

MiG-29M & MiG-29M2

Both the MiG-29M (single seat) and MiG-29M2 (double seat) aircraft are the "4++" generation multi-role fighters with the extended range, weapons increased load and airborne weapons broad nomenclature.

Main technical and technological innovations applied on the MiG-29M/M2 fighters are as follows:

- improved fuselage & wing;
- fly-by-wire control system with quadruple redundancy;
- significantly reduced radar signature;
- increased internal fuel capacity and in-flight refueling possibility;
- increased weapons load stored at nine external hard points.

The MiG-29M/M2 fighters belong to the new unified combat aircraft family designed on the basis of MiG-29K/KUB carrier-based fighters.

The power plant includes RD-33MK engines with increased thrust power, equipped with smokeless combustion chamber and new electronic control system (of FADEC type). Engines are of the module structure and have increased reliability and service life.

Upon customer's request the fighters can be equipped with the modified "all aspect" vectored thrust RD-33MK engine ensuring the aircraft superiority in a maneuvering dogfight. The power plant of two vectored thrust engines was tested on the super-maneuverable prototype-aircraft MiG-29M OVT.

The MiG-29M/M2 fighters are remarkable for the improved operational characteristics and increased reliability of assemblies, systems and units. As compared to the previous fighters the flight hour cost is reduced about 2.5 times. The MiG-29M/M2 fighters are intended for the on-condition maintenance.

The airborne avionics is of the open architecture based on MIL-STD-1553B standard that allows the installation on aircraft of new equipment and weapons of Russian and foreign origin upon customer request.

The fighter has multi-role, multi-mode "pulse-Doppler" type radar "Zhuk-ME" manufactured by "Fazotron-NIIP" Corporation. The radar is provided with the slot array. As compared with radars of the previous generation, "Zhuk-ME" has wider scanning angle in azimuth, twice longer target detection range, less weight and increased reliability. "Zhuk-ME" provides tracking up to 10 air targets with four targets simultaneous firing with missiles.

The MiG-29M/M2 fighters are equipped with state-of-the-art multi-channelIRST with target designation system to the anti-radar passive war-head missiles.

There is the possibility of installation on aircraft of IR and laser sighting equipment pods for ground targets illumination.

Weapons system includes "A-A", "A-S" missiles, guided aerial bombs, rockets, aerial bombs and built-in air-gun of 30 mm caliber. Upon request of the customer the new types of weapons can be applied. The MiG-29M/M2 fighters weapons allow to destruct air targets as well as the movable and stationary ground/surface targets.

Both the single and double seat versions of aircraft have the same airborne equipment and weapons as well as the high unification level of structure.

For the MiG-29M/M2 fighters the full set of training means was developed.

MiG-29M & MiG-29M2

Performance:

	MiG-29M	MiG-29M2
Take-off weight, kg:		
- normal	17 500	17 800
Maximum airspeed, km/h:		
- near ground	1500	1500
- at high altitude	2400	2400
Maximum M-number	2,25	2,25
Service ceiling, m	17 500	17 500
Maximum G-load	9	9
Ferry range, km:		
- without drop tanks	2000	1800
- 3 drop tanks	3200	3000
- 3 drop tanks & one in-flight refueling	6000	6000
Engines	RD-33MK	RD-33MK
Take-off thrust, kgf	2x9000	2x9000
Weapons:		
Number of external stations	9	9
"A-A" missiles:		
- middle range	6xRVV-AE	6xRVV-AE
- short range	8xR-73E	8xR-73E
"A-S" missiles:		
- general purpose	4xKh-29T(TE)	4xKh-29T(TE)
- anti-ship	4xKh-31A, Kh-35E	4xKh-31A, Kh-35E
- anti-radar	4xKh-31P	4xKh-31P
Guided bombs	4xKAB-500Kr	4xKAB-500Kr
Built-in air gun, 30 mm	GSh-301	GSh-301

MiG-29K/MiG-29KUB

Both the MiG-29K (single seat) and MiG-29KUB (double seat) aircraft are the "4++" generation multi-role fighters intended for air-defense missions of naval forces, air superiority gaining, sea & ground targets destruction with the high precision guided weapons day and night and in any weather conditions.

The MiG-29K/KUB carrier-based fighters are the basic aircraft of a new unified family including also the MiG-29M/M2 and MiG-35/MiG-35D aircraft.

The MiG-29K/KUB aircraft are based on the aircraft-carriers with tonnage from 28,000 tons, equipped with take-off ramp and landing arrestor, as well as at the airfields.

