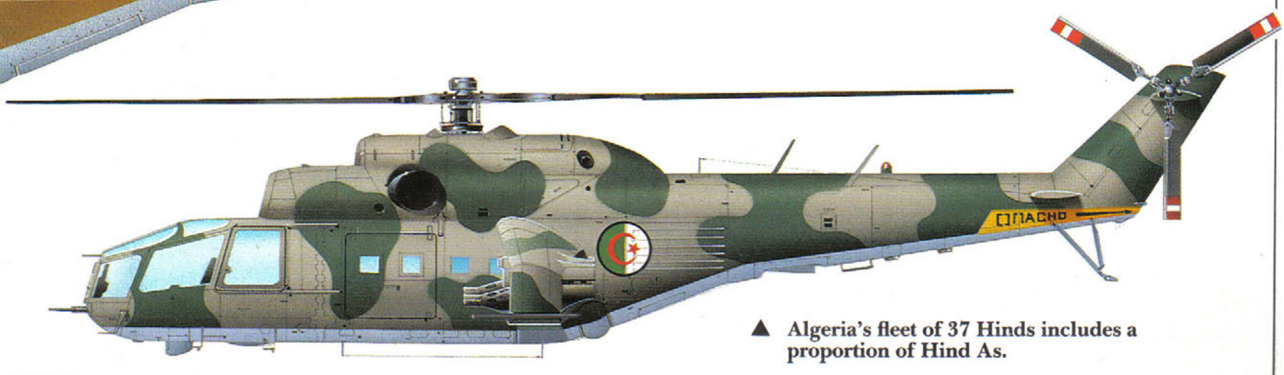
Soviet Air Force Hind A with standard armament of UB-32 rocket pods and wingtip rails mounting twin AT-2 Swatter anti-tank missiles.

◀

Typical Soviet-style numbers as applied to combat helicopters.

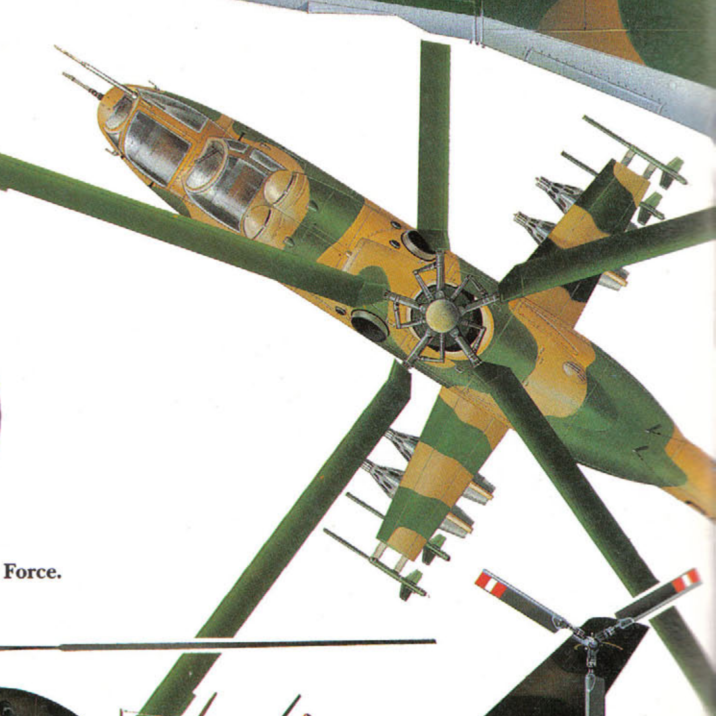
Hind F, the latest variant to be identified in the West, is similar to Hind E but has a twin-barrel fixed cannon instead of the nose gun.

National insignia worn by Algerian Hinds.



Algeria's fleet of 37 Hinds includes a proportion of Hind As.

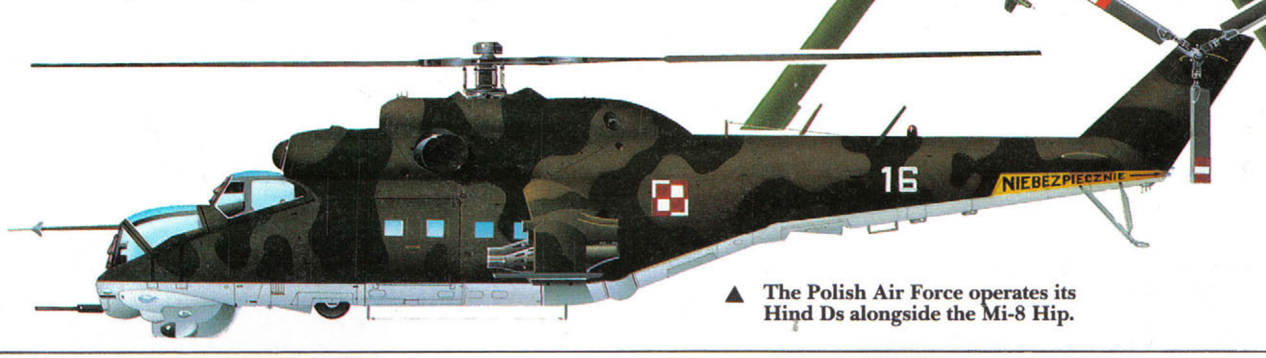
A Hind D operated by an attack helicopter regiment of the Ceskoslovenske Letectvo (Czech Air Force).



Insignia of the Nicaraguan Fuerza Aérea Sandinista.

Insignia of the Força Aérea Popular de Angola.

Current insignia of the Afghan Republican Air Force.

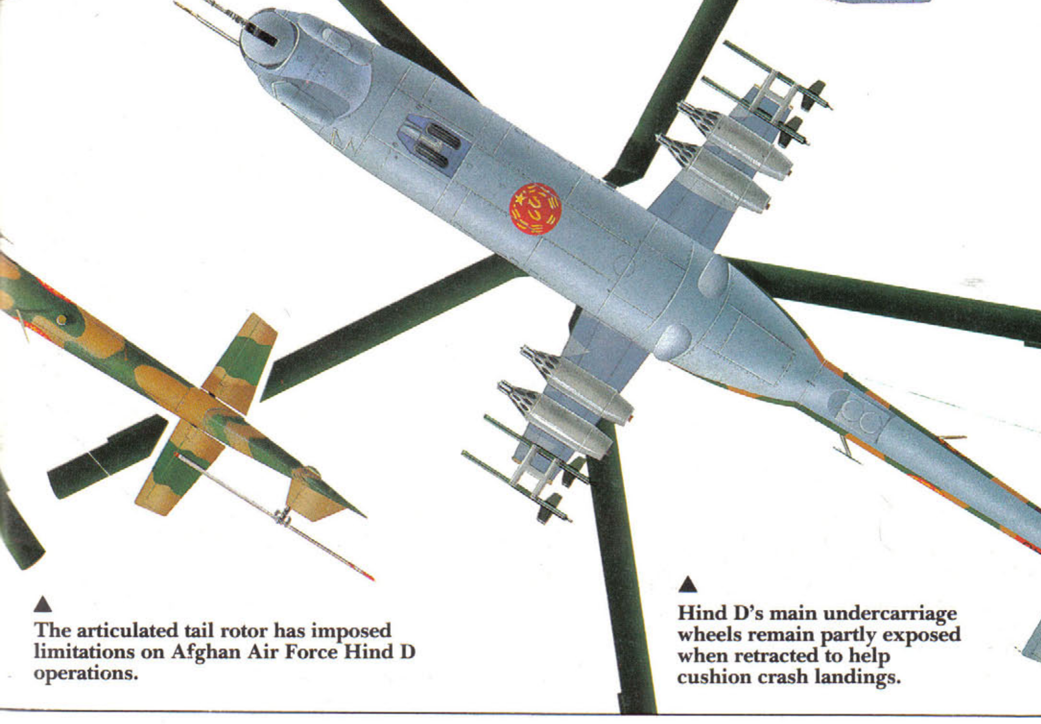


The Polish Air Force operates its Hind Ds alongside the Mi-8 Hip.

▲ Hind Ds of the Angolan People's Air Force have been used against UNITA guerillas.

◀ Hind Ds of the Afghan Republican Air Force were seen briefly carrying this form of national insignia.

