

GALLERY OF SOVIET AEROSPACE WEAPONS

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Bombers and Maritime

Beriev M-12 (NATO 'Mail')

Although new generations of advanced fighters, bombers, and combat helicopters are entering service with the Soviet armed forces, the designs of many aircraft in first-line units originated anything from 25 to 35 years ago. Typical of such veterans is the M-12 amphibian, of which an estimated 100 were built primarily for overwater surveillance and antisubmarine duties within a 230-mile radius of shore bases of the Soviet Northern and Black Sea fleets. About 80 still fly, with no seaplane replacement in sight.

Power Plant: two Ivchenko AI-20D turboprop engines; each 4,190 ehp. Internal fuel capacity approx 2,905 gallons.

Dimensions: span 97 ft 6 in, length 99 ft 0 in, height 22 ft 11 1/2 in, wing area 1,130 sq ft.

Weight: gross 64,925 lb.

Performance: max speed 378 mph, service ceiling 37,000 ft, max range 4,660 miles.

Accommodation: crew of five.

Armament and Operational Equipment: variety of weapons and stores for maritime search and attack carried in internal bay aft of step in bottom of hull and on four pylons under outer wings. Radar in nose 'thimble'; MAD (magnetic anomaly detection) tail-sting.

Ilyushin Il-38 (NATO 'May')

The airframe of this antisubmarine/maritime patrol aircraft was developed from that of the Il-18 airliner in the same way that the US Navy's P-3 Orion was based on the Lockheed Electra. Its lengthened fuselage retains few cabin windows. Il-38s of the original production series each have a large radome under the forward fuselage and a MAD tail-sting, with an internal weapon/stores bay aft of the radome. To compensate for the effect on the CG position of these changes, and equipment inside the cabin, the wing had to be moved forward. On some aircraft, the weapon-bay doors are replaced now by a second, longer, blister fairing.

Il-38s of the Soviet Naval Air Force are encountered frequently over the Baltic and North Atlantic. A Soviet Treaty of Friendship and Co-operation, signed with the People's Democratic Republic of Yemen in October 1979, permits patrols over the Indian Ocean from a base in that country. Periodically, deployments are made to Libya and to Tiyas in Syria. About 60 Il-38s are in service, including three that were passed on to No. 315 Squadron of the Indian Navy, based at Dabolim, Goa.

Power Plant: four Ivchenko AI-20M turboprop engines; each 4,250 ehp. Fuel capacity 7,925 gallons.

Dimensions: span 122 ft 9 1/4 in, length 129 ft 10 in, height 33 ft 4 in.

Performance: max speed 400 mph at 27,000 ft, max range 4,473 miles, patrol endurance 12 hr.

Accommodation: crew of twelve.

Myasishchev M-4 (NATO 'Bison')

About 75 of these four-turbojet aircraft remain available as bombers for maritime and Eurasian missions and as probe-and-drogue aerial refueling tankers for the 'Backfire/Bear/Bison/Blinder' attack force. Pending replacement, respectively, by 'Blackjacks' and a tanker version of the Il-76 'Candid' transport, the 'Bisons' are being phased out of service and placed in storage. (Data for 'Bison-A' strategic bomber follow.)

Power Plant: four Mikulin AM-3D turbojet engines; each 19,180 lb st.



Beriev M-12 (NATO 'Mail') (Swedish Air Force)

Dimensions: span 165 ft 7 1/2 in, length 154 ft 10 in.

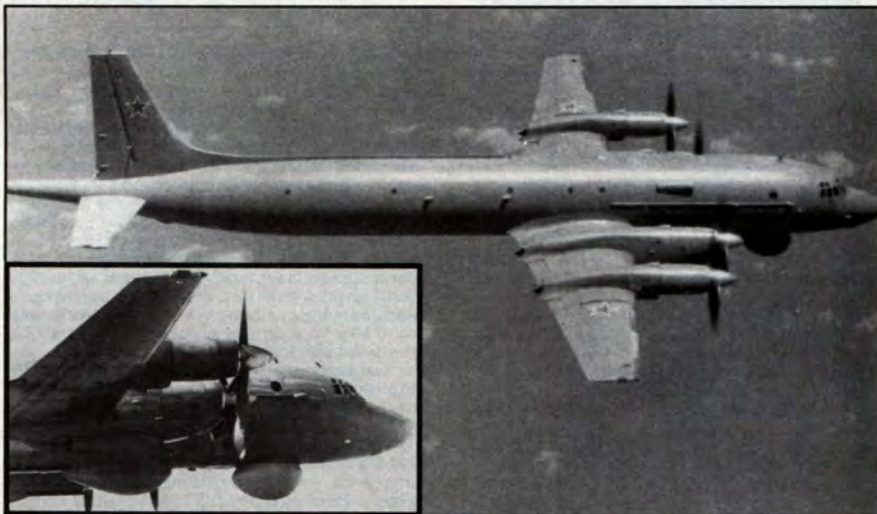
Weight: gross 350,000 lb.

Performance: max speed 620 mph at 36,000 ft, service ceiling 45,000 ft, range 4,970 miles at 520 mph with more than 12,000 lb of bombs, max unrefueled combat radius 3,480 miles.

Armament: eight 23 mm NR-23 guns in twin-gun turrets above fuselage forward of wing, under fuselage fore and aft of weapon-bays, and in tail. Three weapon-bays in center-fuselage, for free-fall weapons only.

Tupolev Tu-16 (NATO 'Badger')

The prototype Tu-16 flew for the first time in the winter of 1952. About 2,000 production models were delivered to the medium-range bomber force and Soviet Naval Aviation in eleven basic versions. Replacement with 'Backfires' has been under way for a decade, but 285 are estimated to remain operational in the five Soviet air



Ilyushin Il-38 (NATO 'May') (US Navy). Inset shows new version of Il-38 with second radome replacing forward weapons bay doors



Myasishchev M-4 (NATO 'Bison-B') (Royal Air Force)

armies, supported by a few Tu-16 aerial refueling tankers, more than 90 of various versions equipped for ECM duties, and 15 for reconnaissance. Soviet Naval Aviation is thought to have about 200 Tu-16 attack models, plus 75 tankers and up to 80 reconnaissance and ECM variants. The attack aircraft carry antiship cruise missiles with standoff ranges varying from 90 to more than 300 km and are often supplemented by air army Tu-16s in naval exercises. A squadron deployed to a permanent base at Cam Ranh Bay, Vietnam, comprises ten aircraft equipped for attack and six for reconnaissance missions, with a potential combat radius encompassing Thailand, the Philippines, Guam, most of Indonesia, and southern China. Known versions of the Tu-16 are as follows:

Badger-A. Basic strategic jet bomber, able to carry nuclear or conventional free-fall weapons. Glazed nose, with small undernose radome. Armed with seven 23 mm guns. Some equipped as aerial refueling tankers, using a unique wingtip-to-wingtip transfer technique to refuel other 'Badgers' or a probe-and-drogue system to refuel 'Blinders'. About 120 operational with Chinese Air Force (still being built in China as Xian H-6).

Badger-B. Generally similar to 'Badger-A', but

equipped originally to carry two turbojet-powered aero-plane-type antishipping missiles (NATO 'Kennel') underwing. Still serves as conventional bomber with free-fall weapons.

Badger-C. Antishipping version, first shown in 1961 Aviation Day flypast. 'Kipper' winged missile carried in recess under fuselage, or 'Kingfish' missiles underwing. Wide nose radome, in place of glazing and nose gun of 'Badger-A'. No provision for free-fall bombs. Operational with Soviet Northern, Baltic, Black Sea, and Pacific fleets.

Badger-D. Maritime/electronic reconnaissance version. Nose like that of 'Badger-C'. Larger undernose radome. Three blister fairings in tandem under center-fuselage.

Badger-E. Similar to 'Badger-A', but with cameras in bomb-bay.

Badger-F. Basically similar to 'Badger-E', but with electronic intelligence pod on pylon under each wing.

Badger-G. Similar to 'Badger-A', but fitted with underwing pylons for two rocket-powered air-to-surface missiles (NATO 'Kelt') that can be carried to a range greater than 2,000 miles. Free-fall bombing capability retained. Majority serve with antishipping squadrons of the Soviet Naval Air Force. A few have been passed on to Iraq.

Badger-G modified. Specially equipped carrier for 'Kingfish' air-to-surface missiles. Large radome, presumably associated with missile operation, under center-fuselage. Device mounted externally on glazed nose might help to ensure correct attitude of Tu-16 during missile launch. Total of about 85 standard and modified 'Badger-Gs' believed operational with Soviet Northern, Black Sea, and Pacific fleets.

Badger-H. Standoff or escort ECM aircraft to protect missile-carrying strike force, with primary function of chaff dispensing. The chaff dispensers (max capacity 20,000 lb) are probably located in the weapons-bay area. Hatch aft of weapons-bay. Two teardrop radomes, fore and aft of weapons-bay. Two blade antennae aft of weapons-bay.

Badger-J. Specialized ECM jamming aircraft to protect strike force, with at least some of the equipment located in a canoe-shape radome protruding from inside the weapons-bay. Anti-radar noise jammers operate in A to I bands inclusive. Glazed nose like 'Badger-A'.

Badger-K. Electronic reconnaissance variant with nose like 'Badger-A'. Two teardrop radomes, inside and forward of weapons-bay. (Data for 'Badger-A' follow.)

Power Plant: two Mikulin RD-3M (AM-3M) turbojet engines; each 20,950 lb st. Internal fuel capacity approx 12,000 gallons.

Dimensions: span 108 ft 0 1/2 in, length 114 ft 2 in, height 35 ft 6 in, wing area 1,772.3 sq ft.

Weights: empty 82,000 lb, normal gross 158,730 lb.

Performance: max speed 616 mph at 19,700 ft, service ceiling 40,350 ft, range with 8,360 lb bomb load 3,000 miles.

Accommodation: crew of six.

Armament: seven 23 mm NR-23 guns; in twin-gun turrets above front fuselage, under rear fuselage, and in tail, with single gun on starboard side of nose. Up to 19,800 lb of bombs in internal weapons-bay.

Tupolev Tu-22 (NATO 'Blinder')

About 250 Tu-22s were built, and were the first Soviet operational bombers capable of supersonic performance for short periods. More than half of these are said to remain operational with medium-range units of the air armies. The Soviet Navy has about 35 bombers and 20 equipped for maritime reconnaissance and ECM duties, based mainly in the Southern Ukraine and Estonia to protect the sea approaches to the USSR. Versions identified by NATO reporting names are as follows:

Blinder-A. Original reconnaissance bomber version, first seen in 1961, with fuselage weapons-bay for free-fall nuclear or conventional bombs. Limited production only.

Blinder-B. Similar to 'Blinder-A', but equipped to carry air-to-surface missile (NATO 'Kitchen') recessed in weapons-bay. Larger radar and partially-retractable flight refueling probe on nose. About 135 'Blinder-As and Bs' remain in service with Soviet air armies, including 15 equipped for reconnaissance, and others with Soviet Naval Aviation. The Libyan and Iraqi Air Forces each have about seven.

Blinder-C. Maritime reconnaissance version, with six camera windows in weapons-bay doors. New dielectric panels, modifications to nosecone, etc., on some aircraft suggest added equipment for ECM and electronic intelligence roles.

Blinder-D. Training version. Cockpit for instructor in raised position aft of standard flight deck, with stepped-up canopy. Used by Soviet and Libyan Air Forces.

Power Plant: two Koliesov VD-7 turbojet engines in pods above rear fuselage, on each side of tail-fin; each 30,900 lb st with afterburning. Lip of each intake is extended forward for takeoff, creating annular slot through which additional air is ingested.

Dimensions: span 78 ft 0 in, length 132 ft 1 1/2 in, height 35 ft 0 in.



Tupolev Tu-16 (NATO 'Badger-D')



Tupolev Tu-22 (NATO 'Blinder-C')

Weight: gross 185,000 lb.

Performance: max speed Mach 1.4 at 40,000 ft, service ceiling 60,000 ft, max unrefueled combat radius 1,925 miles.

Accommodation: three crew, in tandem.

Armament: single 23 mm gun in radar-directed tail mounting. Other weapons as described for individual versions.