Main technical and technological innovations, applied on the MiG-29K/KUB fighters are the following:

- improved airframe with about 15% composite materials application;
- folding wing with upgraded high-lift devices improving take-off/landing performance;
- fly-by-wire control system with quadruple redundancy;
- significantly reduced signature in radar range;
- increased weapons load, stored at eight external hard points;
- increased internal fuel capacity and in-flight refueling possibility;
- possibility of other aircraft refueling being equipped with "PAZ-1MK" refueling unit.

The MiG-29K/KUB fighters as well as other aircraft of the unified family, have improved operational characteristics and higher reliability of assemblies, systems and units. In comparison with the previous fighters, the MiG-29K/KUB flight hours are increased more than twice, but a flight hour cost is reduced about 2.5 times. The MiG-29K/KUB fighters operate without overhaul.

The power plant includes two engines RD-33MK with increased thrust power, equipped with smokeless combustion chamber and new electronic control system (of FADEC type). Engines are of the module structure and have increased reliability and service life.

The airborne avionics is of the open architecture based on MIL-STD-1553B standard.

The fighter has multi-role, multi-mode "pulse-Doppler" type radar "Zhuk-ME" manufactured by "Fazotron-NIIP" Corporation. The radar is provided with the slot array. As compared with radars of the previous generation, "Zhuk-ME" has wider scanning angle in azimuth, twice longer target detection range, less weight and increased reliability. "Zhuk-ME" provides tracking up to 10 air targets with four targets simultaneous firing with missiles.

The MiG-29K/KUB fighters are equipped with state-of-the-art multi-channelIRST with target designation system to the anti-radar passive war-head missiles.

There is the possibility of installation on aircraft of IR and laser sighting equipment pods for ground targets illumination.

Avionics' open architecture allows installation on aircraft of new equipment and weapons of Russian and foreign origin upon customer's request.

The MiG-29K/KUB fighters are equipped with the built-in automated integrated system "Karat" of serviceability check and data recording, video-recorder, computer-aided flight mission recording into the airborne radio-electronic system as well as airborne autonomous power generation station used for the equipment ground checks without main engines starting-up.

Weapons system includes "A-A", "A-S" missiles, guided aerial bombs, rockets, aerial bombs and built-in air-gun of 30 mm caliber. Upon request of the customer the new types of weapons can be applied.

Both the single and double seat versions of aircraft have the same airborne equipment and weapons as well as the high unification level of structure.

For the MiG-29K/KUB fighters the full set of training means was developed including the full mission simulator with the motion system.

The MiG-29KUB aircraft first flight took place in January 2007.

The MiG-29K/KUB fighters are in production under order of the Indian Navy.

MiG-29K/MiG-29KUB

Performance:

	MiG-29K	MiG-29KUB
Length, m	17,3	17,3
Wing span, m*	11,99	11,99
Height, m	4,4	4,4
Take-off weight, kg:		
- standard	18 550	18 650
- maximum	24 500	24 500
Maximum flight speed, km/h:		
- near ground	1400	1400
- at high altitude	2200	2100
Service ceiling, m	17 500	17 500
Maximum G-load	8	8
Ferry range, km:		
- without drop tanks	2000	1700
- with 3 drop tanks	3000	2700
- with 3 drop tanks & one in-flight refueling	5500	5500
Engines	RD-33MK	RD-33MK
Take-off thrust, kgf	2x9000	2x9000
Weapons:		
Number of external stations	8	8
"A-A" missiles:		
- middle range	6xRVV-AE	6xRVV-AE
- short range	8xR-73E	8xR-73E
"A-S" missiles:		
- anti-ship	4xKh-31A, Kh-35E	4xKh-31A, Kh-35E
- anti-radar	4xKh-31P	4xKh-31P
Guided bombs	4xKAB-500Kr	4xKAB-500Kr
Air gun, 30 mm	GSh-301	GSh-301

MiG-29SD

The air superiority MiG-29 fighters adapted to NATO & ICAO standards, having the following new features:

- "Friend or Foe" targets classification within NATO standard without addressing to the ground control center*;
- compatibility with GPS "NAVSTAR", TACAN radio-navigation system, short-range radio-navigation and landing system;
- significant expansion of in-flight navigation data availability due-to additional mission computer and LCD monitor installation;
- operation in the NATO frequency bands, communication with NATO ATC centers due-to additional radio-stations installation;
- international en-route flights using anti-collision strobe-lights corresponding to NATO/ICAO standards;
- aircraft position detection abandoned by a pilot.