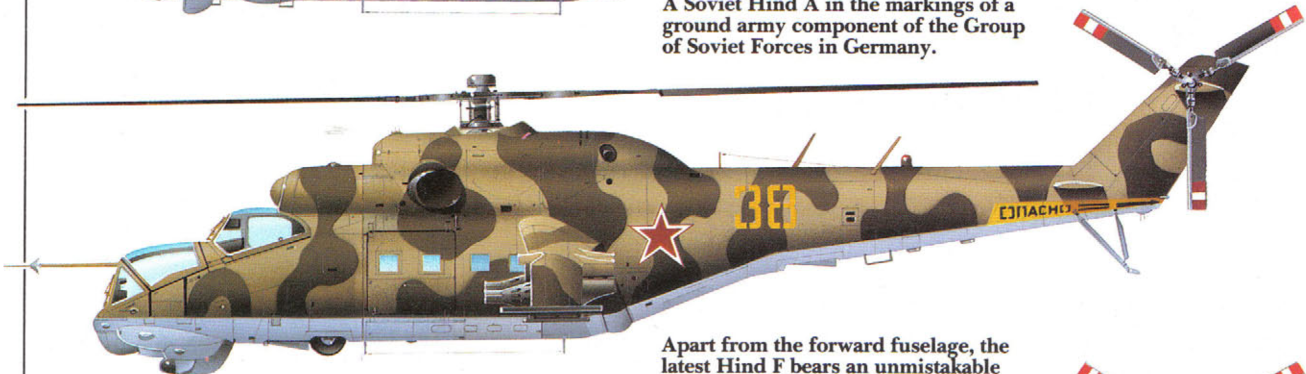
National insignia carried by Iraqi Hind Ds.



▲
The articulated tail rotor has imposed limitations on Afghan Air Force Hind D operations.

▲
Hind D's main undercarriage wheels remain partly exposed when retracted to help cushion crash landings.

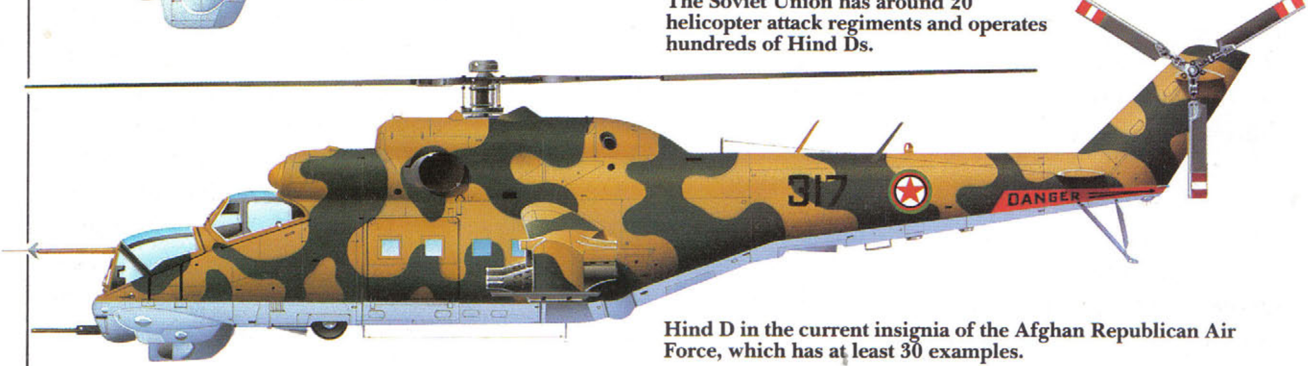
A Soviet Hind A in the markings of a ground army component of the Group of Soviet Forces in Germany.



Apart from the forward fuselage, the latest Hind F bears an unmistakable resemblance to the original version.

Soviet Armiskaya Aviatsiya Hind Ds are assigned at both army and divisional levels.

The Soviet Union has around 20 helicopter attack regiments and operates hundreds of Hind Ds.



Hind D in the current insignia of the Afghan Republican Air Force, which has at least 30 examples.

Above: A Czechoslovakian Hind D in flight showing its predatory, pike-like lines, which are accentuated by the tandem cockpit configuration. The bulge at the top of the fin appears to house the spindle of the tail rotor.

ator in tracking the missile through his telescopic sight and steering it onto the target. The newer, similar in appearance Swatter C was adopted for Hind D. This uses a more sophisticated system, semi-automatic command to line of sight (SACLOS) guidance, whereby the weapons officer simply holds the target in the sight, (which incidentally appears to be monocular), while the computer tracks the missile via the radio command link, making automatic adjustments to the flight path to take the weapon to the point at which the sight is aimed. Swatter C was easier to use and potentially a far more accurate weapon than the earlier model, especially when launched by and guided from an unstable, vibrating helicopter.

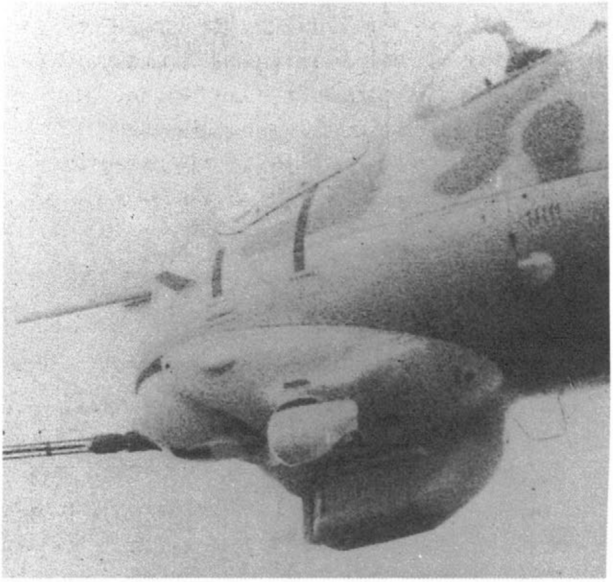
The avionics fit on Hind D was far more comprehensive than on previous models, much of it concerned with improving weapons effectiveness, and still more with giving it some night-adverse weather capability, which had been rather lacking in earlier variants. This resulted in a whole new rash of airframe bumps, warts, and aerials.

The original pitots were replaced by new shortened versions located just below the weapons officer's side transparencies, set horizontally and angled inwards. In addition to these, a lengthy sensor boom appeared high on the right of the front cockpit windshield, with an array of precision airflow sensors on the tip. These are effective at very low airspeeds, and yield not only flight information, but data for gunnery and unguided rocket firing, thereby greatly improving accuracy. The forward Odd Rods IFF antenna were moved, and mounted just above where the sensor boom joins the transparency framing.

Electro-optics cupola

On the right hand side beneath the nose is a very solid looking cupola with a vee-shaped front. This houses a low light television (LLTV), and since 1982 a forward looking infra-red (FLIR) viewer, both of which greatly enhance night operational capability. When not in use the sensor apertures are covered and protected by a heavy duty metal door to each side of the vee, hinged at the rear edge.

On the opposite side of the lower nose is a pivoting housing with a dielectric nose for the radar director unit used for Swatter C guidance. The degree that this unit can traverse is not known, but it appears to be considerable. It allows Hind D to turn away from the target after launch by possibly as much as 60 degrees, although the limiting factor is probably set by the traverse of the sight in the weapons officer's position rather than by the director unit. In practice this is probably nowhere near the limits of the theoretically possible, as Hind D carries out missile attacks in forward flight rather than from the hover, and an over-enthusiastic breakaway after missile launch could quickly take the helicopter out of guidance limits. Nor does the director unit appear to



Above: A blurred close-up of the nose section of Hind D with a few unexplained bumps and excrescences apparent. That just below the grille on the right is the air scoop for the cabin heater. The push-in covers to the weapons officer's access steps can be seen below the vertical dark lines.

have any movement in elevation, which would severely restrict the usable angle of bank during the missile guidance phase.

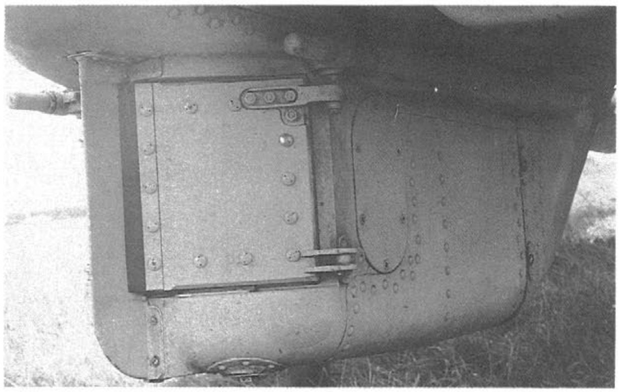
Laser designator

The one other weapons-related item of equipment to appear on Hind D is a laser designator pod, which is positioned on the port wingtip, at the top of the endplate pylon. This has sometimes been identified as the LLTV, which would mean that the laser marked target seeker/designator is actually housed in the FLIR cupola; it is difficult to say which version is correct.