Tupolev Tu-26 (Tu-22M) (NATO 'Backfire')

Although Soviet delegates to the SALT II Treaty talks referred to 'Backfire' as the Tu-22M, its current service designation is believed to be Tu-26. The 1985 edition of DoD's *Soviet Military Power* document refers to it as "a long-range aircraft capable of performing nuclear strike, conventional attack, antiship, and reconnaissance missions", adding later that "unrefueled 'Backfire' bombers can fly a variety of strike profiles against targets in Europe or China. Although Soviet spokesmen have stated [that it] does not have an intercontinental role, the aircraft has the capability to strike the US on one-way intercontinental missions with forward recovery (in non-hostile territory such as Cuba). Using Arctic staging bases and in-flight refueling, the 'Backfire' could achieve similar target coverage on two-way missions. If staged, but not refueled in flight, it could conduct strike missions against some targets in the US." Almost the only unknown is whether its refueling nose probe is removable or retractable.

Three versions have been identified, as follows:

Backfire-A. Initial version, with large landing gear fairings pods on wing trailing-edges. Observed in prototype form on the ground near the manufacturing plant at Kazan, in Central Asia, in July 1970. Equipped a single squadron.

Backfire-B. Extensively redesigned, with increased span and with landing gear pods eliminated except for shallow underwing fairings, no longer protruding beyond the trailing-edge. Mainwheels retract inward into bottom of intake trunks.

Backfire-C. Advanced version with wedge-type engine air intakes, similar to those of MiG-25. No photograph yet available.

About 300 'Backfires' are in service. Two-thirds of them oppose NATO in Europe and over the Atlantic, with the



Tupolev Tu-26 (NATO 'Backfire-B') (JASDF)

others in the far east of the Soviet Union. The latter are observed frequently over the Sea of Japan, and 30 of them are reportedly drawn from the 120 'Backfire-Bs' deployed in a maritime role by Soviet Naval Aviation. Production is expected to continue at the current rate of 30 a year into the 1990s, with progressive design changes to enhance performance. 'Backfires' have been used for development launches of new-generation cruise missiles, but are not considered likely to become designated AS-15 carriers. (Data for 'Backfire-B' follow.)

Power Plant: two unidentified engines, reported to be updated versions of the 44,090 lb st Kuznetsov NK-144 afterburning turbofans developed for the Tu-144 supersonic transport. Can be refueled in flight.

Dimensions: span 113 ft spread, 86 ft swept; length 140 ft; height 33 ft.

Weight: gross 270,000 lb.

Performance: max speed Mach 1.92 at high altitude, Mach 0.9 at low altitude, max unrefueled combat radius 3,400 miles.

Armament: twin 23 mm guns in radar-directed tail mounting. Nominal weapon load 26,450 lb. Primary armament of one to three 'Kitchen' or 'Kingfish' air-to-surface missiles semirecessed in the underside of the center-fuselage and/or carried under the fixed center-section panel of each wing. 'Backfire' can also carry the full range of Soviet free-fall nuclear and conventional weapons, and can have multiple racks for external stores under the front of the air intake trunks. Soviet development of decoy missiles has been reported, to supplement very advanced ECM and ECCM.

Tupolev Tu-95 and Tu-142 (NATO 'Bear')

Andrei Tupolev's huge four-turboprop 'Bear' provides impressive proof of the importance that the Kremlin still attaches to strategic airpower. The first Tu-95 prototype was flown in the summer of 1954. From the start, it flew at speeds 100 mph faster than anyone had expected a propeller-driven aircraft to achieve, and production has been continuous for a variety of duties. Fifteen years after the last of the original bomber variants left the assembly line, the entirely new 'Bear-H' entered series production, at Taganrog, as the first vehicle for the Soviet Union's AS-15 long-range air-launched cruise missiles with nuclear warheads. Twenty-five were in service by the spring of 1985, together with many 'Bear-Gs', which are early bombers reconfigured to carry the supersonic AS-4 'Kitchen' air-to-surface missile instead of the subsonic AS-3 'Kangaroo' with which they were formerly armed.

Versions of 'Bear' that can be identified by unclassified NATO reporting names are as follows:

Bear-A. Basic Tu-95 long-range strategic bomber. Chin radome. Internal stowage for two nuclear or a variety of conventional free-fall weapons. Defensive armament of six 23 mm guns in pairs in remotely-controlled rear dorsal and ventral turrets, and manned tail turret.

Bear-B. As 'Bear-A', but able to carry large air-to-surface winged missile (NATO 'Kangaroo') under fuselage, with associated radar in wide undernose radome replacing glazed nose. Defensive armament retained. A few 'Bs' operate in maritime reconnaissance role, with flight refueling nose probe, and, sometimes, a streamlined blister fairing on the starboard side of the rear fuselage.

Bear-C. Third strike version, with ability to carry 'Kangaroo', first observed near NATO ships in 1964. Differs from 'Bear-B' in having a streamlined blister fairing on each side of its rear fuselage. Has been seen with a faired tail as mentioned under 'Bear-D' entry. Refueling probe standard.

Bear-D. Identified in 1967, this maritime reconnaissance version is equipped with I band surface search radar in a large blister fairing under the center-fuselage. Glazed nose like 'Bear-A', with undernose radome and superimposed refueling probe. Rear fuselage blisters as on 'Bear-C'. Added fairing at each tailplane tip. I-band tail-warning radar in enlarged fairing at base of rudder. Carries no offensive weapons, but tasks include pinpointing of maritime targets for missile launch crews on board ships and aircraft that are themselves too distant to ensure precise missile aiming and guidance.

A 'Bear-D' photographed in the second half of 1978 had in place of the normal tail turret and associated radome a faired tail housing special equipment.

Bear-E. Reconnaissance bomber. Generally as 'Bear-A', but with rear fuselage blister fairings and refueling probe as on 'Bear-C'. Six or seven camera windows in bomb-bay doors. Few only.

Bear-F. First deployed by Soviet Naval Aviation in 1970 and since upgraded, this is a much refined antisubmarine version. Originally, it had enlarged and lengthened fairings aft of its inboard engine nacelles for purely aerodynamic reasons, but current aircraft have reverted to standard size fairings. The undernose radar of 'Bear-D' is missing on some aircraft; others have a radome in this position, but of considerably modified form. On both models the main underfuselage I band radar housing is considerably farther forward than on 'Bear-D' and smaller in size; the forward portion of the fuselage is longer; the flight deck windcreens are deeper, giving increased

headroom; there are no large blister fairings under and on the sides of the rear fuselage; and the nosewheel doors are bulged prominently, suggesting the use of larger or low-pressure tires. 'Bear-F' has two stores bays for sonobuoys, torpedoes, and nuclear depth charges in its rear fuselage, one of them replacing the usual rear ventral gun turret and leaving the tail turret as the sole defensive gun position. Some aircraft have an MAD 'sting' projecting from the rear of the fin tip.

Bear-G. Generally similar to 'Bear-B/C', but reconfigured to carry two supersonic AS-4 ('Kitchen') air-to-surface missiles instead of one subsonic AS-3 ('Kangaroo'), on a large pylon under each wingroot. Other new features include a small thimble radome under the in-flight refueling probe and a solid tailcone similar in shape to that on some 'Bear-Ds'. Operational.

Bear-H. This new production version, based on the Tu-142 type airframe of 'Bear-F', is equipped with pylons under the inboard wing panels to carry long-range cruise missiles, including the AS-15. It achieved initial operational capability in 1984. Features include a larger and deeper radome built into the nose and a small fin-tip fairing. The familiar blister fairings on the sides of the rear fuselage and ventral gun turret are deleted.

The majority of the 125 'Bears' now serving with the five Soviet air armies are of the new 'G' and 'H' models. Soviet Naval Aviation units have about 45 'Bear-Ds' and 55 'Bear-Fs'. Their duties include regular deployments to staging bases in Cuba and Angola, and eight are stationed permanently at Cam Ranh in Vietnam. Three 'Bear-Fs' have been transferred to the Indian Navy. (Data for 'Bear-F' follow.)

Power Plant: four Kuznetsov NK-12MV turboprop engines; each 14,795 ehp. Internal fuel capacity 19,280 gallons. Equipped for in-flight refueling.

Dimensions: span 167 ft 8 in, length 162 ft 5 in, height 39 ft 9 in.

Weight: gross 414,470 lb.

Performance: max speed 575 mph at 41,000 ft, unrefueled combat radius 5,150 miles.

New Tupolev Bomber (NATO 'Blackjack')

Two years away from anticipated operational capability, this long-awaited replacement for the M-4 'Bison' and Tu-95 'Bear' is longer than a B-52, is 50 percent faster than a B-1B, and has a range that offers much the same target coverage as 'Bear'. Apart from one poor-quality reconnaissance photograph taken over Ramenskoye flight test center on November 25, 1981, only DoD artists' impressions are available to show that 'Blackjack' is in no way a simple scale-up of Tupolev's earlier 'Backfire'. Common features include low-mounted variable-geometry wings and large vertical tail surfaces with a massive dorsal fin, but 'Blackjack's' horizontal tail surfaces are mounted higher, at the intersection of the dorsal fin and main fin. The fixed root panel of each wing seems to be long and very sharply swept, like the inboard section of the Tu-144's delta wing. The engine installation also seems to resemble that of the now-retired airliner rather than 'Backfire', leading to suggestions that 'Blackjack' might be powered by four Kolesov single-shaft turbojets of the kind that gave the developed Tu-144D an increased range (these might be related to the Type 57 engines tested in the experimental bomber known as 'Aircraft 101'). Such assessments should be regarded with caution, as the Tu-144D was designed to cruise at around Mach 2 throughout its flight, whereas the bomber would need to cruise at subsonic speed to conserve fuel and accelerate to supersonic speed at high altitude, or transonic speed at penetration height, only as it approached and left the target area. Major differences in flight profile normally call for different engines. However, it is Soviet policy to uprate or adapt an existing engine for a new aircraft rather than develop a new design, whenever this is possible. If the engines are mounted in pairs inside two divided underwing ducts, as on the Tu-144, the gap between the ducts will determine the type and size of weapons that 'Blackjack' can carry. DoD expects the Soviet Union to build a production series of about 100 in a new complex added to the Kazan airframe plant. The AS-15 air-launched cruise missile, with a range of 1,600 nm, will be 'Blackjack's' primary weapon.

Power Plant: possibly four 'Type 57' engines; each 44,100 lb st.

Dimensions: span 172 ft spread, 110 ft swept; length 166 ft; height 45 ft.

Weight: gross 590,000 lb.

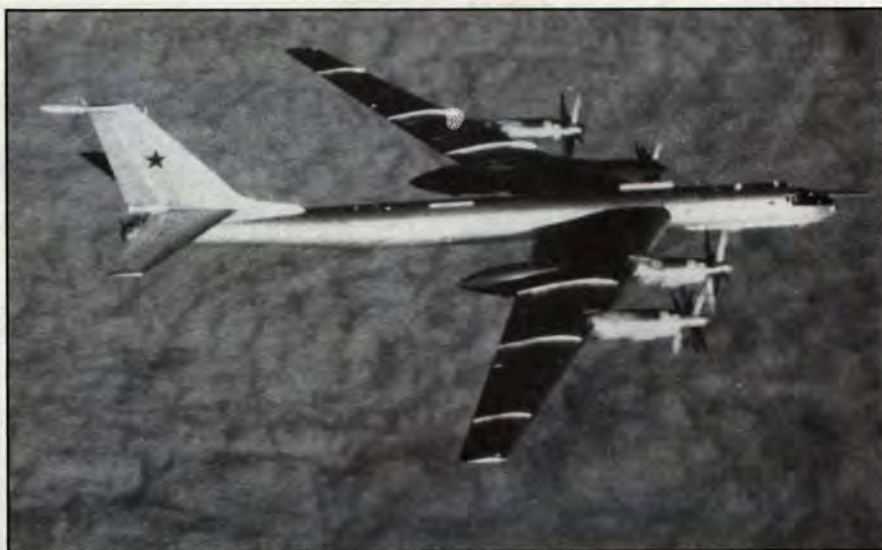
Performance: max speed Mach 2.1 at high altitude, max unrefueled combat radius 4,535 miles.

Armament: up to 36,000 lb of free-fall bombs or ALCMs.

Fighters

MIG-21 (NATO 'Fishbed')

MIG-21s continue to be flown by at least 37 air forces worldwide, but replacement with the MIG-23 and other



Tupolev Tu-142 (NATO 'Bear-F') with MAD tail 'sting' (USAF)



MiG-21MF (NATO 'Fishbed-J')

types has left only 700 in first-line units of the Soviet tactical air forces, including 50 of the reconnaissance models known to NATO as 'Fishbed-H'. Early MiG-21/PF/PFM variants (NATO 'Fishbed-C/D/F') are flown by various Warsaw Pact air forces, but the major versions deployed with Soviet air forces of the military districts (MDs) and groups of forces are as follows:

MiG-21PFMA ('Fishbed-J'). Multirole development of PFM, with Tumansky R-11-300 turbojet, improved radar (NATO 'Jay Bird'; search range 12 miles), and four underwing pylons instead of two. Armament can include GP-9 underbelly pack, housing GSh-23 twin-barrel 23 mm gun, instead of external fuel tank. Deepened dorsal spine fairing above fuselage contains some tankage, but internal fuel totals only 687 gallons. Two additional pylons carry either 130-gallon fuel tanks or radar-homing 'Advanced Atoll' missiles to supplement infrared K-13As on inboard pylons. Zero-speed, zero-altitude ejection seat. Later production PFMA's can have GSh-23 gun installed within fuselage, with shallow underbelly fairing for the barrels, and splayed cartridge ejection chutes to permit retention of centerline tank.