In the course of upgrading the weapons nomenclature remains the same as compared with the original aircraft.

In the composition of the MiG-29SD aircraft airborne avionics the data exchange multiplex channel is added (bus of MIL STD 1553B standard).

Aboard the MiG-29 aircraft adapted to NATO & ICAO standards the new radio-stations, navigation and IFF systems of UK and USA production are installed. The cockpit data display system is improved due to installation of MFD-54 multifunction color display with button bezel and PUS-29 systems control panel (supplied by Russian company "SKB "Russian Avionics").

As compared with the original MiG-29 aircraft the airborne avionics of the MiG-29SD aircraft has additional mission computer intended for solving the navigation and identification tasks.

The specific scope of up-grading works and new equipment composition can vary depending on the Customer request.

BAE Systems, Rockwell Collins and other companies are subcontractors under the MiG-29 aircraft up-grading program to the NATO & ICAO standards.

The air-superiority gaining MiG-29 fighters adapted only to the ICAO standards differ in simplified composition of airborne equipment and lesser possibilities.

During the MiG-29 aircraft adaptation to NATO and/or ICAO standards the following optional up-grading can be fulfilled:

- aircraft structure reinforcement for the extension of flight hours and service life up to 100% (depending on the aircraft technical condition);
- increase of internal fuel tanks capacity;
- installation of in-flight refueling systems of different types;
- improvement and/or replacement of some airborne systems;
- repair and transfer to on-condition maintenance.

The MiG-29 aircraft up-grading to NATO & ICAO standards can be fulfilled without aircraft delivery to Russia.

The MiG-29 fighters upgraded to NATO & ICAO standards have been in operation with Slovakian AF since 2006.

** The MiG-29 fighters belonging to the AF of states which are not the NATO members initially have the above possibility but without right to enter the NATO airspace.*

MiG-29SD

Performance:

Length, m	17,32
Wing span, m	11,36
Height, m	4,73
Take-off weight, kg:	
- normal	14 900
- maximum	18 000
Maximum airspeed, km/h:	
- near ground	1500
- at high altitude	2400
Maximum M-number	2,25
Service ceiling, m	18 000
Maximum G-load	9
Ferry range, km:	
- without drop tanks	1500
- with 1 drop tank	2100
- with 3 drop tanks	2900
Engines	RD-33 ser.2 (3)
Take-off thrust, kgf	2x8300
Weapons:	
Number of external stations	6
"A-A" missiles:	
- middle range	2xR-27R1
- short range	6xR-73E
Built-in air gun, 30 mm	GSh-301

MiG-29SM

The MiG-29SM is a multi-role fighter with improved airborne avionics and enhanced nomenclature of high precision weapons capable to destroy the air and ground (surface) targets. At development of the MiG-29SM aircraft version the main attention was paid to reduction of the up-grading cost and terms.

The MiG-29 aircraft upgrading to the MiG-29SM version results in inclusion into the N-019E (N-019ME) airborne radar composition of an independent radar-channel with MVK-04 computer, in upgrading of the optical electronic fire control & navigation system due to integration of a new data display system with a MFD-54 multifunction color display and installation of additional weapons management control system. The flight-navigation and radio-communication equipment is added with the multifunctional computer, GPS receiver and additional radio-station. It is provided for the use of a new electronic counter-measures system in pod.

In the composition of MiG-29SM airborne avionics the data exchange multiplex channel is added (bus of MIL STD 1553B standard).

The "A-A" class weapons nomenclature is added with middle-range missiles R-27ER1, R-27ET1 (T1) with radar-guided and IR homing heads and RVV-AE missiles with active radar homing heads.

The up-graded weapons management system ensures the application of high precision weapons of the "A-S" class:

Kh-29T (TE), Kh-31A, Kh-31P missiles and guided bombs KAB-500Kr and KAB-500-OD. While using the target designation pod or target external illumination it is possible to apply the Kh-29L, Kh-25ML missiles as well as the laser guided bombs.

It is possible to adapt the MiG-29SM aircraft to the NATO and/or ICAO standards.

While upgrading the original aircraft to the MiG-29SM version the following optional works can be fulfilled:

- aircraft structure reinforcement for the extension of flight hours and service life up to 100% (depending on the aircraft technical condition);
- increase of internal fuel tanks capacity;
- installation of in-flight refueling systems of different types;
- improvement and/or replacement of some airborne systems;
- repair and transfer to on-condition maintenance.