It seems unlikely, although not impossible that Hind D would laser designate its own targets. Laser guided bombs are most effective, because they are most controllable, when released at high speed, either from medium altitude or from low level using toss bombing. The designator can however be used to indicate targets for fixed-wing aircraft, or laser-guided artillery projectiles. This accords well with the Soviet "all arms" concept.

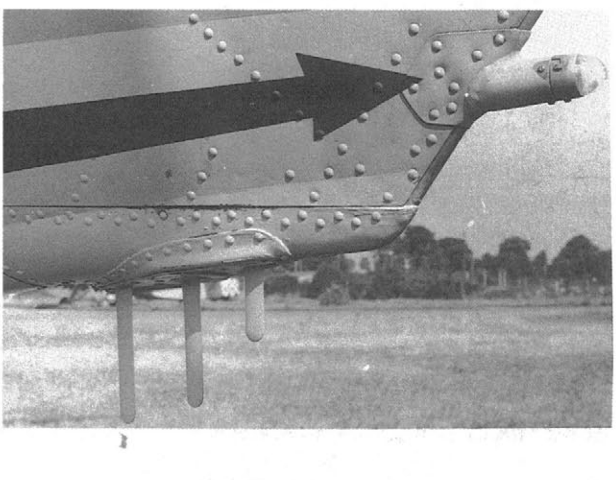
The Hind's designator can also be used simply to indicate targets which might otherwise remain concealed, for other helicopters, fixed wing or surface assets, to attack by more conventional means, or even in a defensive situation to lase friendly positions on the understanding that anything beyond these is hostile. But communications and understanding would have to be excellent in this latter scenario to avoid unfortunate incidents.

Hind D is equipped with the RSBN-6 short range navigational system, which coupled with the Doppler and tied into the map display, gives an adequate level of accuracy for the sort of distances involved in the average tactical mission. It is possible that the Doppler data, which is so important for ultra low-level flight, can be presented on the pilot's HUD, but this is not certain; the HUD is small, and a head down display may be needed. The SAU automatic flight control system is also fitted, which enables the machine to be guided directly from ground stations, their signals being fed straight to the auto-pilot.



Above: A detail shot of the optical sight housing believed to contain either LLTV or FLIR with its heavy protective hinged door and rather crude rod linkage for inflight use. Internal access is through the oval hatch at right.

Below: Looking like a collection of afterthoughts nailed on by the local blacksmith, the junction between the end of the tail boom and the bottom of the pylon houses the aft Odd Rods IFF antenna and the rear navigation light.



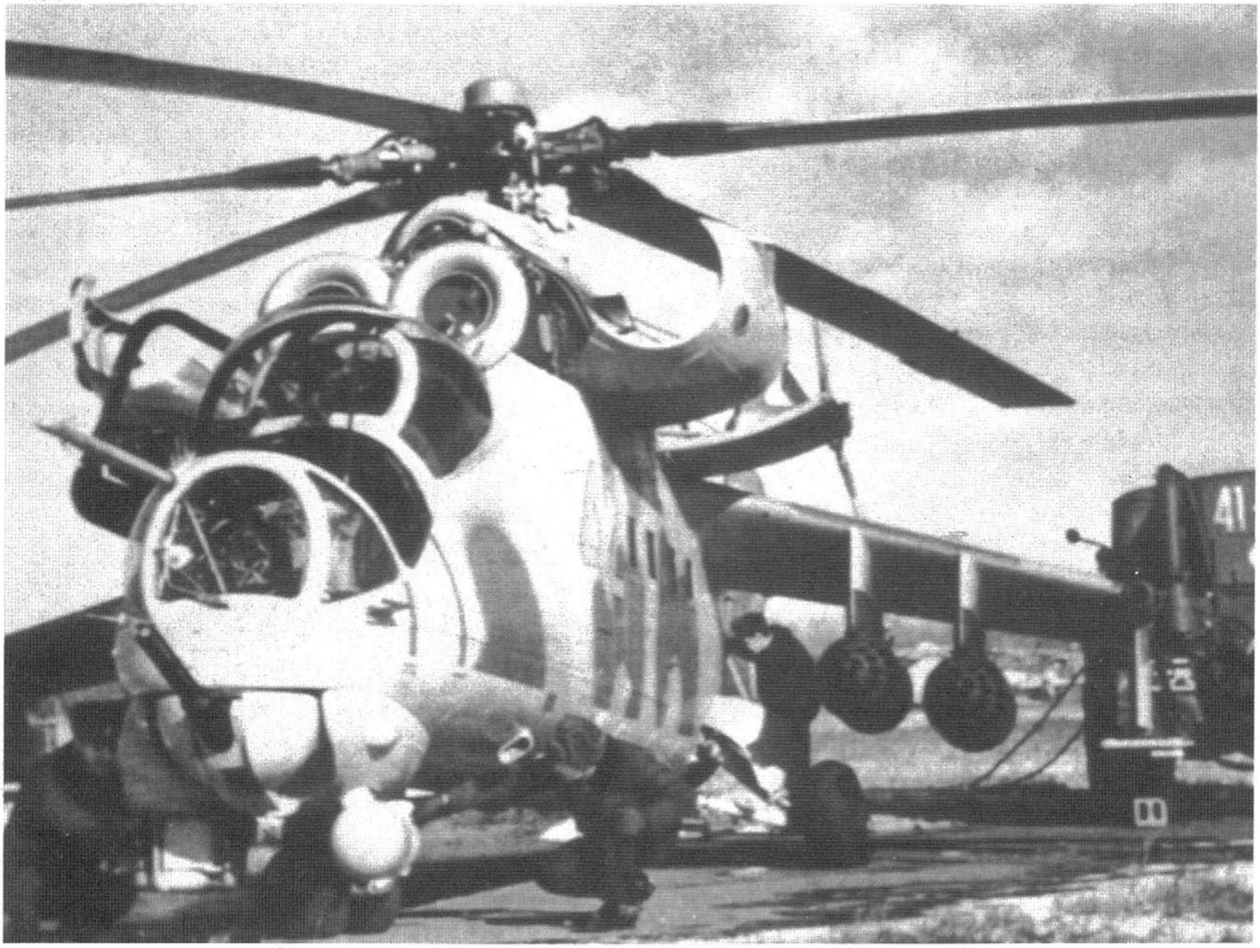
To give extra survivability, it was felt that a comprehensive radar warning system was necessary, and the established Sirena RWR was fitted, which gave all-round 360 degree coverage in azimuth. Sirena is believed to be able to detect and classify threat radars by types; i.e. ground based search, airborne tracking, gun laying etc., at the same time indicating the threat radar direction, either in terms of a bearing, or at the very least the quadrant in which it lies, e.g. left rear. This addition caused more bulges and aerials to appear; two small blisters on either side of the nose adjoining the gun barbette; one on the starboard wingtip with the one on the port side actually being located on the outside of the laser designator pod.

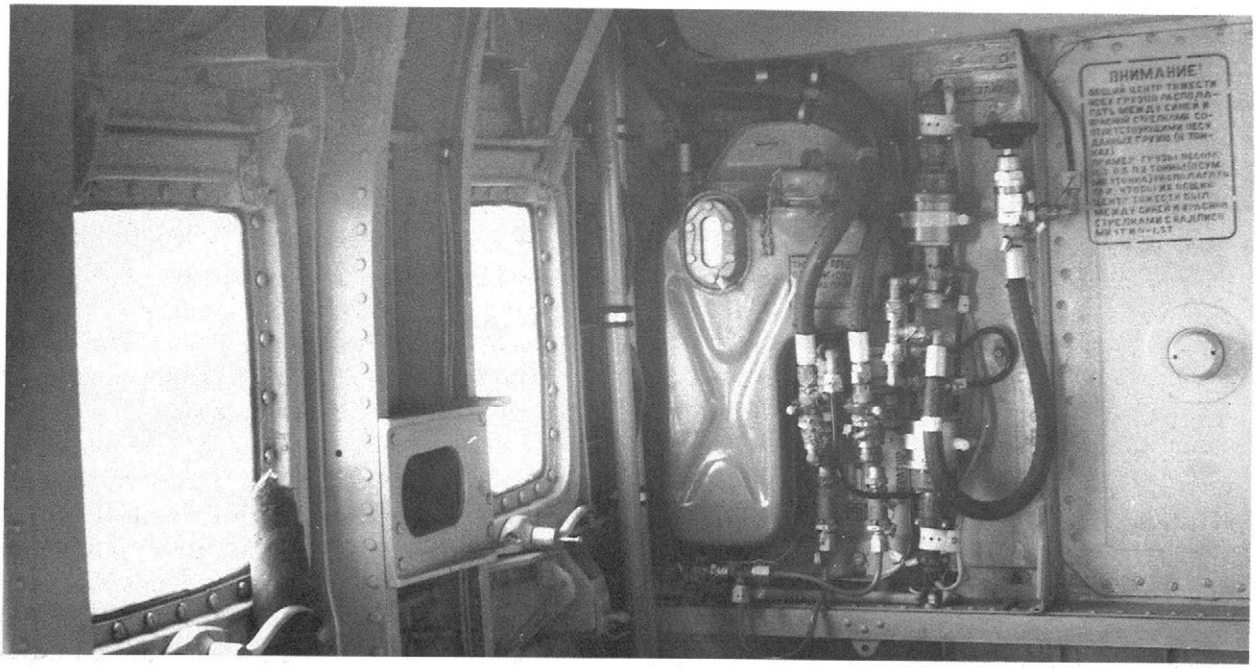
At least one small blade aerial has appeared in a dorsal position at the front of the tailboom, although it is not certain whether this is connected with Sirena or not, and it is very likely that the fairing covering the head of the tail rotor pylon conceals another. Several dielectric panels appeared on the fuselage, which may conceal jamming transmitters. A further difference in aerials on Hind D was the substitution of the forward dorsal VHF aerial by a different pattern UHF aerial.