MiG-21MF ('Fishbed-J'). Differs from PFMA in having lighter-weight, higher-rated Tumansky R-13-300 turbojet. Entered service in 1970.

MiG-21SMT ('Fishbed-K'). As MiG-21MF, but deep dorsal spine extends rearward as far as parachute brake housing to provide maximum fuel tankage and optimum aerodynamic form. Provision for ECM equipment in small removable wingtip pods. Deliveries believed to have started in 1971.

MiG-21bis ('Fishbed-L'). Third-generation multirole air combat fighter/ground attack version, with wider and deeper dorsal fairing, updated avionics, and generally improved construction standards. Internal fuel capacity increased to 766 gallons.

MiG-21bis ('Fishbed-N'). Advanced version of 'Fishbed-L' with Tumansky R-25 turbojet engine, rated at 16,535 lb st with afterburning. Enhanced avionics. Rate of climb at T-O weight of 15,000 lb, with 50% fuel and two 'Atoll' missiles, is 58,000 ft/min. Armament uprated to two radar-homing 'Atolls' and two 'Aphids'. (Data for MiG-21MF follow.)

Power Plant: one Tumansky R-13-300 turbojet engine; 14,550 lb st with afterburning.

Dimensions: span 23 ft 5 1/2 in, length 51 ft 8 1/2 in, height 14 ft 9 in, wing area 247 sq ft.

Weight: gross 20,725 lb.

Performance: max speed Mach 2.1 above 36,000 ft, Mach 1.06 at low altitude; practical ceiling about 50,000 ft; range 683 miles on internal fuel, 1,118 miles with three external tanks.

Accommodation: pilot only.

Armament: one twin-barrel 23 mm GSh-23 gun, with 200 rounds. Typical underwing loads for interceptor role include two K-13A ('Atoll') and two 'Advanced Atoll' air-to-air missiles; two K-13As and two UV-16-57 (sixteen 57 mm) rocket pods; two drop tanks and two missiles. Typical ground attack loads are four UV-16-57 rocket packs; two 1,100 lb and two 550 lb bombs; or four S-240 mm rockets.

MiG-23 (NATO 'Flogger')

An estimated 2,100 MiG-23 interceptors form the backbone of the slimmed-down Voyska PVO air defense force and air combat elements of the tactical air forces. Versions are flown by all of the non-Soviet Warsaw Pact air forces and have been exported to at least ten other nations. Currently operational MiG-23 variants identified by unclassified NATO reporting names are as follows:

MiG-23M ('Flogger-B'). First series production version. Single-seat air combat fighter with Tumansky R-27 turbojet, rated at 22,485 lb st with afterburning, and considerably modified airframe compared with Lyulka-engined prototype and preproduction models. Deliveries began in 1972.

MiG-23MF ('Flogger-B'). Generally similar to MiG-23M, but with more powerful R-29 turbojet and uprated equipment, including J-band radar (NATO 'High Lark'; search range 53 miles, tracking range 34 miles) in nose, ECM in fairings forward of starboard underwing pylon and above rudder, infrared sensor pod beneath cockpit, and Doppler. Described as the first Soviet aircraft with a demonstrated ability to track and engage targets flying below its own altitude. Standard version for Soviet Air Force from about 1975 and for other Warsaw Pact air forces from 1978.

MiG-23M ('Flogger-C'). Tandem two-seater for both operational training and combat use. Identical to early MiG-23M (with R-27 engine), except for slightly raised second cockpit to rear, with retractable periscopic sight for occupant, and modified fairing aft of canopy.

MiG-23 ('Flogger-E'). Export version of 'Flogger-B', equipped to lower standard. Smaller radar (NATO 'Jay Bird'; search range 18 miles, tracking range 12 miles) in shorter nose radome. No infrared sensor or Doppler. Armed with 'Atoll' missiles and GSh-23 gun.

MiG-23BN ('Flogger-F'). Export counterpart of Soviet Air Forces' MiG-27 ('Flogger-D') ground attack/interceptor. Has the nose shape, laser rangefinder, raised seat, cockpit external armor plate, and larger, low-pressure tires of the MiG-27, but retains the power plant, variable-geometry intakes, and GSh-23 twin-barrel gun of the MiG-23MF.

MiG-23MF ('Flogger-G'). First identified when six aircraft from Kubinka air base made goodwill visits to Finland and France in the summer of 1978. Although basically similar to 'Flogger-B', these aircraft had a much smaller dorsal fin. Absence of operational equipment suggested that only a few aircraft had been modified to this standard for improved aerodynamic capability as a display team. 'Flogger-G' has since been confirmed as a standard operational variant, with lighter-weight radar and, on some aircraft, an undernose sensor pod of new design.

MiG-23BN ('Flogger-H'). As 'Flogger-F', but with small avionics pod added on each side at bottom of fuselage, immediately forward of nosewheel struts.

On all versions, wing sweep is variable manually, in flight or on the ground, to 16°, 45°, or 72°. Full-span

single-slotted trailing-edge flaps are each in three sections, permitting continued actuation of outboard sections when wings are fully swept. Upper-surface spoilers/lift dumpers operate differentially in conjunction with horizontal tail surfaces (except when cut out at 72° sweep), and collectively after touchdown. Leading-edge flap on outboard two-thirds of each main (variable-geometry) wing panel, coupled to trailing-edge flaps. Horizontal tail surfaces operate differentially and collectively for aileron and elevator functions respectively. Conventional rudder. (Data for current Soviet AF MiG-23MF follow.)

Power Plant: one Tumansky R-29B turbojet engine, rated at 27,500 lb st with max afterburning. Variable-geometry air intakes and variable nozzle. Internal fuel



MiG-23MF (NATO 'Flogger-B')
(Camera Press)



MiG-25M (NATO 'Foxbat-E')

capacity 1,519 gallons. Provision for 211 gallon external fuel tank on centerline pylon, and two more under fixed wing panels. Attachment for assisted take-off rocket on each side of rear fuselage.

Dimensions: span 46 ft 9 in spread, 26 ft 9½ in swept; length 59 ft 6½ in; wing area 293.4 sq ft spread.

Weight: gross 35,275–41,670 lb.

Performance: max speed Mach 2.35 at height, Mach 1.2 at sea level, service ceiling 61,000 ft, combat radius 560–805 miles.

Accommodation: pilot only.

Armament: one twin-barrel 23 mm GSh-23 gun in belly pack. One pylon under center-fuselage, one under each engine air intake duct, and one under each fixed inboard wing panel, for rocket packs, air-to-air missiles, or other stores. Use of twin launchers under air intake ducts permits carriage of four AA-8 (NATO 'Aphid') missiles, in addition to two AA-7 (NATO 'Apex') on underwing pylons.

MiG-25 (NATO 'Foxbat-A, C, and E')

Fastest armed combat aircraft yet identified in squadron service, the MiG-25 was designed more than 25 years ago to counter the threat of the B-70 Mach 3 strategic bomber then under development for USAF. Emphasis was placed on high speed, high altitude capability and a radar/missile fit that would permit attack over a considerable range; maneuverability was less important. Despite the subsequent NATO switch to low-level operations, MiG-25s continue to equip approximately one-quarter of

the 1,200-strong Soviet strategic interceptor force; a further 130 interceptors and 170 reconnaissance MiG-25s serve with the tactical air forces. Others fly in the national markings of Algeria, India, Iraq, Libya, and Syria. Five versions have been identified:

MiG-25 ('Foxbat-A'). Basic interceptor designed to attack high-flying targets. Built mainly of steel, with titanium only in places subject to extreme heating, such as the wing leading-edges. Slightly reduced wing sweep towards tips, which carry antiflutter bodies housing ECM and CW target-illuminating radar. Nose radar (NATO 'Fox Fire') of MiG-25 examined in Japan in 1976, after the defection of its pilot, was the most powerful fitted to any interceptor of that period, but embodied vacuum tubes rather than modern circuitry, with emphasis on antijamming capability rather than range. Most operational aircraft are being uprated progressively to 'Foxbat-E' standard.

MiG-25R ('Foxbat-B'). Reconnaissance version. Described separately in *Reconnaissance, ECM, and EW Aircraft* section.

MiG-25U ('Foxbat-C'). Trainer, of which first photographs became available in late 1975. New nose, containing separate cockpit with individual canopy, forward of standard cockpit and at a lower level. No search radar or reconnaissance sensors in nose.

MiG-25R ('Foxbat-D'). Reconnaissance version. Described separately.

MiG-25E ('Foxbat-E'). Converted 'Foxbat-A' with changes to radar and equipment to provide limited look-

down/shutdown capability comparable with that of 'Flogger-B'. Undernose sensor pod. Engines uprated to 30,865 lb st. Developed via aircraft known as E-266M, which recaptured two time-to-height records from the F-15 *Streak Eagle* in 1975 and subsequently set the current absolute height record of 123,524 ft. (Data for 'Foxbat-A' follow.)

Power Plant: two Tumansky R-31 (R-266) turbojet engines, each 27,010 lb st with afterburning. Internal fuel capacity approx 4,600 gallons. Electronically-controlled variable ramps in intakes.

Dimensions: span 45 ft 9 in, length 78 ft 13¼ in, height 20 ft 0¼ in, wing area 611.7 sq ft.

Weights: basic operating 44,100 lb, gross 82,500 lb.

Performance: never-exceed combat speed, with missiles, Mach 2.83, max speed at low altitude, with missiles, Mach 0.85, service ceiling 80,000 ft, max combat radius 900 miles.

Armament: four air-to-air missiles. These may comprise one infrared and one radar homing example of the AA-6 (NATO 'Acrid') under each wing. Alternatively, one AA-7 (NATO 'Apex') and one AA-8 ('Aphid') can be carried under each wing.

MiG-29 (NATO 'Fulcrum')

Operational since early 1985, the MiG-29 is expected to replace MiG-21s, Su-15/21s, and some MiG-23s in Soviet service. The basic version is a twin-engined single-seat fighter comparable in size to USAF's F-16 Fighting Falcon. An important difference is that the MiG is fitted from the start with a large pulse-Doppler look-down/shutdown radar that gives it day and night all-weather operating capability against low-flying targets as well as freedom from the outmoded ground control interception techniques that restricted Soviet air defense effectiveness in the past.

References to this fighter first appeared in the Western press in 1979, after a prototype had been identified in photographs taken over Ramenskoye flight test center by a US reconnaissance satellite. From the start, it was plain that the MiG-29 (NATO 'Fulcrum') represented a concerted effort by the Soviet Union to close the technology gap with the West. Combat radius and sustained turn rate are much improved over earlier Soviet fighters, and thrust-to-weight ratio is better than one. Although intended primarily as a counterair fighter, it is likely to have a full dual-role air combat/attack capability, and a combat capable two-seater is also in production. Manufacture is centered at a factory in Moscow, from which about 75 MiG-29s are believed to have been delivered by the beginning of 1986. India was awaiting delivery of an initial batch of six single-seaters and two two-seaters at that time and expects to manufacture MiG-29s under license to meet its requirement for fighters to match Pakistan's F-16s.

Power Plant: two Tumansky R-33D turbofans, each 18,300 lb st with afterburning.

Dimensions: span 33 ft 7½ in, length 50 ft 10 in, height 17 ft 2 in.

Weights: empty 17,250 lb, gross 36,375 lb.

Performance: max speed at height Mach 2.2, at S/L Mach 1.06, combat radius 500 miles.

Accommodation: pilot only (tandem two-seater to follow).

Armament: six AA-10 medium-range radar homing air-to-air missiles, bombs, rocket pods, or other stores on two pylons under each wing and one under each engine air duct. At least one large-caliber gun is also likely.