The MiG-29 aircraft upgrading to the MiG-29SM version can be fulfilled without aircraft delivery to Russia. The Customer's companies or of the third countries may be involved into upgrading.

The equipment required for MiG-29 aircraft upgrading to the MiG-29SM version as well as appropriate algorithmic description and software have been already tested aboard the aircraft and is in serial production and operation with Customer.

Besides the upgrading of the previously supplied aircraft, the new aircraft of the MiG-29SM type can be manufactured.

MiG-29SM

Performance:

Length, m	17,32
Wing span, m	11,36
Height, m	4,73
Take-off weight, kg:	
- normal	15 300
- maximum	20 000
Maximum airspeed, km/h:	
- near ground	1500
- at high altitude	2400
Maximum M-number	2,25
Service ceiling, m	17 750
Maximum G-load	9
Ferry range, km:	
- without drop tanks	1500
- with 1 drop tank	2100
- with 3 drop tanks	2900
- with 3 drop tanks and one single in-flight refueling	more than 5000
Engines	RD-33 ser.2 (3)
Take-off thrust, kgf	2x8300
Weapons:	
Number of external stations	6
"A-A" missiles:	
- middle range	2xR-27ER1(R1) 2xR-27ET1(T1) 6xRVV-AE 6xR-73E
- short range	
"A-S" missiles:	
- general	2xKh-29TE 2xKh-29L* 4xKh-25ML*
- anti-ship	2xKh-31A
- anti-radar	2xKh-31P
Guided bombs	4xKAB-500Kr (OD)
Built-in air gun, 30 mm	GSh-301

MiG-31E

The MiG-31E aircraft is designed for intercepting and destroying high- and low-altitude targets in forward and rear hemispheres in uplook and downlook, VMC and IMC, day and night, in the passive and active jamming environment of the enemy.

The MiG-31E aircraft is the export version of the basic MiG-31 aircraft of the Russian Air Force.

The MiG-31E fighter-interceptor basic version has become the first serially produced fighter over the world which is equipped with airborne phased array radar.

The RP-31E phased array radar has a long detection range and simultaneous tracking of 10 air targets. The airborne radio-electronic equipment and armament allows the MiG-31E aircraft to intercept air targets of any types in the whole range of flight altitudes and speeds capable for aerodynamic vehicles (including cruise missiles flying at low altitude in the relief envelope mode) with possibility of simultaneous attack of four targets with long-range missiles.

The MiG-31E aircraft is armed with R-33E long-range missiles as well as the other "A-A" class weapons.

The air targets can be intercepted via the information received from ground automated control system, single coordinate support of this system as well as during the semi-automated actions in the discontinuous radar field and fully independent operations in group. The data link system available aboard the aircraft ensures the mutual exchange of tactic information in automatic mode among the group of four aircraft one of which is a leading one and the group of four MiG-31E aircraft is capable to control the air space in band of 800 km-width to frontage. Besides the airborne equipment is capable to give the target designation to the interacting aircraft when the MiG-31E aircraft is engaged in the combined formation.

The aircraft basic version is operated in Russia and Kazakhstan.

The RAC "MiG" accumulates and summarizes the unique experience of the MiG-31E aircraft application which is called by the leaders of the Russian Air Force as the main aircraft of the air defense fighter aviation. The aircraft and its airborne radio-electronic equipment are being continuously upgraded and new aircraft weapons are being introduced.

At present together with the other Russian companies it is studied the possibility of creating the Russian-Kazakhstan aerospace system "Ishim" intended for placing in orbit small satellites. The upgraded MiG-31 aircraft is supposed to be used as the carrier in such system.

MIg-31E

Performance:

Length, m	21,62
Wing span, m	13,456
Height, m	6,456
Take-off weight (maximum), kg	46 200
Maximum airspeed, km/h:	
- near ground	1500
- at high altitude	3000
Maximum M-number	2,83
Service ceiling, m	20 600
Maximum G-load	5
Service range with 4xR-33E and 2 drop tanks, km:	
- without in-flight refueling	3000
- with one in-flight refueling	5400
Engines	D-30F6
Take-off thrust, kgf	2x15 500
Weapons:	
Number of external stations	6
"A-A" missiles:	
- long range	4xR-33E
- middle range	2xR-40TD1
- short range	4xR-60MK
Built-in air gun, 30 mm	GSh-6-23M

MiG-35 & MiG-35D

The MiG-35 (single seat) and MiG-35D (double seat) are the "4++" generation multi-role fighters, exhibiting the further development of the MiG-29K/KUB and MiG-29M/M2 fighters in the field of the combat efficiency enhancement, universality and operational characteristics improvement.