Below: Hind D with everything open for servicing and intake blanks fitted. The clamshell engine covers are strong enough to act as work platforms for the fitters. Winter camouflage is worn, with a muted pink "buzz number" ahead of the wing. Light snow is on the ground, lit by a wintry sun.

Hind details

The fact that Hind A originally aroused little interest in the West is confirmed by the lack of hard information about it, although there is no dearth of guesswork. Hind D, with its far more warlike appearance, has been the subject of detailed study, especially since the change of role priorities became known in the West. The result is that many features have been positively identified on Hind D which may also apply to the earlier variants. They include a retractable landing/taxying lamp, protected by a wire grille, located centrally beneath the nose, behind the gun





Above: Interior view of the troop cabin, showing details of the inward opening gunports. The pipes are probably hydraulic lines, with the glycol tank in the corner.

barbette; a cabin heater is positioned under the cockpit floor to the left of the nose gear bay, and fed by two inlet/outlet grilles. On Hind D there is a prominent air scoop feeding this on the port underside, which does not appear on Hind A.

Small red patches have been observed just in front of the troop cabin doors on some versions, slightly below the level of the horizontal split. These may be just warning notices of the "stand clear" type, or they could be warning lights. All windows in the troop cabin, including those in the doors, are hinged to open upwards and inwards, and each cill has an integral swivelling split-head type rest on which the assault troops can steady their AK-47 Kalashnikovs. This could be a valuable asset in an opposed landing, automatic fire helping keep the heads of the defenders down, although little else of use would be likely to result. Based on American experience in South East Asia, and despite intensive Soviet training, really damaging fire is not to be expected from what are little more than gunports on an unstable, moving, vibrating platform. Under these circumstances, one describes as a target anything that one is lucky enough to hit.

Other features probably common to Hind A, C, and D are two small bulges beneath the tail boom which cover the radar altimeter aerials, and air intake grilles for cooling the bevel gear driving the rotor shaft in the tail and also the tail rotor gear, which are to be found at the bottom and top of the tail rotor pylon leading edge respectively. The various access and maintenance points are almost certainly identical.

Engine access is achieved through vast clam-shell doors which rather surprisingly fold down from the top. The refuelling points are located in a triangular panel which is removable to give access to the fuel control system just above the port wing. The avionics compartment is accessible from the lower rear of the fuselage, and the ground power connection and the intercomm connection by which the ground crew can talk to the flight crew, are both in the same area, low on the port side.

New features

Other items which are specific to Hind D and still later variants include a rudimentary means of reducing the infra-red signature by passing cooling air over the hot engine parts inside the cowling, finally exhausting through a duct located just in front of the engine efflux. It should be noted that there are two sources of infra-red emissions; the plume of hot exhaust gas from the engine, and the "black body" radiation from the hot metal of the engine itself. It is the second source that this particular measure was intended to reduce, and this was quite a viable method of attempting it, given that in general Soviet engines tend to run at lower temperatures than those of the West, typically by about 150°C.

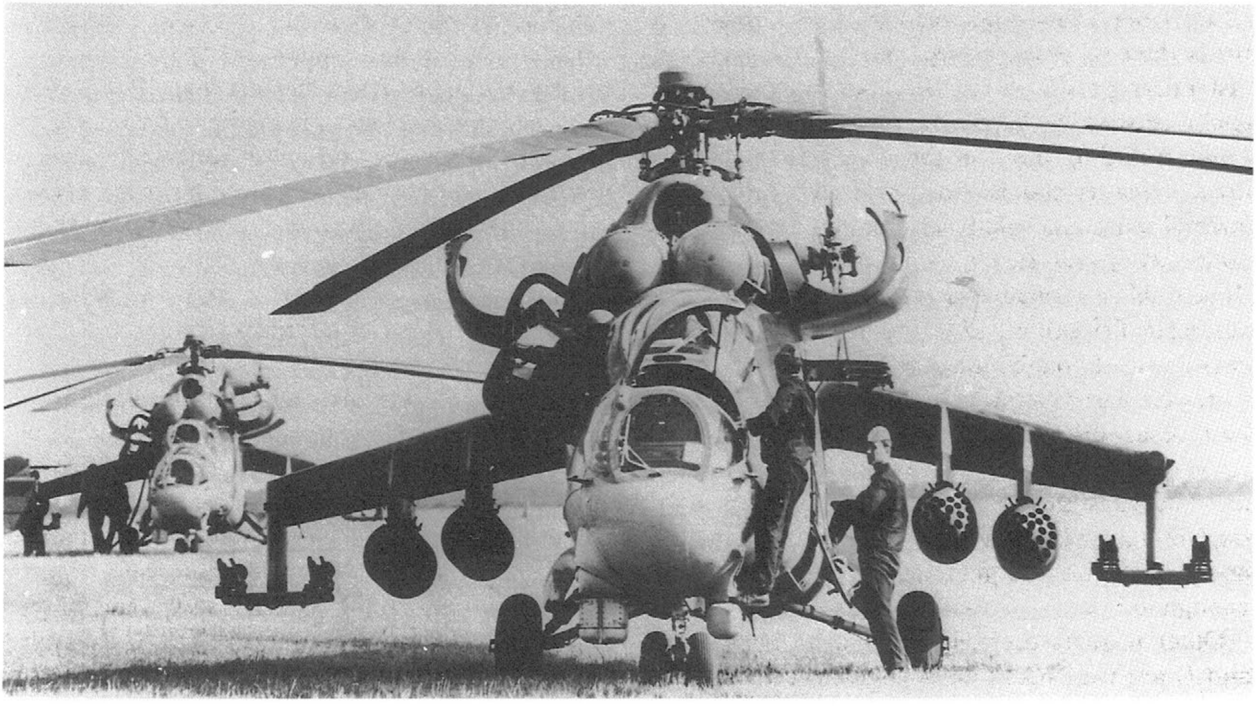
Other items on Hind D that had not appeared earlier were naturally the pair of armoured nose doors just above the gun barbette, which enclose the magazine, and through which reloading is accomplished; the heavy duty windscreen wipers, one to each screen, pivoting from the bottom centre of the frame; the rod operated (and incredibly old-fashioned) fresh air vent to the pilot's position, which opens in the centre of the narrow scuttle beneath the windshield, and finally, the pyrotechnic signal and flare dischargers, which are placed on each side of the tail boom, about one third of the way back from the fuselage junction.

Hind Ds used by training schools often appear with the gun barbette removed and the nose smoothly faired over. The extended sensor boom is also missing from this model, which might indicate that the data derived from it is primarily to improve gunnery accuracy. A small hemispherical cover is fitted over the socket in which it is usually sited.

Below: An optical illusion makes it appear that the nose section of this Hind D is coming unglued as servicing takes place at the Syrzan Air Force Academy, Volga Military District.

One thing that is absolutely certain about Hind D is that its weight greatly increased over earlier models—according to Western intelligence sources up to 24,250lb (11,000kg) for maximum take-off, which could only be achieved by rolling; vertical take-off was not possible at this weight which would increase the disc loading to 9.92lb/sq.ft (48.45kg/sq.m), a 30 percent increase over Hind A. Of course, in the battle zone it would probably be nowhere near this weight, but the disc loading would still be high in comparison with Western helicopters, although the 25 percent disc offloading by the stub wing at high speed should be taken into account.