MiG-31 (NATO 'Foxhound')

First Soviet interceptor to offer true lookdown/shutdown and multiple-target engagement capability, the MiG-31 is expected to reequip many MiG-21, MiG-23, Su-15/21, and MiG-25 units. Although it inherits its general configuration from 'Foxbat' and may have the same power plant as 'Foxbat-E', it is a very different aircraft, with a crew of two and reduced emphasis on highest possible speed. Nonetheless, Assistant Secretary of Defense Donald Latham raised a few eyebrows last year by stating his opinion that the MiG-31 is superior to any existing US fighter, with better avionics, a better C³ system to work into, a better air-to-air missile, and greater speed and combat range. Key to this superiority is the aircraft's new pulse-Doppler radar, allied to eight beyond-visual-range missiles considered to be better than the embryonic US AMRAAM.

Deployment of MiG-31s with Voyska PVO air defense regiments has been under way for three years, and more than 70 were already operational by the spring of 1985, from the Arkhangelsk area near the USSR's western borders to Dolinsk on Sakhalin Island, north of Japan. Production is centered at the Gorkiy airframe plant.

Power Plant: two Tumansky R-31 turbojets; each 30,865 lb st with afterburning.

Dimensions: span 45 ft 10½ in, length 77 ft 1¼ in.

Weights: empty 48,115 lb, gross 90,725 lb.
Performance: max speed Mach 2.4 at height, combat radius 1,305 miles.



Artist's impression of MiG-29 (NATO 'Fulcrum') (DoD)

Accommodation: two crew, in tandem.

Armament: eight air-to-air missiles, including new radar homing AA-9.

Sukhoi Su-15/21 (NATO 'Flagon')

With deployment of the new MiG-29 and MiG-31 gathering pace, the number of 'Flagons' in first-line home defense units is believed to have diminished from about 750 to fewer than 200 during the past year. Those remaining are of three variants, of which 'Flagon-E/F' are so different from early Su-15s that they are said to be designated Su-21 in the USSR:

Flagon-C. Two-seat training version, probably with combat capability. Individual rearward-hinged canopy over each seat.

Flagon-E. Single-seat interceptor. Longer-span wings than those of original 'Flagon-A', with compound sweep. R-13F-300 turbojets, each rated at 14,550 lb st, increasing speed and range. Up-rated avionics. Major production version, operational since second half of 1973.

Flagon-F. Last known production version, identified by ogival nose radome instead of conical type on earlier variants. Generally similar to 'Flagon-E', but with up-rated engines. (Data for 'Flagon-F' follow.)

Power Plant: two afterburning turbojets, reported to be Tumansky R-13F2-300s; each 15,875 lb st.

Dimensions: span 34 ft 6 in., length 68 ft 0 in.

Weight: gross 35,275 lb.

Performance: max speed Mach 2.1 above 36,000 ft, service ceiling 65,600 ft, combat radius 450 miles.

Accommodation: pilot only.

Armament: one radar homing and one infrared homing air-to-air missile (NATO 'Anab') on outboard underwing pylons; infrared homing close-range missile (NATO 'Aphid') on each inboard pylon. GSh-23L 23 mm gun pods or fuel tanks on two underbelly pylons.

Sukhoi Su-27 (NATO 'Flanker')

Sukhoi's equivalent to USAF's F-15 Eagle, the Su-27 (NATO 'Flanker') is a supersonic all-weather counterair fighter with lookdown/shootdown weapon systems and beyond-visual-range air-to-air missiles and with a possible secondary ground attack role. The aircraft's range, thrust-to-weight ratio, and maneuverability are all said to be improved by comparison with earlier Soviet fighters. Its large pulse-Doppler radar and heavy armament should also give it formidable potential against low flying aircraft and cruise missiles, particularly when it is deployed in partnership with the new Soviet AEW&C aircraft based on the Il-76 transport and known to NATO as 'Mainstay'.

The only photographs of the Su-27 yet published are thought to show a prototype or preseries model with curved wingtips. Production Su-27s have square tips, carrying launchers for air-to-air missiles; the twin tail fins are also moved outboard of the engine housings. Production is centered at a plant in Komsomolsk, Khabarovsk territory. The fighter was expected to achieve operational capability during 1985 and, with the MiG-31, to replace many of the MiG-21, MiG-23/27, Su-15/21, and MiG-25 aircraft in the 17 tactical air forces assigned to Soviet military districts and groups of forces.

'Flanker' has also been observed with various other types at Saki naval air base on the Black Sea. There, the Soviet Navy has a 975 ft dummy flight deck, complete with arrester gear and barriers as well as two ski-jump ramps, as part of the development program for the 65,000 ton nuclear-powered aircraft carrier built at Nikolayev. This may suggest the eventual manufacture of a navalized version of the Su-27 to equip the ship's carrier air group.

Power Plant: two unidentified turbojets, possibly related to Tumansky R-31; each 30,000 lb st with afterburning.

Dimensions: span 47 ft 7 in., length (excl nose probe) 69 ft 0 in., height 18 ft 0 in.

Weight: gross 44,000-63,000 lb.

Performance: max speed Mach 2.35 at height, Mach 1.1 at S/L, combat radius 930 miles.

Accommodation: pilot only.

Armament: six radar homing AA-10 air-to-air missiles under fuselage and wings and on wingtip launchers, or 13,225 lb of external stores (e.g., twelve 1,100 lb bombs) for secondary attack role.

Tupolev Tu-28P/Tu-128 (NATO 'Fiddler')

Largest purpose-designed interceptor yet put into service. 'Fiddler' is usually designated Tu-28P in the press, but DoD prefers Tu-128. Which is correct is unlikely to be of consequence for much longer; after 20 years of service, only about 90 of the production 'Fiddler-Bs' remain operational.

Power Plant: two unidentified afterburning turbojet engines; each estimated at 27,000 lb st. Half-cone shock-body in each air intake.

Dimensions: span 59 ft 4 1/2 in., length 89 ft 3 in.

Weight: gross 100,000 lb.

Performance: max speed Mach 1.65 at 36,000 ft, ceiling 65,600 ft, range 3,100 miles.

Accommodation: crew of two in tandem.

Armament: four air-to-air missiles (NATO 'Ash') under wings, two radar homing, two infrared homing.

Yakovlev Yak-28P (NATO 'Firebar')

About 90 Yak-28P all-weather interceptors are thought to remain operational in the Vyska PVO fighter force. The longer dielectric nosecone fitted retrospectively to some aircraft does not indicate any increase in radar capability or aircraft performance, but simply a change of material and shape.

Power Plant: two turbojet engines, related to the Tumansky R-11 fitted in some MiG-21s; each 13,120 lb st with afterburning. Each intake houses a centerbody shock-cone.

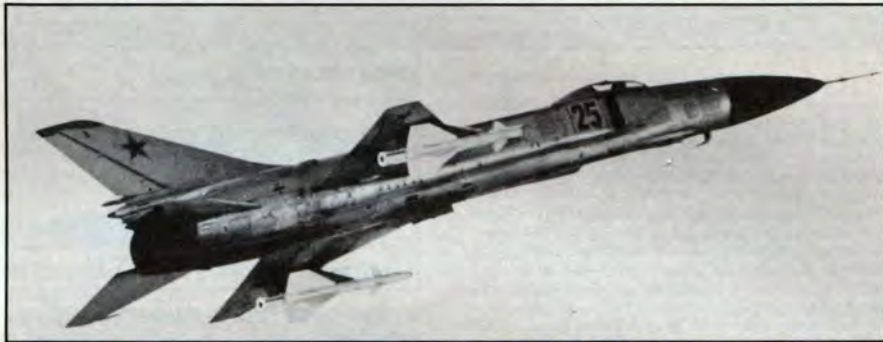
Dimensions: span 42 ft 6 in., length 75 ft 5 1/2 in., height 12 ft 11 1/2 in.

Weight: gross 44,000 lb.

Performance: max speed Mach 1.88 at 35,000 ft, service ceiling 55,000 ft, combat radius 575 miles.

Accommodation: crew of two in tandem.

Armament: two air-to-air missiles (NATO 'Anab') under outer wings, with alternative infrared or semiactive radar homing heads.



Sukhoi Su-15 (NATO 'Flagon-F') (Royal Norwegian Air Force)



Tupolev Tu-28P (NATO 'Fiddler') (Royal Norwegian Air Force)



Yakovlev Yak-28P (NATO 'Firebar')



Yakovlev Yak-38 (NATO 'Forger-A')

Yakovlev Yak-38 (NATO 'Forger')

The Yak-38 is the only jet combat aircraft that shares the Harrier's V/STOL capability, but it requires three engines, rather than one, to achieve this. Its single large propulsion turbojet exhausts through a pair of rotating nozzles aft of the wing roots. Two lift-jets are mounted in tandem aft of the cockpit, inclined at an angle so that their thrust is exerted upward and slightly forward. All three engines are used for takeoff, which was always vertical when first observed on board the carrier/cruiser *Kiev* during the ship's maiden voyage through the Mediterranean and North Atlantic in July 1976. More recently, the vertical takeoff technique has been superseded by a STOL type with a short forward run, which can be assumed to offer improved payload/range performance. This has been made practicable by an automatic control system that ensures "that the lift engines are brought into use, and the thrust vectoring rear nozzles rotated, at the optimum point in the takeoff run."

Landing procedure begins with a gradual descent from far astern, with the last 1,300 ft flown essentially level, about 100 ft above the water. The aircraft crosses the ship's stern with about a 6 mph closure rate, 35-45 ft

above the flight deck, then flares gently to a hover and descends vertically. Precise landings are ensured by the automatic control system, perhaps in association with laser devices lining each side of the rear deck. Puffer-jets at the wingtips and tail help to give the Yak-38 commendable stability during takeoff and landing.

With small refinements, the Yak-38, known to NATO as 'Forger', has become standard equipment also on the *Kiev's* three sister ships. There are two operational versions:

Forger-A. Basic single-seat combat aircraft. Prototype was completed in 1971 and production began in 1975. Twelve appear to be operational on each Soviet carrier/cruiser, in addition to about 19 Kamov Ka-25 or Ka-27 helicopters. Primary operational roles are assumed to be reconnaissance, strikes against small ships, and fleet defense against shadowing, unarmed maritime reconnaissance aircraft. Production probably totals about 70 aircraft.

Forger-B. Two-seat trainer, of which one is deployed on each carrier/cruiser. Second cockpit forward of normal cockpit, with its ejection seat at lower level, under a continuous canopy. Rear fuselage lengthened to compensate for longer nose. No ranging radar or weapon pylons. Overall length about 58 ft 0 in.

Power Plant: one Lyulka AL-21 turbojet, without afterburner, exhausting through two vectored-thrust nozzles that can turn up to 10° forward of vertical for VTOL; 17,985 lb st. Two Koliesov lift-jets; each 7,875 lb st.

Dimensions: span 24 ft 0 in., length 50 ft 10 1/4 in., height 14 ft 4 in.

Weights: basic operating (incl pilot) 16,500 lb, gross 25,795 lb.

Performance: max speed Mach 0.95 at height, Mach 0.8 at S/L, service ceiling 39,375 ft, combat radius 115-230 miles.

Accommodation: pilot only.

Armament: four pylons under inner wings for 5,730-7,935 lb of stores, including 'Kerry' short-range air-to-surface missiles, armor-piercing antiship missiles, 'Aphid' air-to-air missiles, gun pods each containing a 23 mm twin-barrel GSh-23 cannon, rocket packs, bombs, and auxiliary fuel tanks.

Attack Aircraft

MiG-27 (NATO 'Flogger')

This single-seat ground attack aircraft has many airframe features in common with the MiG-23, but differs in such important respects that its Soviet designation was



MiG-27 (NATO 'Flogger-D')



Sukhoi Su-17 (NATO 'Fitter-C') carrying ECM pod

changed to MiG-27. It has the same basic power plant as the Soviet Air Force's MiG-23MF, but with a fixed nozzle and fixed engine air intakes, consistent with the primary requirement of transonic speed at low altitude. Two versions are operational in Soviet tactical air force regiments:

Flogger-D. Basic version, with forward portion of fuselage completely redesigned by comparison with interceptor versions of MiG-23. Instead of having an ogival radome, 'Flogger-D' nose is sharply tapered in side elevation, with a small sloping window covering a laser rangefinder and marked target seeker. Additional armor on flat sides of cockpit. Seat and canopy raised to improve view from cockpit. Six-barrel 23 mm Gatling-type underbelly gun replaces GSh-23 of interceptor. Bomb rack under each side of rear fuselage in addition to five pylons for external stores, including tactical nuclear weapons and, probably, the air-to-surface missile known to NATO as 'Kerry'. Provision for external fuel tank for ferry flights under each outer wing, which must be kept fully-forward when tanks are in place. Bullet-shape antenna above each glove pylon.