The MiG-35/MiG-35D main features are the following:

- the fifth generation information-sighting systems integration into aircraft airborne avionics;
- possibility of advanced Russian and foreign origin weapons application;
- increased combat survivability due to integration of airborne integrated defense system.

State-of-the art avionics in combination with advanced weapons allow the MiG-35/MiG-35D fighters fulfill a great number of missions:

- air superiority gaining against four & fifth generation fighters;
- interception of existing and being developed air attack means;
- ground/surface targets destruction with high precision weapons without entering the air defense zone day and night in any weather conditions;
- air reconnaissance using optical-electronic and radio-technical equipment;
- participation in group actions and air control over groups of fighters.

The MiG-35/MiG-35D fighters structure is based upon the following achievements obtained on the MiG-29K/KUB, MiG-29M/M2 aircraft:

- increased weapons load stored at nine external stations;
- increased fuel capacity, in-flight refueling and possibility of using as a tanker;
- airframe & main systems anti-corrosion protection technology which meets the standards developed for carrier-based aircraft thus simplifying fighters operation in tropical weather conditions;
- significantly reduced radar signature;
- three channel fly-by-wire control system with quadruple redundancy.

In the course of the MiG-35 aircraft development the most attention was paid to operational characteristics improvement:

- reliability of aircraft, engines and avionics is significantly increased;
- lifetime and service life are extended;
- mean time between overhauls (MTBO) of engines is increased;
- the MiG-35 aircraft flight hour cost is almost 2.5 times lower than those of the MiG-29 fighter;
- the MiG-35 aircraft is intended for the on-condition maintenance.

The complex of technical and technological solutions has been developed for the MiG-35/MiG-35D aircraft which provides for independent operation, like airborne oxygen generation plant.

The power plant includes two engines RD-33MK with increased thrust power, equipped with smokeless combustion chamber and new electronic control system (of FADEC type). Engines are of the module structure and have increased reliability and service life.

Upon customer request the fighters can be equipped with "all aspect" thrust vectored RD-33MK engines ensuring the aircraft superiority in the maneuvering dogfight. The power plant of two thrust vectored engines was tested on the super-maneuverable prototype-aircraft MiG-29M OVT.

The airborne avionics of the MiG-35/MiG-35D aircraft is developed on the basis of the new generation technologies.

The multi-role radar with active phased array provides for advantage over the competitors due to the following factors:

- extended range of operating frequencies;
- increased quantity of detected, tracked and attacked targets;
- possibility of simultaneous attack of air and ground targets;
- extended detection range;
- enhanced resolution in the surface mapping mode;
- high jamming protection and survivability.

The IRST system with infra-red, TV and laser sighting equipment has been developed using the space technologies which were not applied previously in aviation. The system distinctive features are the increased range, detection, tracking, identification and lock-on of air, ground/surface targets in the forward and rear hemispheres, at day and night measuring the distance with laser range-finder as well as the formation of target designation and laser illumination of ground targets. The IRST system and new helmet-mounted target designation system are integrated into the armament control system. In addition to the built-in IRST system the MiG-35 aircraft is equipped with a podded one.

The MiG-35/MiG-35D aircraft is provided with a defense system including in particular:

- radio electronic reconnaissance and electronic counter measures;
- optronic systems for detection of attacking missiles and laser emission;
- decoy dispensers to counteract the enemy in the radar and infrared ranges.

In addition to the "A-A" and "A-S" class weapons applied on the MiG-29K/KUB and MiG-29M/M2 aircraft the advanced aircraft armament, which have not been offered earlier for export, is being included into the MiG-35/MiG-35D aircraft weapons. The long range weapons capable to attack targets without approaching the air defence zone are among them.

Avionics' open architecture allows installation on aircraft of new equipment and weapons of Russian and foreign origin upon customer's request.

Both the single and double seat versions of aircraft have the same airborne equipment and weapons as well as the high unification level of structure.

For the MiG-35/MiG-35D fighters the full set of training means was developed including the interactive computer-based training system and a number of simulators including the full-mission simulator with a motion system.

The basic version of the MiG-35/MiG-35D fighter is designed taking into account the international cooperation organization when developing new modifications of aircraft and during serial production.