While it is possible that the engines might have been uprated, there is no evidence that this is so, and in this event, the power loading goes up to 6.38lb (2.89kg) per shp, an increase of over 40 percent. This extra weight, primarily caused by armour and other survivability measures, would have an extremely adverse effect on manoeuvrability, on slow speed forward flight, and on transient performance such as acceleration. Maximum speed would not be affected so much; Hind D would just take longer to get there, with something like a 10kt (19km/hr) degradation. It may of course be found in the future that the TV3-117 turboshafts *have* been uprated, the passage of time since their introduction having been quite sufficient for progress to have been made.



4

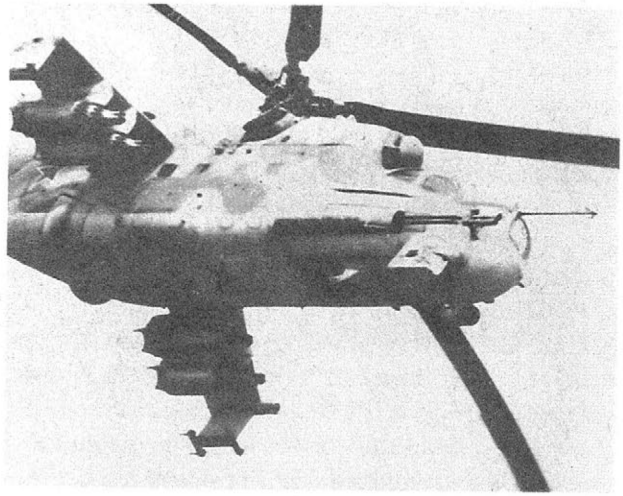
Evolution of Hind E

THE DEVELOPMENT of Soviet rotary wing machines is a steady evolutionary process, as indeed it is with fixed wing aircraft. The work goes largely unheralded, and this makes progress very difficult to chart. Consequently the NATO officials whose task it is to allocate codenames, are often hard pressed to decide when the incremental variations warrant a new suffix. Thus it was with Hind E, the first reports of which started to trickle through to the West in 1977–8, and which entered widespread service in both Europe and the Far East in 1981.

Externally, Hind E differs little from Hind D, but it does reflect the increasing Soviet preoccupation with the anti-tank role for helicopters, which began during the 1970s. The main difference lies in the anti-tank weapons and their guidance system. In place of four AT-2 Swatter Cs, Hind E carries four AT-6 Spiral anti-tank missiles.

First identified in 1977, Spiral is a tube-launched missile with folding fins, slightly longer than the Western AGM-114A Hellfire, but considerably slimmer. In the absence of firm information, much speculation has taken place, some of it rather wild. It is variously credited with being supersonic, with a top speed approaching Mach 1.5; long ranged, between four and five nautical miles (8 to 10km), using a laser beam riding guidance system, with millimetric (94GHz) terminal homing, and having a warhead powerful enough to knock out all known main battle tanks. Lacking confirmation of these figures, the application of a little horse sense gives a much more prosaic picture.

Taking each point in turn, the maximum speed stated is possible, but highly unlikely. Spiral manoeurvres using aerodynamic control surfaces: at high supersonic speeds control would be difficult, and much manoeuvre capability would be lost, although it would have the advantage of reducing the tracking time by a worthwhile amount. Finally, it



Above: The latest version of the Mi-24, known to NATO as Hind F, is armed with AT-6 Spiral missiles, and the nose gun is replaced by a fixed twin-barrel 23mm cannon.

does not seem possible that sufficient fuel to sustain such a high velocity over such a long range can be contained in the small available volume, unless the Soviet Union has made a quantum jump in the field of solid rocket fuels. This last statement also deals in part with the question of long range. The lowest speed attributed to Spiral from any source is 538kt (1,000km/hr), which comes out at Mach 0.81. This may well be an average over an effective range, with the maximum speed attained being in the high subsonic region, say about Mach 0.95.

Range limitations

The stated range, like the stated speed, is possible to attain, but fuel apart, other considerations militate against it. The main difficulty is that of target acquisition and identification. Under perfect conditions it might just be possible to identify individual main battle tanks at distances of 8–10km, but the probability is that with average weather and average terrain it is very difficult at half this distance.

Above: A fine shot of Hind E from head-on. The white bar across the pilot's face appears to be a reflection from the gunsight plate, and may indicate a wider field of view.

Guidance is another problem. Missile time of flight at an average of 1,000km/hr over 10km is nearly 36 seconds, which is far too long for the Hind to expose itself over the battle area, bearing in mind that the sensors are chin-mounted, so that Hind cannot launch from a concealed position. This very long range can be attained in theory, but hardly seems worth it from an operational point of view.

It now seems certain that missile guidance is SACLOS using a radio command link. The evidence for this lies in the radar designator pod mounted under the nose on the port side. This was used for Swatter, but with the change of missile came a change of designator pod, which still swivels, but now is rather larger, with a dielectric dome to the front rather than an arched facing piece. It seems obvious that missile and designator are directly connected. It is of course possible that laser designation could be used for the terminal homing phase, but laser beam riding guidance can almost certainly be ruled out.

Some form of terminal homing seems very possible; laser guidance has already been mentioned. Infra-red is a contender, but this can be fouled up by bad weather, let alone the flame and smoke of the battlefield. Millimetric radar is not impossible, but it does rather imply a sudden jump in Soviet capabilities, and what is more, a jump that has not been matched in the terminal guidance systems of other weapons. There is just an outside chance that terminal guidance could be electro-optical, the missile sending back a television picture of the target as it nears it, allowing the operator to steer it accurately for the last few seconds. The technology certainly exists, but somehow it seems rather un-Russian in concept. The first two are the simple solutions, and therefore the most likely to have been adopted.

Finally, the ability to knock out all main battle tanks is a very optimistic assessment. The warhead is of the hollow charge type, and penetration of homogenous armour is closely related to the warhead

Above: Hind E, apparently an early production aircraft which has retained the traversing nose machine gun. As usual, the missiles and their launch tubes are not fitted.

diameter. In theory, the 140mm diameter warhead could penetrate armour nearly 700mm thick. In practice, the penetration would be too thin to assure destruction against an armour thickness of more than 500mm, while applique armour would reduce this still more. Composite armour such as the British Chobham could possibly reduce effective penetration depth by 80 percent or even more, rendering Spiral ineffective in a frontal shot, and of dubious value from the side, while according to the latest information, a combination of composite/composite applique, or alternatively reactive armour, which explodes outwards to dissipate the heat of a shaped charge, would totally negate the effect of a hollow charge warhead of this diameter.

Spiral has a kill probability assessment of 90 percent, but in the light of the latest developments in tank protection, this looks extemely optimistic, although it may be about right for hit probability during exercises, where the Hind weapons officer is not being shot at in turn. On the other hand, Spiral cannot be written off as useless, but its effectiveness is very dependent on the exact part of the tank on which a hit is scored.

Weaponry apart, there is little else to distinguish Hind E from Hind D. One minor detail concerns the protective doors to the sensors in the starboard under-nose pod. Previously hinged, they have been replaced by sliding covers, with a central locking and actuating system. Hind E is also believed to carry a more comprehensive ECM suite than Hind D, but it is not obvious externally, and may well have been retrofitted to the earlier model.

Hind E was the first of the Mi-24 series to appear with the brassiere engine inlet covers. These contain vortex-type dust and foreign object extractors, which filter harmful matter from the inlet air before ejecting unwanted material through small chutes set on the lower outboard side of the engine nacelles. They also have spin-off functions, one of the more obvious of which is keeping the intakes clear of ice breaking away from the canopy, while they may also give a measure of protection to the compressor face from small arms fire from ahead, plus marginal reduction to both the infra-red and radar signatures from the front aspect. The covers do however, impose a penalty. Pressure losses at the compressor face are inevitable, reducing the available power. With Hind's hover and low speed capability being so poor, this may well be a pointer to the engines having been uprated if performance was not to fall to unacceptable limits, although no confirmation is forthcoming. Eyewitness accounts of Hind D operating at high all-up weights refer to it having difficulty in getting away from the ground, even without this extra handicap, but this has not prevented some Hind Ds being modified with inlet covers as a retrofit.

The first Hind Es retained the machine gun barbette, but during Exercise Druzhba in 1982, it was noted that this had been removed (or perhaps never built in) and the nose faired over. Its replace-

Above: Hind E, again with the nose machine gun. The bigger radar designator can be seen under the nose to port, while the starboard-mounted cupola has sliding covers.

ment was a fixed twin barrel 23mm GSh-23L cannon in a semi-cylindrical pod, mounted on the starboard side of the nose beneath the cockpits.