Flogger-J. Identified in 1981. New nose shape, with lip at top and blister fairing below. Antennae above glove pylons deleted. Wing-root leading-edge extensions on some aircraft. Armament includes two gun pods on underwing pylons, with gun barrels that can be depressed for attacking ground targets.

A total of about 730 'Flogger-Ds' and 'Js' is deployed with Soviet tactical air forces, plus at least one squadron with the East German Air Force. The somewhat similar aircraft known to NATO as 'Flogger-F' and 'H' are MiG-23s. Both have been operated by Soviet units, but are basically export counterparts of the MiG-27, equipped to lower standards. (Data for 'Flogger-D' follow.)

Power Plant: generally similar to MiG-23MF, but R-29B engine rated at 25,350 lb st with afterburning.

Dimensions: span as MiG-23, length 52 ft 6 in.

Weights: max external weapon load 8,820 lb, gross 44,313 lb.

Performance: max speed Mach 1.7 at height, Mach 1.1 at S/L, service ceiling 52,500 ft, combat radius (lo-lo-lo, with underbelly tank, four 1,100 lb bombs, and two 'Atoll' missiles) 240 miles, max ferry range (3 external tanks) 1,550 miles.

Armament: described above.

Sukhoi Su-7 (NATO 'Fitter-A')

This big single-seat ground attack fighter has been seen in action in support of Soviet forces in Afghanistan, and eight other air forces continue to fly Su-7s. However, the number deployed with Soviet regiments has diminished to about 130, in the following versions:

Su-7BM. Compared with the original Su-7B of the late 1950s, this introduced a zero-altitude ejection seat, Sirena tail-warning radar, a second pair of underwing stores pylons, larger blast panels forward of wing-roots, JATO attachments under rear fuselage, twin brakechutes in a container at base of rudder, and an uprated engine.

Su-7BKL. Introduced low-pressure nosewheel tire, necessitating bulged doors to enclose it when retracted, and small extensible skid outboard of each mainwheel for operation from short, unprepared fields.

Su-7BMK. As Su-7BKL, but with further equipment changes. (Data for this version follow.)

Power Plant: one Lyulka AL-7F-1-100 turbojet engine; 21,150 lb st with afterburning. Internal fuel capacity 777 gallons. Provision for two external tanks under

belly, combined capacity 317 gallons, and two ferry tanks on inner wing pylons, total capacity 475 gallons. Two JATO rockets can be fitted under rear fuselage to shorten takeoff run.

Dimensions: span 28 ft 9 1/4 in, length 55 ft 1 1/2 in, height 15 ft 9 in.

Weights: empty 18,360 lb, gross 29,630 lb.

Performance: max speed Mach 1.6 clean or Mach 1.2 with external stores at 36,000 ft, or 530 mph at sea level without afterburning, service ceiling 59,050 ft, combat radius 155-215 miles.

Accommodation: pilot only.

Armament: two 30 mm NR-30 guns in wing roots, each with 70 rounds; underwing pylons for two 1,650 lb and two 1,100 lb bombs, including nuclear weapons, or rocket pods. External weapon load reduced to 2,200 lb when two underbelly fuel tanks are carried.

Sukhoi Su-17, Su-20, and Su-22 (NATO 'Fitter-C, D, E, F, G, H, and J')

The original prototype of this family of aircraft, known to NATO as 'Fitter-B', was simply an Su-7 with about 13 ft of each wing pivoted outboard of a very large fence. By the time the Sukhoi Bureau had introduced also a more powerful engine and improved avionics, the variable-geometry 'Fitter' was in a completely different class from 'Fitter-A'. A doubled external load could be lifted from strips little more than half as long as those needed by the original fixed-wing aircraft; it could then be carried about 30% farther and delivered with greater accuracy. As a result, the fighter was put into series production, and about 1,000 of the 2,350 ground attack aircraft in service with Soviet tactical air forces are now Su-17s. Soviet Naval Aviation has about 65 assigned to the Baltic Fleet for antishipping strike and amphibious support roles and has formed a further Su-17 unit in the Pacific. Variants in Soviet service are as follows:

Su-17 ('Fitter-C'). Basic single-seat attack aircraft for Soviet Air Forces, with Lyulka AL-21F-3 turbojet. Manual wing sweep control. Fuselage diameter constant between wing and tailplane. Curved dorsal fin between tail fin and dorsal spine fairing. Equipment said to include SRD-5M (NATO 'High Fix') I-band centerbody ranging radar, ASP-5ND fire control system, Sirena 3 omnidirectional radar homing and warning system, and SRO-2M IFF. Operational since 1971 in relatively small numbers. Serves also with Soviet Navy.

Su-17M ('Fitter-D'). Generally similar to 'Fitter-C', but forward fuselage lengthened by about 1 ft 3 in. Added undernose electronics pod for terrain avoidance radar. Laser marked target seeker in intake centerbody.

Su-17UM ('Fitter-E'). Tandem two-seat trainer for Soviet Air Force. Generally similar to 'Fitter-D', without electronics pod, but entire fuselage forward of wing drooped slightly to improve view from rear seat. Deepened dorsal

spine fairing, almost certainly providing additional fuel tankage. Port wing-root gun deleted.

Su-17 ('Fitter-G'). Two-seat trainer variant of 'Fitter-H', with combat capability. Deepened dorsal spine fairing and drooped front fuselage like 'Fitter-E'. Taller vertical tail surfaces. Shallow ventral fin (removable). Starboard gun only. Laser target seeker fitted.

Su-17 ('Fitter-H'). Improved single-seater for Soviet Air Forces. Basically as 'Fitter-C', but with wide and deep dorsal fairing aft of canopy, like 'Fitter E/G'. Terrain avoidance radar said to be fitted internally in deepened undersurface of nose. Taller fin like 'Fitter-G'. Removable ventral fin. Retains both wing-root guns. Additional pylon for AS-7 (NATO 'Kerry') air-to-surface missile or other external store under wing center-section on each side. About 200 'Fitter-H/K' equipped for tactical reconnaissance duties.

Su-17 ('Fitter-K'). Latest single-seat version for Soviet Air Forces, identified in 1984. Dorsal fin embodies small cooling air intake at front.

It was deduced for some years that certain export versions of the variable-geometry 'Fitter' series had different engines from the Su-17 variants listed above. 'Fitter-C/D/E/G/H/K' operated by the Soviet Air Force and some other air forces have a rear fuselage of basically constant diameter and are powered by a Lyulka turbojet. Versions exported to Angola, Libya, Peru, Syria, Vietnam, and North and South Yemen were seen to have a more bulged rear fuselage, now known to house a Tumansky R-29B turbojet, as fitted in the MiG-27, with re-arranged external air ducts and a shorter plain metal shroud terminating the rear fuselage. This change of power plant, together with variations in equipment standard, is covered by the following changes to the Soviet type designation:

Su-20 (Su-17MK, 'Fitter-C'). Generally similar to Soviet Air Force 'Fitter-C', with Lyulka engine, but with reduced equipment standard. Supplied to Algeria, Czechoslovakia, Egypt, Iraq, Poland, and Vietnam.

Su-22 ('Fitter-F'). Export counterpart of 'Fitter-D', with modified undernose electronics pod. Tumansky R-29B turbojet, rated at 25,350 lb st with afterburning, in increased-diameter rear fuselage. Gun in each wing-root. Weapons include 'Atoll' air-to-air missiles. Aircraft supplied to Peru had Sirena 2 limited-coverage radar warning receiver, virtually no navigation aids, and IFF incompatible with that nation's SA-3 (NATO 'Goa') surface-to-air missiles.

Su-22 ('Fitter-G'). Export counterpart of Su-17 'Fitter-G', with R-29B engine.

Su-22 ('Fitter-J'). Generally similar to 'Fitter-H', but with Tumansky engine. Internal fuel capacity 1,656 gallons. More angular dorsal fin. 'Atoll' air-to-air missiles. Supplied to Libya.

There is also a two-seat counterpart of 'Fitter-J' that has no separate NATO reporting name. (Data for Su-17 'Fitter-C' follow.)

Power Plant: one Lyulka AL-21F-3 turbojet, rated at 24,700 lb st with afterburning. Internal fuel capacity 1,200 gallons. Up to four 211-gallon drop-tanks under fuselage and wings.

Dimensions: span 45 ft 11 1/4 in spread, 34 ft 9 1/2 in swept; length 61 ft 6 1/4 in; height 15 ft 7 in; wing area 431.6 sq ft spread, 400.4 sq ft swept.

Weights: empty 22,046 lb, takeoff clean 30,865 lb, gross 39,020 lb.

Performance: max speed Mach 2.09 at height, Mach 1.05 at sea level, ceiling 59,050 ft, combat radius (lo-lo-lo) 224 miles, (hi-lo-hi) 391 miles.

Accommodation: pilot only.

Armament: two 30 mm NR-30 guns in wing-roots; eight pylons under fuselage and wings for more than 7,000 lb of bombs, including nuclear weapons, rocket pods, and such guided missiles as the air-to-surface AS-7 (NATO 'Kerry').

Sukhoi Su-24 (NATO 'Fencer')

Best interdictor in the Soviet inventory, the Su-24 was the first modern Soviet fighter designed specifically for ground attack and the first to carry a weapon systems officer, in a side-by-side two-seat cockpit. Smaller and lighter than USAF's F-111, its variable-geometry wings have a fully swept sweep of about 16°, fully swept angle of 68°, and intermediate sweep of 45°. The outer panels carry the first pivoting pylons seen on a Soviet vg aircraft. The primary pulse-Doppler radar dish appears to have a diameter of at least 49 in; other equipment is thought to include terrain avoidance radar and a laser rangefinder and marked target seeker. RAF assessment suggests that the Su-24 has five times the weapon load and five times the range of its immediate predecessor, enabling it to reach any target in England from East German advanced bases. A USAF senior officer has said that it can deliver ordnance within 180 ft of its target in all weathers.

Known to NATO as 'Fencer', the Su-24 entered squadron service in December 1974 as a replacement for the Yak-28 ('Brewer'). More than 500 are now serving with first-line squadrons, including those assigned to strategic missions. Two full regiments have been reported at

Tukums in Latvia, near the Gulf of Riga, and at Chernyakhovsk, near Kaliningrad on the Soviet Baltic coast. Two more are said to be stationed at Starokonstantinov and Gorodok in the Ukraine, and one in the Soviet Far East. First brief deployment beyond the Soviet borders was made to Templin Air Base, north of Berlin in East Germany, in July 1979. Su-24s have been standard equipment of the 16th Air Army in that country since 1982.

Three variants have been identified by NATO reporting names:

Fencer-A. Identifiable by rectangular rear fuselage box enclosing jet nozzles.

Fencer-B. Rear fuselage box around jet nozzles has deeply dished bottom skin between nozzles.

Fencer-C. Introduced in 1981. Important equipment changes. Multiple fitting on nose instead of former simple probe. Triangular fairing forward of each fixed wing-root, on side of air intake, presumably housing equipment of the kind seen on the fuselage sides, forward of the nosewheel doors, of ground attack MiG-23/27 'Floggers'.

Power Plant: two afterburning turbojets; believed to be related to Lyulka AL-21F fitted in Su-17. Internal fuel capacity estimated at 3,435 gallons. Provision for large drop-tank on each glove pylon.

Dimensions: span 56 ft 7 in spread, 32 ft 9 1/2 in swept; length 69 ft 10 in; height 18 ft 0 in.

Weights: empty equipped 41,885 lb, gross 87,080 lb.

Performance: max speed Mach 2.18 at height, Mach 1.2 at S/L, service ceiling 54,135 ft, combat radius (lo-lo) over 200 miles, (hi-lo-hi, with 4,400 lb weapons and two external tanks) 1,115 miles.

Armament: one gun on port side of belly; eight pylons under fuselage, wing-root gloves, and outer wings for 24,250 lb of guided and unguided air-to-surface weapons, including nuclear weapons.

Sukhoi Su-25 (NATO 'Frogfoot')

Nobody is suggesting any longer that experience in Afghanistan has persuaded the Soviet Union to limit production of this counterpart to USAF's single-seat A-10 Thunderbolt II attack aircraft. Su-25s are leaving the Tbilisi airframe plant in numbers adequate to reequip not only Soviet tactical units but those of other Warsaw Pact nations, beginning with Czechoslovakia and Hungary. The aircraft's engines are now confirmed as non-afterburning versions of the Tumansky turbojets fitted in late-model MiG-21s. The first good photographs of the type, published in Czechoslovakia, have revealed details of the split airbrakes at the rear of each wingtip fairing, like those of the Grumman A-6 Intruder, as well as a variety of operational equipment including SRO-2 ('Odd Rods') IFF, Sirena 3 radar warning system, nose-mounted laser rangefinder and marked target seeker, and a flare dispenser in the tailcone. A large-caliber gun is fitted.