At first it was thought that this was purely an evaluation; while the cannon would be more effective against soft or light armoured vehicles in terms of hitting power and penetration, it would be less effective against deployed infantry. A further drawback was that it was less flexible in use, the helicopter having to make an orthodox strafing pass, with the cannon aimed and fired by the pilot. Off-boresight firing was no longer possible with the new arrangement, and this left the weapons officer as an observer/missileer only. It soon became clear that the Soviets regarded the extra range and hitting power of the cannon as an acceptable tradeoff against flexibility, and Hind E now carries this weapon as standard.

Hind D and E modifications

Many Hind Ds have since been modified to E standards, while combat experience, much of it in Afghanistan, showed that the big helicopter was vulnerable to man-portable surface to air missiles using infra-red guidance, ironically the Soviet SA-7 among them. As a direct result, both Hind D and E received modifications designed to reduce their vulnerability to heat seekers.

The first of these was a thimble-shaped dome, situated on top of the tail boom, just astern of the fuselage break. This contains a pulsed IR source intended to fool a missile by sending out intermittent bursts of IR radiation, which works by distracting the missile seeker from the original target then vanishing; only to reappear and disappear, rather like the flashing strobe on top of a police car.

The second was an engine exhaust heat suppressor. A box-like structure fitted onto each efflux pipe, this draws in cool air through vertical venetian-blind-type slats at the front, mixes it with the hot efflux, and expels it from the rear at a much lower temperature. Needless to say, the box structure is well insulated in order to minimise black body radiation. Finally, a short box-like structure which is literally strapped onto the underside of the rear of the tail boom contains decoy IR flares and chaff. Film shot in Afghanistan often shows Hinds pulling up after an attack, releasing heat decoys in strings of three as they go.

Pictures released early in 1987 show a Polish Hind D with strange protuberances on either side of the nose, level with the inter-cockpit scuttle. At first misidentified as weapons pylons, possibly for air to air missiles, it is now clear that they have dielectric heads, and are possibly some form of detection system, for either radar or laser designation, but as at August 1987, their true purpose remained unknown. However, by that time it had been confirmed that the cannon-armed variant was designated Hind F by NATO.

5

Hind in Service

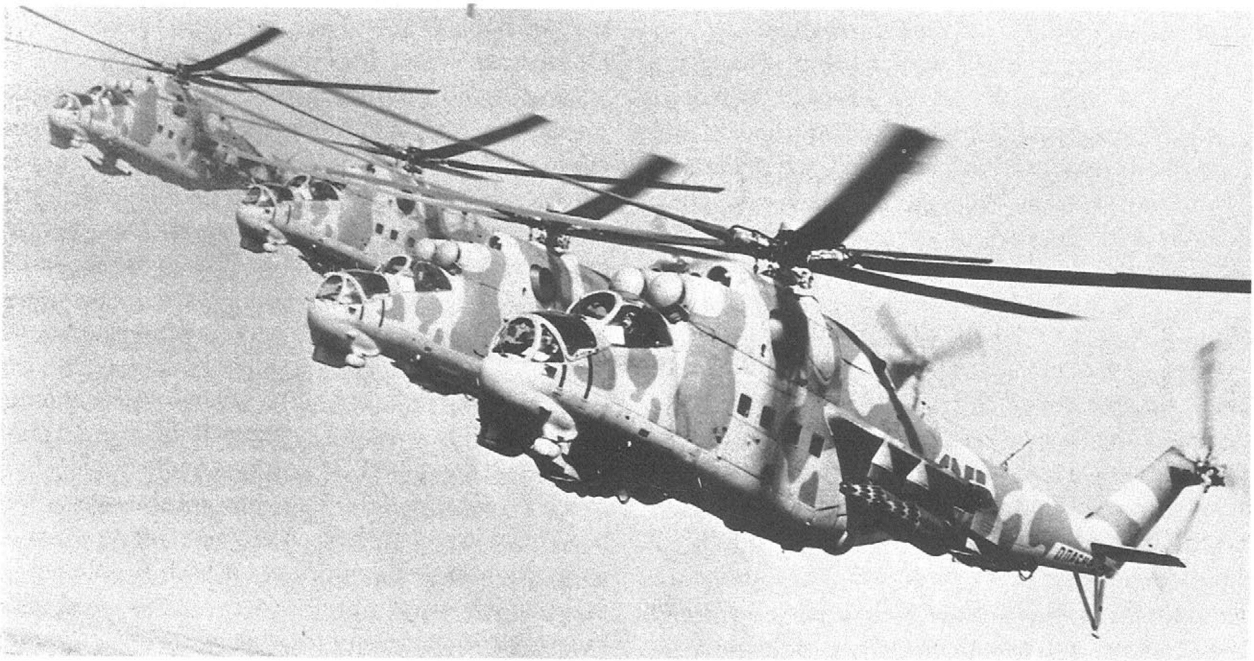
HIND IS CURRENTLY in service with no less than 20 air arms around the world. In alphabetical order they are: Afghanistan, Algeria, Angola, Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, India, Iraq, Libya, Mozambique, Nicaragua, North Korea, Peru, Poland, South Yemen, Soviet Union, Syria and Vietnam. Production continues at better than one every two days, although this is expected to tail off when the Mi-28 Havoc dedicated anti-tank helicopter comes on stream. The Soviet Union is by far the largest user of the type, with an estimated 1,100 plus Hinds, mainly of the D and E variants, in operational units.

In its long service life, Hind has seen action in many parts of the world; the Ogaden and Chad, Nicaragua, Angola, and most notably in Afghanistan and over the Iran/Iraq border. Apart from the last, it has been engaged mainly in counter-insurgency work, in which it has been proved very effective, but this was not, and is still not, its intended role in Soviet service.

Soviet tactical writings show an overwhelming stress on three main factors; attack, firepower, and all arms working in unison. It is difficult to isolate the role of the Hind, as its operational usage is so integrated with armour, motorized infantry, artillery, and fixed-wing airpower. It both supplements them and is supplemented by them. Its speed and range give it a degree of flexibility unmatched by the surface forces, while its hitting power is formidable by any standards. Hind can be used to bolster a crumbling defence or reinforce a main thrust, but its main use seems to be as an adjunct to armour.

From Soviet sources, a picture emerges of Hinds reconnoitering ahead of an armoured attack, prob-

Below: Hind D crewmen, this time in hard hats rather than leather flying helmets, discuss the mission. Most Warsaw Pact nations operate Hind; this example is East German.



Above: A flight of training machines from the Syrzan Air Force Academy in close formation. The machine gun has been removed and the nose smoothly faired over.

ing the defences and trying to spring possible ambushes, while others range along the flanks, providing initial protection and warning of counter-attacks. Other scenarios are escorting Hip troop carriers in cross-FLOT operations to seize strategic points, probably at night, and conveying troops rapidly to the point of similar enemy operations behind the Soviet lines. In the event of tactical nuclear weapons being used, and Soviet tactical writings lay great stress on this, the combined helicopter force would be used to bypass contaminated areas quickly, setting down in open country beyond.

As Major Rafikov noted in *Voyennyy Vestnik* in September 1986:

'. . . helicopters fly missions to destroy enemy objectives (primarily mobile) both at the forward edge and in tactical depth, they support tactical airborne drops, support their combat operations, and so forth. They fly these aerial support missions either according to a schedule or at the request of combined arms commanders.

'When flying these missions, as a rule helicopters operate in front of and on the flanks of attacking forces. During tactical live-fire exercises they also operate beneath the trajectory of our own rounds. Combat helicopters are a mobile means for increasing the firepower of combined arms units. They are essentially all-weather, able to take off from almost any field location in difficult climatic conditions, and suddenly appear over the target.'

If the thought of helicopters leading the armoured assault seems a trifle optimistic, the following, extracted from *Krasnaya Zvezda* of December 1986, written by Sr Lt Popov, appears incredibly so.

'The aviators' attention was drawn to the fact that the 'enemy's' forward edge was saturated with air defence assets. It was possible to avoid the air defence coverage, but that would take too much time. . . Major Tolmachov made his decision. He would attack in groups. One would suppress the air defence assets and the other would follow behind at a set distance and be prepared to support their comrades with fire. The flight commander also decided to use the motorized riflemen who were on board the helicopter to suppress the "enemy". . . The pilots began to manoeuvre along the route. Tracers reached towards the combat vehicles from the broken line of trenches on the ground. The assault forces used their automatic weapons and machine guns to fire through the open ports. . . The helicopter pilots continued the attack and fired at the air defence launchers with their on-board weapons. Cutting a corridor through the enemy's defence with their fire, the flight swiftly flew over the enemy combat formations and was hidden behind a small grove... using terrain masking they arrived precisely at the assault landing sites... When the enemy realised that an air assault had been made in their rear area, they regrouped part of their fire support assets and met the attacker with mortar fire. And the helicopter pilots made another impressive contribution. After completing the assault manoeuvre, Majors Gerasimov and Porshnev attacked the mortar position with rocket volleys.'

The foregoing concept is remarkable in that it envisages a direct assault straight across the front line in an admittedly heavily defended area. Of course, the assault would not have been made in isolation. The crossing point would have been under armoured attack, and probably also have been subjected to a pounding from both fixed wing aircraft and artillery, but to Western eyes it still looks suicidal. This poses the question of how well Hind is equipped to carry out a mission of this nature.

Attack profile

As noted earlier, Hind is fast, and manoeuvrable at high speed, but it is unsuitable for Western-style nap of the earth flying, which is a low speed mode. In Western European terrain, with hills, houses, trees, and innumerable high tension wires and pylons, it would in the main be forced to operate above their level, and against modern air defence weapons, altitude bears a direct relationship to exposure time: the longer the exposure, the more potentially lethal the weapons. There is another factor here. Helicopters advancing at high speed have a wonderful view forward, but concealed defences are still going to pick them up first, and the Hind pilots will generally only become aware of them when they are shot at, by which time it may well be too late. Smoke could be used to conceal the Hind's approach, but this will do little to hamper radar-laid weapons, and actually may be counter-productive in that aimed suppression fire will no longer be possible. Only if the opposing air defence systems are badly degraded by close air support and/or artillery fire beforehand does this sort of headlong cavalry charge seem viable.

Much the same comments apply to the Hind operating in the anti-tank role. The preferred attack method appears to be a fast, low ingress at about 65ft (20m) from about four nautical miles (7 to 8km), pulling up to around 300ft (100m) at maximum missile range to acquire targets. From this point on they will be vulnerable. Anti-tank missiles never seem to be fired from the hover, and the continued forward flight will take them towards the hostile defences at the rate of 2,600ft (790m) for every 10 seconds of tracking time required. On the other hand, while a single Hind is an easy target, a whole regiment of 40 plus, leading a massed tank attack and supported by ground attack aircraft and artillery, is no mean opponent. For this reason, if no other, Hind should not be under-rated.

As with virtually all other combat helicopters, rearward visibility on the Hind is nil, and for this reason the basic fighting element is a pair, to give mutual cross-cover in the blind spots. When attacking tanks, flights of four or six are normal, echeloned either to port or starboard from the leader. A "wagon wheel", or "circle of death", has been practised on exercises, with individual machines breaking away in a diving attack, in the manner of the Il-2

Below: Soviet combined arms doctrine: APCs storm forward under cover of an artillery barrage supported by Hinds and fixed-wing aircraft.

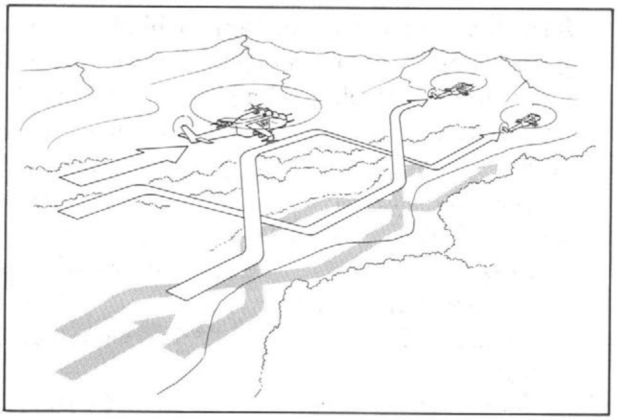
Sturmovik in the Great Patriotic War—but this will hardly suffice on a modern battlefield.

New formation

Since 1982 a new formation has been introduced for anti-armour reconnaissance. This consists of three helicopers; a pair in the lead flying a scissor pattern, alternately gaining and losing height, covered by a singleton astern at higher altitude. This last is flown by the element commander, who directs the attack when contact is made.

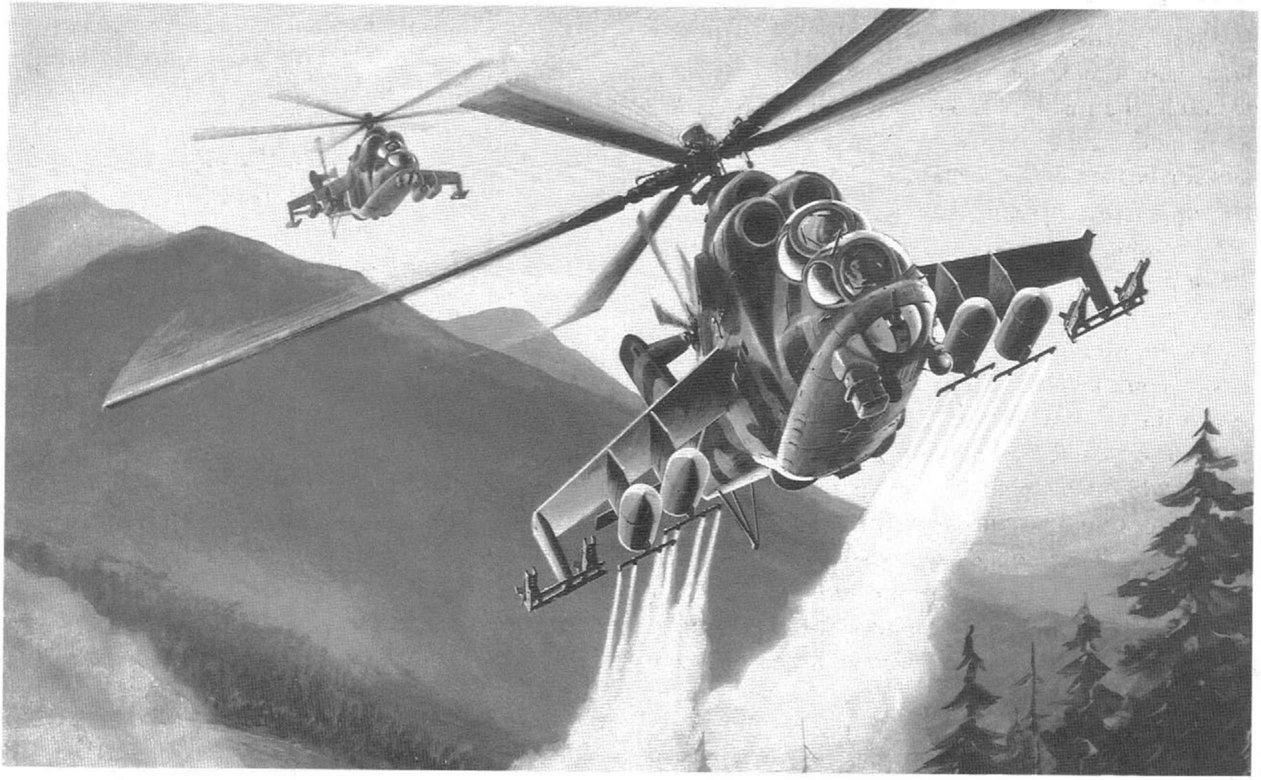
Hind was operational in Afghanistan even before the Soviet invasion of 27 December 1979. At first apparently contemptuous of the opposition, Hind would often engage the Mujahideen from a low level hover. Sr Lt. Alexander Korchagin, who last used this ploy in November 1980, is just one of the Hind drivers who is no longer around to tell how dangerous it is. Also in 1980, the guerrillas received supplies of the shoulder-launched SA-7, and this forced the Russian airmen to review their tactics.

From about this time, two general methods of attack began to be adopted. Dive-bombing attacks, using both conventional and cluster weapons, were made from an altitude of about 3,300ft (1,000m) above ground level, the pull-out being made at the limits of small arms fire effectiveness, or a low level attack profile was adopted, with rockets and guns being fired from maximum range. Often in this last case, one helicopter would stand off at medium altitude to direct the attack.



Above: First introduced in 1982, this three-ship anti-armour reconnaissance formation has been adopted for Hind operations. A pair abreast fly a scissor pattern, alternately gaining and losing height to obtain relative target motion, covered by the element leader behind and above them.

Below: An artist's impression of Hind D engaged in chemical warfare using tanks on the wing pylons. While this has not actually been seen, it remains a distinct possibility.