This is a type of aircraft that the Soviet forces pioneered with the Ilyushin Il-2 *Shturmovik* of World War II. The pilot is again protected by flat slabs of armor around his cockpit, and big wings support ten weapon pylons for 9,920 lb of ordnance, including chemical weapons. Since 1982, in Afghanistan, the Soviet tactical air forces have been testing techniques for coordinating low-level close support by Su-25s operating in partnership with Mi-24 'Hind' helicopter gunships. With new attack helicopters like the Mi-28 'Havoc' and Kamov 'Hokum' set to join the Mi-24, the upgrading of Soviet tactical airpower clearly continues to enjoy high priority.

Power Plant: two nonafterburning Tumansky R-13-300 turbojets; each 11,240 lb st.

Dimensions: span 50 ft 10 in, length 47 ft 6 in, wing area 404.7 sq ft.

Weights: empty 20,950 lb, gross 39,950-42,330 lb.

Performance: max speed 546 mph, combat radius 345 miles.

Accommodation: pilot only.

Armament: one 30 mm twin-barrel gun on port side of nose. Ten underwing pylons for external stores, including 57 mm and 80 mm rockets, and 1,100 lb incendiary, antipersonnel, and chemical cluster bombs.

Reconnaissance, ECM, and Early Warning Aircraft

New Reconnaissance Aircraft

Among Soviet military aircraft said to have been observed at Ramenskoye flight test center is a high-altitude reconnaissance vehicle in the class of USAF's Lockheed TR-1. It is known at present as Ram-M, a designation which suggests a development status somewhere between the MiG-29 (Ram-L) and the Tupolev bomber

known to NATO as 'Blackjack' (Ram-P). No details are yet available, except that it has twin tail fins.

Antonov An-12 (NATO 'Cub-A, B, C, and D')

The large hold of this four-turboprop transport can accommodate a wide variety of equipment for special duties. Four variants may be identified by NATO reporting names:

Cub-A. Electronic intelligence (elint) version. Generally similar to basic 'Cub' transport, but with blade antennae on front fuselage, aft of flight deck, and other changes.

Cub-B. Conversion of 'Cub' transport for elint missions. Examples photographed over international waters by the crews of Norwegian and Swedish combat aircraft each had two additional radomes under the forward- and center-fuselage, plus other antennae. About 10 produced for Soviet Naval Air Force.

Cub-C. ECM variant carrying several tons of electrical generation, distribution, and control gear in the cabin, and palletized jammers for at least five wavebands fared into the belly, plus ECM dispensers. Glazed nose and undernose radar of transport retained. An ogival 'solid'



Antonov An-12 (NATO 'Cub') testbed for advanced avionics



Ilyushin Il-20 (NATO 'Coot-A') (Royal Navy)



Sukhoi Su-25 (NATO 'Frogfoot') (copied from *Letectvi + Kosmonautika*)

fuselage tailcone, housing electronic equipment, is fitted in place of the usual gun position.

Cub-D. This further variant of the An-12 reflects the huge efforts being made by the Soviet Union to ensure effective handling of every conceivable ECM task. Equipment differs from that of 'Cub-C' to perform different active countermeasures duties. Up to 40 'Cub-C and D' aircraft are believed to serve with the Soviet Air Force and Navy.

In addition to these operational variants, an An-12 has been utilized as a test-bed for advanced avionics housed in a large blister fairing on each side of the fuselage, forward of the landing gear fairings, and in other containers under the front of the loading ramp/door and rear turret.

Ilyushin Il-20 (NATO 'Coot-A')

This ECM or electronic intelligence (elint) aircraft appears to be a conversion of the standard Il-18 four-turboprop transport. An under-fuselage container, about 33 ft 7 1/2 in long and 3 ft 9 in deep, is assumed to house side-looking radar. Smaller containers on each side of the forward fuselage each contain a door over a camera or other sensor. About eight antennae and blisters can be counted on the undersurface of the center and rear fuselage, plus two large plates projecting above the forward fuselage.

Ilyushin Il-76 AEW&C Variant (NATO 'Mainstay')

An AEW&C (airborne early warning and control) version of the Il-76 has been under development since the 1970s as a replacement for the Tu-126s operated by the Voyska PVO home defense force and tactical air forces. Known to NATO as 'Mainstay', it is believed to have a conventionally located rotating 'saucer' radome, lengthened fuselage forward of the wings, and flight refueling probe. In the latest edition of *Soviet Military Power*, DoD states that 'Mainstay' will improve substantially Soviet capabilities for early warning and air combat command and control. It provides the Soviet forces with the capability to detect and track aircraft and cruise missiles flying at low altitude over land and water, and could be used to help direct fighter operations over European and Asian battlefields as well as to enhance air surveillance and defense of the USSR. Test and evaluation were continuing in 1985. At least four 'Mainstays' had been produced by then, with others expected to follow at a rate of five a year. They are intended to operate primarily with the Voyska PVO's new-generation MiG-29, MiG-31, and Sukhoi Su-27 counterair fighters.

MiG-21 (NATO 'Fishbed-H')

Two versions of this single-seat fighter are operated by the Soviet Air Forces and their allies as specialized tactical reconnaissance aircraft:

Transports

MiG-21R ('Fishbed-H'). Basically similar to MiG-21PFMA, but with a pod housing forward-facing or oblique cameras, infrared sensors, or ECM devices, and fuel, carried on the fuselage centerline pylon. Suppressed ECM antenna at mid-fuselage; optional ECM equipment in wingtip fairings.

MiG-21RF ('Fishbed-H'). Generally similar to MiG-21R, but based on MiG-21MF. Total of 50 'Fishbed-Hs' of both models estimated in service with Soviet tactical air forces.

MiG-25 (NATO 'Foxbat-B and D')

Although generally similar to the basic MiG-25 interceptor, the reconnaissance variants have a modified wing and, carrying no external weapons, are not limited to Mach 2.8. Two versions have been identified in service, as follows:

MiG-25R ('Foxbat-B'). Basic reconnaissance version, with five camera windows and various flush dielectric panels aft of very small dielectric nose cap for radar. Equipment believed to include Doppler navigation system and side-looking airborne radar (SLAR). No armament. Slightly reduced span. Wing leading-edge sweep constant from root to tip. Total of about 170 'Foxbat-Bs and Ds' estimated in service with Soviet tactical air forces. 'Foxbat-B' also operational in Algeria, Libya, Syria, and with No. 106 Squadron of the Indian Air Force.

MiG-25R ('Foxbat-D'). Similar to 'Foxbat-B', but with larger SLAR dielectric panel, farther aft on side of nose, and no cameras. Supplied also to Libya.

Dimension: span 44 ft 0 in.

Weights ('Foxbat-B'): basic operating 43,200 lb, gross 73,635 lb.

Performance: max speed Mach 3.2 at height, service ceiling 88,580 ft, operational radius 560 miles.

the fuselage is 6 ft larger than that of the E-3; however, the Tu-126 is believed to have only limited effectiveness in the warning role over water and to be ineffective over land.

Power Plant: four Kuznetsov NK-12MV turboprop engines; each 14,795 ehp. Internal fuel capacity 20,075 gallons. In-flight refueling probe standard.

Dimensions: span 168 ft 0 in, length 181 ft 1 in, height 52 ft 8 in, wing area 3,349 sq ft.

Weight: gross 374,785 lb.

Performance: max speed 528 mph, normal operating speed 404 mph, max range without flight refueling 7,800 miles.

Accommodation: crew of twelve.

Armament: none.

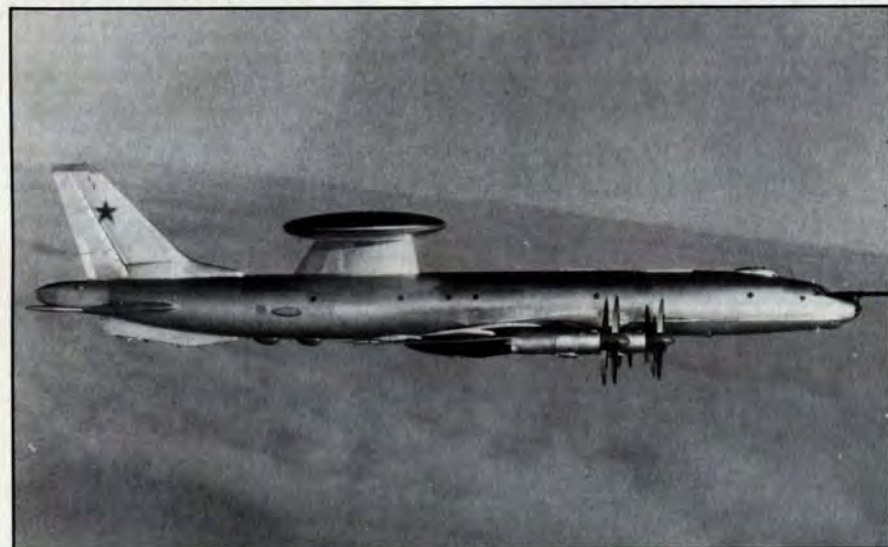
Yakovlev Yak-28 (NATO 'Brewer')

Versions of this two-seat tactical aircraft still operational in support roles are as follows:

Brewer-D. Reconnaissance aircraft, carrying cameras or other sensors, including side-looking airborne radar, instead of weapons in its internal bomb-bay. Blister radome under fuselage forward of wings. About 150 operational.

Brewer-E. Deployed in 1970 as the first Soviet operational ECM escort aircraft, with an active ECM pack built into its bomb-bay, from which the pack projects in cylindrical form. No radome under front fuselage, but many additional antennae and fairings are apparent. A rocket pod can be carried under each outer wing, between the external fuel tank and balancer wheel housing. About 30 estimated in service.

Dimensions, weight, and performance should be in the same order as those of the Yak-28P ('Firebar') interceptor (which see).



Mil Mi-8 (NATO 'Hip-D, G, J, and K')

Versions of this medium-size helicopter adapted for various electronic duties have been allocated the following NATO reporting names:

Hip-D. For airborne communications role. Generally similar to 'Hip-C' transport, but with canisters of rectangular section on outer stores racks, and added antennae.

Hip-G. Airborne communications version. Rearward inclined antennae projecting from rear of cabin and from undersurface of tailboom, aft of box for Doppler radar.

Hip-J. Additional small boxes on sides of fuselage, fore and aft of main landing gear legs, identify this ECM version.

Hip-K. Communications jamming ECM version with large antenna array on each side of cabin. No Doppler radar box under tailboom.

Sukhoi Su-17 (NATO 'Fitter-H and K')

About 200 of the Su-17 ('Fitter-H/K') fighters serving with Soviet tactical air force units are thought to be equipped for reconnaissance duties.

Tupolev Tu-126 (NATO 'Moss')

The Tu-126 is the Voyska PVO's counterpart to USAF's Boeing E-3 AWACS (Airborne Warning and Control System). About nine are operational, with airframe and power plant based on those of the now-retired Tu-114 turboprop airliner rather than the smaller-fuselage Tu-95 bomber. The 36 ft diameter rotating radar 'saucer' above

Tupolev Tu-126 (NATO 'Moss')



Yakovlev Yak-28 (NATO 'Brewer')



Antonov An-26 of Czechoslovak Air Force

Antonov An-12BP (NATO 'Cub')

More than 220 of the total of almost 600 medium- and long-range transports operated by the Soviet Military Transport Aviation force (VTA) are still An-12BPs. They are outnumbered by Il-76s, which have been replacing them at the rate of 30 a year since the 1970s, but the totals quoted are misleading. VTA also has about 55 large An-22s. The impressive An-124 will enter service this year, and the assets of VTA can be boosted at any time by drawing on the 200 An-12s and Il-76s belonging nominally to the national airline Aeroflot, as well as the 1,250 smaller military transports assigned to air commands and 1,200 medium- and long-range passenger airliners in the Aeroflot fleet.

The An-12BP has served as a standard Soviet paratroop and freight transport since 1959. Its usefulness is limited slightly by lack of an integral rear loading ramp/door. Instead, the bottom of the rear fuselage is made up of two longitudinal doors that hinge upward inside the cabin to permit direct loading from trucks on the ground or airdropping of supplies and equipment. A full load of 60 paratroops can be dispatched via this exit in under one minute.

An-12s serve with nine other air forces and are in production in China under the designation Y-8 for both transport and maritime patrol duties. The Soviet 'Cub-A, B, C, and D' elint and ECM versions are described separately.

Power Plant: four Ivchenko AI-20K turboprop engines; each 4,000 ehp. Normal fuel capacity 3,672 gallons; max capacity 4,781 gallons.

Dimensions: span 124 ft 8 in, length 108 ft 7 1/4 in, height 34 ft 6 1/2 in, wing area 1,310 sq ft.

Weights: empty 61,730 lb, gross 134,480 lb.

Performance: max speed 482 mph, service ceiling 33,500 ft, range 2,236 miles with max payload.

Accommodation: crew of six; 44,090 lb of freight, 90 troops or 60 parachute troops. Built-in freight handling gantry with capacity of 5,070 lb.

Armament: two 23 mm NR-23 guns in manned tail turret.

Antonov An-22 (NATO 'Cock')

Pending delivery of the new An-124 'Condor', the An-22 remains the only Soviet transport aircraft capable of lifting the Soviet Army's battle tanks and theater missile systems. The prototype flew for the first time on February 27, 1965. Production was terminated sooner than expected, in 1974, and only 55 An-22s are now available to VTA. Each has a max payload of 176,350 lb.

Power Plant: four Kuznetsov NK-12MA turboprop engines; each 15,000 shp.

Dimensions: span 211 ft 4 in, length 190 ft 0 in, height 41 ft 1 1/2 in, wing area 3,713 sq ft.

Weights: empty 251,325 lb, gross 551,160 lb.

Performance: max speed 460 mph, range 6,800 miles with 99,200 lb payload.

Accommodation: crew of five or six, 28-29 passengers in cabin forward of main freight hold. Four traveling gantries and two winches to speed freight handling.

Armament: none.

Antonov An-26 (NATO 'Curl')

The An-26 twin-turboprop freighter was the first aircraft to embody Oleg Antonov's unique rear-loading ramp. This forms the underside of the rear fuselage when retracted, in the usual way, but can be slid forward under the rear of the cabin to facilitate direct loading on to the floor of the hold, or when the cargo is to be airdropped. An OPB-1R sight is available to ensure pinpoint delivery into the dropzone. Max payload is 12,125 lb; conversion of the standard freighter to carry troops or litters takes 20 to 30 minutes in the field. In addition to military models assigned to air commands in regiments and squadrons, more than 200 Aeroflot An-26s are available to the Soviet Military Transport force; others are flown by about 27 foreign air forces. Some operated by Angola and Mozambique have a rack on each side of the fuselage below the wing for bombing missions.

Power Plant: two Ivchenko AI-24VT turboprop engines; each 2,820 ehp. One 1,765 lb st RU 19A-300 auxiliary turbojet in starboard nacelle for turboprop starting and to provide additional power for takeoff, climb, and cruising flight, as required.

Dimensions: span 95 ft 9 1/2 in, length 78 ft 1 in, height 28 ft 1 1/2 in.

Weights: empty 33,113 lb, gross 52,911 lb.

Performance: cruising speed 273 mph at 19,675 ft, service ceiling 24,600 ft, range 683 miles with max payload.

Accommodation: crew of five, plus station for load supervisor or dispatcher. Electrically-powered mobile hoist, capacity 4,409 lb, and conveyor to facilitate loading and airdropping. Provision for carrying 40 paratroops or 24 litters. Improved An-26B version has rollgangs and mechanical handling system, enabling

two men to load and unload three 8 ft long standard freight pallets in 30 minutes.

Armament: none on Soviet Air Force An-26s.

Antonov An-32 (NATO 'Cline')

The Indian Air Force has begun reequipping its paratroop training school and five transport squadrons with this specialized 'hot and high' short/medium-range transport, for which there may not be a Soviet Air Force requirement. The basic airframe is similar to that of the An-26, except for having triple-slotted trailing-edge flaps, automatic leading-edge slats, much enlarged ventral fins, and a full-span slotted tailplane. When fitted with two 5,180 ehp Ivchenko AI-20DM turboprops, the An-32 is able to operate from airfields 13,000 to 14,750 ft above sea level in an ambient temperature of ISA + 25°C and can transport 3 metric tons of freight over a 683 mile stage length, with fuel reserves. Maximum payload is 14,770 lb.

Alternatively, the An-32 can be fitted with 4,195 ehp AI-20M engines for operation in moderate climatic conditions. (Data for version with AI-20DM engines.)

Dimensions: span 95 ft 9½ in, length 77 ft 8¼ in, height 28 ft 8½ in.

Weight: gross 59,525 lb.

Performance: normal cruising speed 329 mph, service ceiling 29,525 ft, range with max payload 497 miles, with max fuel 1,367 miles.

Accommodation: crew of five; freight, or 39 troops, 30 paratroops, or 24 litters and a medical attendant.

Armament: none.

Antonov An-72 (NATO 'Coaler')

The An-72 was conceived as a STOL replacement for the An-26 that would be able to operate from unprepared airfields or from surfaces covered with ice or snow. The high location of the engines was adopted primarily to avoid foreign object ingestion. Their efflux is ejected over the wing upper surface and then down over large multislot flaps to provide a considerable increase in lift for short-field operation, using the so-called 'Coanda effect'. The first prototype flew on December 22, 1977; the second was shown at the 1979 Paris Air Show, by which time just over 1,000 flying hours had been logged by the two aircraft in about 300 flights. Handling in the air was described as outstanding; standard features include a completely automatic Doppler-based navigation system and a special 'slide-forward' loading ramp of the kind fitted to the An-26.

An An-72 set 17 height, time to height, and payload to height records in November/December 1983. Its current production status is not known, although the An-74 (which see) appears to be a production development.

Power Plant: two Lotarev D-36 high bypass ratio turbofan engines; each 14,330 lb st.

Dimensions: span 84 ft 9 in, length 87 ft 2¼ in, height 27 ft 0¼ in.

Weights: max payload 22,045 lb, gross weight 72,750 lb.

Performance: max cruising speed 447 mph, service ceiling 36,100 ft, range 2,360 miles with max fuel, or 620 miles with max payload.

Accommodation: crew of two or three on flight deck. Folding seats for 32 passengers along walls of freight hold. Provision for carrying 24 casualties and attendant in ambulance role.

Armament: none.

Antonov An-74

In February 1984, the Soviet newspaper *Pravda* referred to a new transport aircraft, designated An-74, which had been built for operation in the Arctic and Antarctic regions. Unlike the Il-18D turboprop transports used currently to carry men and equipment between Leningrad and the Antarctic base of Molodejnaya, the An-74 has a wheel-ski landing gear for operation on snow and ice landing strips. It appears to be a development of the An-72 (which may also be designated An-74 in standard production forms), as *Pravda* described it as a STOL transport powered by two Lotarev D-36 engines of 14,330 lb st, with a max T-O weight of about 66,140 lb and max payload of 16,535 lb.

The An-74 is an all-weather aircraft, equipped with the latest available radio navigation aids, and with de-icing equipment on the wings, tail unit, and engine air intakes. In the Polar regions, its duties will include assistance in setting up scientific stations on Arctic ice floes, airdropping supplies to motorized trans-Antarctic expeditions, and reconnaissance to observe changes in the icefields.

Antonov An-124 (NATO 'Condor')

An An-124, named *Ruslan* after the giant hero of Russian folklore immortalized by Pushkin, was the undoubted star of the 1985 Paris Air Show. Never before exhibited in public, it was confirmed as the largest aircraft currently flying, in terms of wingspan, with the heaviest max takeoff weight of any aeroplane yet built. For once, NATO was seen to have chosen well the reporting name 'Condor', after the world's largest flying bird. The example shown in Paris was one of three An-124s



Antonov An-72 (NATO 'Coaler')



Antonov An-32 in production form, with extended overwing nacelles



Antonov An-124 (NATO 'Condor')

fown by mid-1985. First flight of the original prototype had been made on December 26, 1982; production was said to be well advanced, with initial operational capability scheduled for the summer of this year. Except for having a low-mounted tailplane, the An-124's general configuration is similar to that of its US counterpart, the Lockheed C-5 Galaxy. It has an upward hinged visor-type nose and rear fuselage ramp-door for simultaneous front and rear loading/unloading. Advanced features include a 100 percent fly-by-wire control system, titanium floor throughout the main hold, and 12,125 lb of composites, making up 16,150 sq ft of its surface area and giving a weight saving of 3,968 lb. The 24-wheel landing gear enables the An-124 to operate from unprepared fields, hard packed snow, and ice-covered swampland. Payloads will range from the largest Soviet battle tanks to complete SS-20 nuclear missile systems, Siberian oil well equipment, and earth movers.

Of particular significance is that the Soviet Union has available at last turboprop engines comparable with those fitted in the latest Western transport aircraft. They enabled an An-124 to set 21 official records by lifting a payload of 377,473 lb to a height of 35,269 ft on July 26, 1985, exceeding by 53 percent the previous record set by a C-5A.

Power Plant: four Lotarev D-18T turboprops; each 51,650 lb st.

Dimensions: span 240 ft 5¾ in, length 228 ft 0¼ in, height 72 ft 2¼ in.

Weights: nominal max payload 330,693 lb, gross 892,872 lb.

Performance: max cruising speed 537 mph, range 2,795 miles with max payload, 10,250 miles with max fuel.

Accommodation: crew of six, plus reserve crew; up to 88 passengers on upper deck; freight on lower deck, positioned by two electric traveling cranes with total lifting capability of 44,100 lb.

Armament: none on aircraft shown in Paris.

Ilyushin Il-76 (NATO 'Candid-B')

This Soviet counterpart to USAF's C-141 StarLifter now equips 50 percent of the Soviet VTA transport force and will continue replacing An-12BPs at the rate of about 30 a year. Its designers were given the task of producing an aircraft that would haul 40 metric tons of freight over a distance of 3,100 miles (5,000 km) in under six hours in the harsh operating conditions of Siberia. The prototype flew for the first time on March 25, 1971. By July 1975, Il-76s were able to set 25 official records, including a payload of more than 70 metric tons lifted to a height of 38,960 ft and a speed of 532.923 mph around a 1,000 km circuit with the same load.

Design features include rear-loading ramp/doors, a T-tail, full-span leading-edge slats and triple-slotted flaps for good field performance, a navigator's station in the glazed nose, with ground-mapping radar in a large undernose fairing, and a unique and complex 20-wheel

landing gear. The entire accommodation is pressurized, making it possible to carry 140 troops or 125 paratroops as an alternative to freight. Advanced mechanical handling systems are fitted for containerized and other freight. Equipment for all-weather operation includes a computer for automatic flight control and automatic landing approach.

The unarmed Il-76/76T/76TD versions are known to NATO as 'Candid-A'. Deliveries to a development squadron of military Il-76Ms ('Candid-B'), with rear guns and small ECM fairings, began in 1974. Current operators include the air forces of India, Iraq, Czechoslovakia, and Poland, as well as the VTA, which can also draw on the Il-76Ts and Ms of Aeroflot as necessary. A developed version of the Il-76 is entering service with the Soviet Air Forces in an AEW&C role (see entry on 'Mainstay') and will be joined by Il-76 in-flight refueling tankers deployed in support of both strategic and tactical combat forces.

The following data refer to the basic military Il-76M. Also in service is an improved version, designated Il-76MD, with an increased gross weight of 418,875 lb, max payload of 105,820 lb, and additional fuel to extend max range by 745 miles.

Power Plant: four Soloviev D-30KP turboprop engines, each 26,455 lb st. Fuel capacity 21,615 gallons.

Dimensions: span 165 ft 8 in, length 152 ft 10¼ in, height 48 ft 5 in, wing area 3,229.2 sq ft.

Weight: gross 374,785 lb.

Performance: cruising speed 466-497 mph at 29,500-

39,350 ft, nominal range 3,100 miles with payload of 88,185 lb, max range 4,163 miles.

Accommodation: crew of seven, incl two freight handlers; up to 140 passengers.

Armament: two 23 mm NR-23 guns in tail turret.

Trainers

Aero L-29 Delfin (NATO 'Maya')

About 3,600 L-29 two-seat basic and advanced jet trainers were manufactured in Czechoslovakia between 1963 and 1974 for standardized use by the air forces of all Warsaw Pact nations except Poland, which preferred its own TS-11 Iskra, and for export. Replacement with another Czech-designed trainer, the L-39, began in 1974, but L-29s remain in large-scale service in the Soviet Union.

Power Plant: one M701c500 turbojet engine; 1,960 lb st.

Dimensions: span 33 ft 9 in, length 35 ft 5 1/2 in, height 10 ft 3 in.

Weights: empty 5,027 lb, gross 7,804 lb.