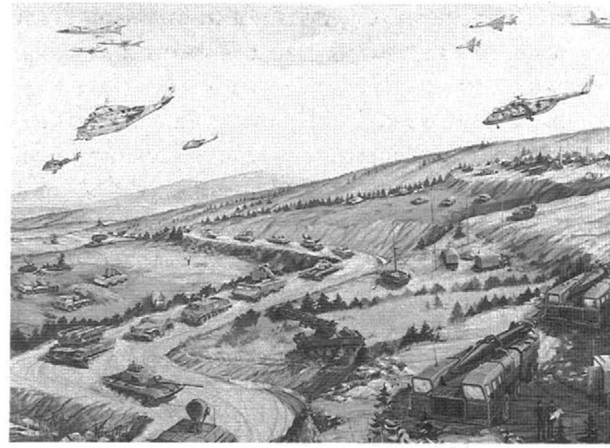
Still later, increasing casualties forced the Hinds to adopt a Western style NOE approach, although limitations of both machine and pilot made this rather faster and higher than true Western practice. Hind is stressed for plus 3g, which is rather more than most Western types, but can take no negative g, while even zero g is hazardous, as is evidenced by the many reports of the rotor striking the tail boom.

Experience in Afghanistan

In Afghanistan, the Hind has gained a reputation for being almost impervious to small arms fire. This statement should be treated with reservation, as several reports exist where Hinds have been downed by the Afghan resistance firing down at them from higher up mountainsides. While certainly resistant to anything up to 12.7mm calibre, much of the ground fire has been at extreme range, where much of its penetrative capability has been lost. On other occasions helicopters have remained in action although badly hit, as in the case of Capt. Petr Ivanovitch Chindin, who was decorated for continuing to support the ground forces although his machine had become difficult to control.

Early Soviet writings of the Afghan war gave the impression that the helicopter pilots spent most of their time delivering fresh bread to isolated villages and their tear-stained grateful inhabitants, while presumably bombarding the rebels with yesterday's stale rolls. More recently active accounts have emerged. The following is taken from *Aviatsiya i kosmonavtika,* August 1986, and Capt Chindin, leading a flight of three machines, is patrolling the Mach-An pass in search of a *dushmany* (bandit) force reported in the area.

'The ground rose at a 50 degree gradient from the border, and on this side of the summit dropped off sharply, plunging towards the Kharb gorge, down which coursed a swift mountain stream. Petr Ivanovitch immediately spotted the wide strip of trampled snow stretching across the entire pass. There was no doubt about it; a large group had passed this way... They swung over the pass and proceeded along the gorge. In places it opened up to a width of as much as 4km, but in other places it narrowed to as little as 800m. Everything was covered with snow along the banks of the mountain stream, and the trail showed clearly, leading ever deeper into Afghanistan. On a nearby plateau, where the gorge opened up, the airmen almost simultaneously spotted dark flecks on the snow. What was it,—livestock, men, or just projecting rocks? On the leader's command they orbitted at about 400m altitude, but could not make it out... Petr Ivanovich dropped lower, and his crewman spotted a movement. Next to a stone-walled enclosure, Capt. Chindin saw several dark spots, and concluded that they were possible weapons and ammunition covered by cloths or tarpaulins. As he pulled up, he saw muzzle flashes; the dushmany were firing at him. Almost immediately rocket bursts threw up showers of snow. His wingmen were returning the bandits' fire.'



Above: Hind is an integral part of the basic Soviet field army, the elements of which shown here include armour, artillery, motorized infantry and air defence units.

In all, over 200 guerrillas had been discovered, and all day long helicopters worked in relays to contain them until the ground forces could be brought in. It was in this action that rebel leader Najmutin was captured.

This action is many ways typical of Afghan helicopter operations, in that only by drawing his fire could the adversary be pinpointed and identified, a factor which has undoubtedly led to many Soviet helicopter losses.

The widespread use of battlefield helicopters inevitably means that machines of opposing sides will encounter each other, and equally inevitably that they will have to fight one another, using the weapons that are to hand, and the methods that seem most suitable. The Hind, with its high disc loading, low power loading, and slow transient reponse to the controls, does not at first sight seem very suited to fighting the agile Western battlefield helicopters, although its sheer firepower makes it an opponent to be treated with respect. In a one-on-one combat, with neither side having an intial advantage, it would generally be out-manoeuvred, although at high speed, with the winglets off-loading the rotor disc, it would be a formidable adversary, being faster than most Western types.

Typical scenario

A more typical scenario would be a dozen or more Hinds storming across the terrain, giving each other mutual support to compensate for their lack of agility, and blasting at anything in their path. Unless they could be matched with numbers, any opposing helicopters in their path would have a thin time of it, notwithstanding a favourable kill/loss ratio.

Hind has already received its baptism in air to air rotary wing combat in Iraqi service against Iranian SeaCobras. As in fixed wing combat, the advantage goes to the one who spots the enemy first. If cover is available, the SeaCobras try to ambush the large Iraqi machine; if not, Hind's superior speed means the crew must turn and fight; they cannot outrun an AH-1J. At the top end of the speed range, the Hind can out-turn the SeaCobra. If the Hind pilot is the first to make a sighting, his usual tactics are to come charging in flat out, firing everything.

In one reported instance a Hind was intercepted head-on by an Iranian Phantom, and shot it down by the simple expedient of firing everything at it. While this cannot be regarded as anything other than an almighty fluke, it should be noted that if the helicopter pilot sees the fast jet in time, it is difficult for the fixed-wing driver to make anything other than a head-on attack, as the rotary wing craft can turn into him faster than he can fly around the circle to get behind it.

To summarize, Hind, properly handled, and used in suitable circumstances, is a formidable battlefield weapon. Like any other, it has its strengths and its weaknesses, but should be handled to exploit the one and protect the other. In the past it has often been over-rated; the current tendency is to under-rate it, although this is not evident among those who one day may have to oppose it. In Soviet service it is more formidable than elsewhere due to its numerical strength, which compensates for some of its shortcomings in a battlefield situation. Assessed on a one-for-one basis it is nothing special. *En masse* it is a potent weapon.

Below: Hind Ds fly their World War 2-style circle of death during Caucasus 85. This bare and desolate steppe has little in common with the terrain of Central Europe.

HIND RECORDS

1975: Pilots Galina Rastorgoueva and Ludmila Polyanskaya.

100km closed circuit:	180.50kt (334.50km/hr).
500km closed circuit:	178.6kt (331km/hr).
1,000km closed circuit:	179.5kt (332.6km/hr).
Time to 3,000m altitude (9,843ft):	2 min. 33.5 seconds.
Time to 6,000m altitude (19,686ft):	7 min 43 seconds.

1978: Pilot Gourguen Karapetyan.
Absolute helicopter speed record over a 15–25km course:
198.79kt (368.37km/hr)*
* since broken by Westland Lynx.

SPECIFICATION

(Estimated)	**HIND A**	**HIND A Mod**	**HIND D/E**
Length, rotor turning (ft/m)	68.92/21.00	68.92/21.00	68.92/21.00
fuselage only (ft/m)	55.75/17.00	55.75/17.00	55.50/16.92
Height, rotor turning (ft/m)	21.33/6.50	21.33/6.50	21.33/6.50
structure only (ft/m)	18.05/5.50	18.05/5.50	18.05/5.50
Rotor diameter (ft/m)	55.75/17.00	55.75/17.00	55.75/17.00
Cabin width (ft/m)	5.57/1.70	5.57/1.70	5.57/1.70
Stub wing span (ft/m)	24.28/7.40	24.28/7.40	24.28/7.40
Weights (Estimated)			
Empty (lb/kg)	10,360/4,700	10,360/4,700	15,432/7,000
Max vertical take-off (lb/kg)	18,520/8,400	18,520/8,400	22,050/10,000
Max rolling take-off (lb/kg)	21,000/9,500	21,000/9,500	24,250/11,000
Internal fuel (lb/kg)	3,300/1,500	3,300/1,500	3,300/1,500
Max external load (lb/kg)	2,810/1,275	2,810/1,275	2,810/1,275
Max payload (lb/kg)	6,390/2,900	6,390/2,900	6,390/2,900
Power			
Engine type	2 × TV2-117A	2 × TV3-117	2 × TV3-117
Emergency rating (shp)	1,500	2,200	2,200
Normal rating (shp)	1,300	1,900	1,900
Performance (Estimated)			
V max (kt/km-hr)	167/310	167/310	174/322
V cruise (kt/km-hr)	159/295	159/295	159/295
Ceiling IGE (ft/m)	14,765/4,500	14,765/4,500	14,765/4,500
Ceiling OGE (ft/m)	7,218/2,200	7,218/2,200	7,218/2,200
NB: ceiling figures quoted are for the hover, at light all-up weight.			
Max vertical climb (ft/min-m/sec)	1,732/8.8	1,732/8.8	n/a
Max oblique climb (ft/min-m/sec)	2,460/12.5	2,460/12.5	2,360/12.0
Combat Radius, max fuel. (naut mls/km)	194/360	194/360	167/310
Combat Radius, max load. (naut mls/km)	49/90	49/90	86/160

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