Performance: max speed 407 mph at 16,400 ft, service ceiling 36,100 ft, range 555 miles with external tanks.

Accommodation: crew of two, in tandem.

Armament: provision for two bombs of up to 220 lb, eight air-to-ground rockets, or two 7.62 mm machine-gun pods under wings.

Aero L-39 Albatros

The first prototype of the L-39 flew on November 4, 1968, and series production began in 1972 to supplement and eventually replace the L-29 as the standard trainer of the Soviet and other air forces. Well over 1,500 have been delivered, and production will continue through the 1980s at a rate of 200 a year. There are five versions:

L-39C. Basic and advanced flying trainer; operators include the air forces of Afghanistan, Czechoslovakia, the German Democratic Republic, and the USSR. Production continues.

L-39V. As basic L-39C, but with added winch for target towing for anti-aircraft artillery training.

L-39Z0. Weapon training version, with four underwing weapon stations. Strengthened wings. Exported to Iraq, Libya, and Syria. Production continues.

L-39ZA. Ground attack and reconnaissance version, with underfuselage gun and underwing weapon stations. Strengthened wings and landing gear. Operational with air forces of Czechoslovakia and Romania. Production continues.

L-39MS. New version with improved airframe and upgraded avionics and equipment, including electronic displays. Prototype flying in 1985, initially with standard engine. New power plant (approx 5,300 lb st), available in 1987, will enhance performance, notably rate of climb.

Power Plant (current production versions): one Ivchenko AI-25-TL turbofan engine; 3,792 lb st. Internal fuel capacity 332 gallons. Provision for two 92.5 gallon underwing drop tanks.

Dimensions: span 31 ft 0 1/2 in, length 39 ft 9 1/2 in, height 15 ft 7 3/4 in, wing area 202.36 sq ft.

Weights (L-39ZA): empty 8,060 lb, gross (clean) 10,029 lb, max 12,346 lb.

Performance (L-39ZA): max speed 469 mph at 16,400 ft, service ceiling 36,100 ft, range 621 miles on internal fuel.

Accommodation: crew of two, in tandem.

Armament (L-39ZA): underwing bombs, rockets, air-to-air missiles, or reconnaissance packs, on four hard-points, and a 23 mm GSh-23 twin-barrel cannon in an underfuselage pod.

MiG-15UTI (NATO 'Midget')

After completing their basic and initial advanced training on the L-29 or L-39, pupil pilots of the Soviet Air Force graduate to this tandem two-seat version of the MiG-15 jet fighter. The airframe differs from that of the original single-seater mainly in having a rear cockpit for an instructor in place of some fuselage fuel tankage. Armament is reduced to a single gun on most of the trainers, which continue in service with more than thirty air forces. Next stage of training after the MiG-15UTI is normally on one of the two-seat adaptations of current operational aircraft listed after this entry.

Power Plant: one RD-45F turbojet engine; 5,000 lb st.

Dimensions: span 33 ft 0 7/8 in, length 33 ft 1 1/2 in, height 12 ft 1 5/8 in.

Weights: empty 7,716 lb, gross (clean) 10,692 lb.

Performance: max speed 631 mph at sea level, range 590 miles (clean) or 833 miles (with two underwing tanks) at 32,800 ft.

Accommodation: crew of two, in tandem.

Armament: normally one 23 mm NR-23 gun or one 12.7 mm UBK-E machine-gun under port side of nose.

MiG-21U (NATO 'Mongol')

Nearly twenty of the air forces equipped with MiG-21



Aero L-39ZA of Czechoslovak Air Force



MiG-23U (NATO 'Flogger-C') (Camera Press)



Yakovlev Yak-38 trainer (NATO 'Forger-B')

single-seat fighters also fly this two-seat training version of the same type. The basic **MiG-21U** (NATO 'Mongol-A') is generally similar to the MiG-21F, but has two cockpits in tandem under a sideways-hinged double canopy, larger mainwheels and tires, a one-piece forward air-brake, and repositioned pitot boom, above the air intake. It carries no guns. Later production models ('Mongol-B') have a wide-chord fin and deeper dorsal spine fairing. A third variant is the **MiG-21US**, which adds SPS flap-blowing and a retractable periscope for the instructor. The **MiG-21UM** is a trainer counterpart of the MiG-21MF, with R-13 turbojet and four underwing stores pylons.

MiG-23U (NATO 'Flogger-C')
(See page 85.)

MiG-25U (NATO 'Foxbat-C')
(See page 86.)

Sukhoi Su-7U (NATO 'Moujik')

The Soviet and several other air forces use this tandem two-seat adaptation of the Su-7B as an operational trainer for their ground attack pilots. Changes are minimal. The forward fuselage fuel tank is deleted and the fuselage lengthened slightly, to make room for the second ejection seat, the occupant of which has a periscope sight for improved forward view. The aft cockpit is fitted with a slightly-raised canopy, from which a prominent dorsal spine extends back to the base of the tail-fin. Versions in service are the **Su-7UM** and **Su-7UMK**, corresponding to the single-seat 'M' and 'MK' respectively.

Sukhoi Su-15 trainer (NATO 'Flagon-C')
(See page 87.)

Sukhoi Su-17 trainer (NATO 'Fitter-E and G')
(See page 88.)

Tupolev Tu-22U (NATO 'Blinder-D')
(See page 84.)

Yakovlev Yak-18 (NATO 'Max')

The prototype of this primary trainer first flew in 1946. About 8,000 were built subsequently, for use mainly at the civilian or paramilitary schools at which pilots of the Warsaw Pact air forces receive their primary training, including the Soviet DOSAAF centers. The original tandem two-seat Yak-18 had a 160 hp M-11 radial engine and tailwheel landing gear. The **Yak-18U** introduced a nosewheel and longer fuselage. **Yak-18A** switched to a 300 hp AI-14RF engine and was generally cleaned up.

The **YAK-18P** and **PM** were refined single-seat aerobatic variants of the -18A, and the **Yak-18PS** a tailwheel counterpart of the PM. Replacement with Yak-52s is well advanced. (Data for Yak-18A follow.)

Power Plant: one Ivchenko AI-14RF piston engine; 300 hp.

Dimensions: span 34 ft 9 1/4 in, length 27 ft 4 3/4 in, height 11 ft 0 in, wing area 191.6 sq ft.

Weights: empty 2,259 lb, gross 2,910 lb.

Performance: max speed 186 mph, service ceiling 16,600 ft, max range 435 miles.

Armament: none.

Yakovlev Yak-28U (NATO 'Maestro')

Although the operational Yak-28P ('Firebar') is a tandem two-seater, it was not possible to adapt the existing rear cockpit in order to produce a dual-control training version. Instead, the Yakovlev Bureau had to design a completely new front fuselage for the Yak-28U. This has two individual single-seat cockpits in tandem, each with its own blister canopy. The front canopy is sideways hinged, to starboard. The higher rear canopy is rearward-sliding. A very large conical probe projects forward of the nosecone.

Yakovlev Yak-38 trainer (NATO 'Forger-B')

(See page 87.)

Yakovlev Yak-50

The Yak-50 single-seat aerobatic trainer flew for the first time in 1975 and virtually swept the board in both the men's and women's events at the 1976 World Aerobatic Championships. Its configuration is almost identical to that of the earlier Yak-18PS, but it has a more powerful engine, a reduced span with no wing center-section, and a semi-monocoque rear fuselage instead of the Yak-18's fabric-covered steel tube structure.

Power Plant: one Vedeneyev M-14P piston engine; 360 hp. Fuel capacity 14.5 gallons.

Dimensions: span 31 ft 2 in, length 25 ft 2 1/4 in.

Weights: empty 1,686 lb, gross 1,984 lb.

Performance: max speed 199 mph, service ceiling 18,045 ft, max range 307 miles.

Armament: none.

Yakovlev Yak-52

Announced in 1978, the Yak-52 is a tandem two-seat variant of the Yak-50, with generally similar overall dimensions but with a tricycle landing gear that leaves all three wheels fully exposed when retracted to reduce damage in a wheels-up landing. Large-scale production has been centered at the Intreprinderea de Avioane Bacau works, in Romania, to provide replacements for the old Yak-18s of DOSAAF and other training organizations. The 500th Yak-52 was delivered in 1983, and production continues.

Power Plant: one Vedeneyev M-14P piston engine; 360 hp. Fuel capacity 32 gallons.

Dimensions: span 30 ft 6 1/4 in, length 25 ft 5 in, height 8 ft 10 1/4 in, wing area 161.5 sq ft.

Weights: empty 2,205 lb, gross 2,844 lb.

Performance: max speed at 1,650 ft 186 mph, econ cruising speed 118 mph, service ceiling 19,685 ft, max range 341 miles.

Armament: none.

Yakovlev Yak-53

This fully-aerobatic single-seater is identical dimensionally to the Yak-50, and has the same power plant, but utilizes the semiretractable tricycle landing gear of the Yak-52. After a period of initial manufacture in the Progress Factory at Arsenyev in the USSR, production is expected to be transferred to Bacau, alongside the Yak-52. The Yak-53 is intended as a 'long life' trainer, whereas the Yak-50 is a maximum performance high-g aircraft supplied exclusively to State Cooperatives.

Weights: empty 1,985 lb, gross 2,337 lb.

Performance: max speed 186 mph, cruising speed 143 mph, max endurance 50 min.

Helicopters

Kamov Ka-25 (NATO 'Hormone')

It has been emphasized for years in these Soviet Galleries that the apparent lack of sophistication of the Ka-25 should not be allowed to camouflage the ingenuity of its designers. By adopting a compact twin-turbine/coaxial-rotor configuration for this helicopter, the Kamov Bureau was able to package extensive equipment permutations into aircraft small enough to operate from platforms on a wide variety of naval and merchant ships. About 460 Ka-25s were built in 1966-75, primarily to replace Mil Mi-4s in the Soviet Navy's ship- and shore-based force of around 250 ASW helicopters. Replacement with the similarly compact but vastly more effective

Ka-27 is under way, with perhaps 125 Ka-25s remaining in Soviet Navy service and others operational in India, Syria, Vietnam, and Yugoslavia. Meanwhile, the same basic configuration has made possible Kamov's pioneering combat helicopter, known to NATO as 'Hokum'.

Versions of the Ka-25 that can be identified by NATO reporting names are as follows:

Hormone-A. Basic ship-based ASW version, with large flat-bottomed housing for undernose search radar, and racks for small stores, including canisters of sonobuoys, on the starboard side of the fuselage. Other equipment varies from one aircraft to another. Some have an underfuselage weapon bay, which can be extended downward as a container for wire-guided torpedoes. Most have an electro-optical sensor in the tailboom, under a 'flower pot' housing with a transparent top, and over a corresponding window in the undersurface of the boom. Each of the four wheels of the landing gear can be enclosed in an inflatable pontoon, surmounted by inflation bottles. The rear legs are pivoted, so that the wheels can be moved into a position where they offer least interference to signals from the nose radar. Dipping sonar is housed in a compartment at the rear of the cabin, but the Ka-25 is unable to operate with this at night or in adverse weather. Ka-25s have been observed on cruisers of the *Kara* and *Kresta* classes, the nuclear-powered guided missile cruiser *Kirov*, the carrier/cruisers of the *Kiev* class, each of which can carry about 19 'Hormone-A's and B's', and the helicopter cruisers *Moskva* and *Leningrad*, each of which accommodates about 18 aircraft.

Hormone-B. Special electronics variant able to provide over-the-horizon target acquisition and midcourse guidance for SS-N-3, SS-N-12, and SS-N-19 cruise missiles launched from the ship on which it is deployed. Larger undernose radome with more spherical undersurface. Cylindrical radome under rear of cabin. Data link equipment.

Hormone-C. Utility and search and rescue model, generally similar to 'Hormone-A' but with inessential operational equipment and weapons removed. This version sometimes has a yagi aerial mounted on the nose; it has been photographed in nonoperational red and white paint finish. (Data for 'Hormone-A' follow.)

Power Plant: two Glushenkov GTD-3F turboshaft engines; each 900 shp (later aircraft have 990 shp GTD-3BMs).

Dimensions: rotor diameter (each) 51 ft 8 in, length of fuselage 32 ft 0 in, height 17 ft 7 1/2 in.

Weights: empty 10,500 lb, gross 16,500 lb.

Performance: max speed 136 mph, service ceiling 11,500 ft, range 250-405 miles.

Accommodation: crew of two on flight deck; other crew in main cabin, which is large enough to contain 12 folding seats for passengers in transport role.

Armament: ASW torpedoes, nuclear depth charges, and other stores in underfuselage weapon bay, when installed. Some aircraft reportedly armed with small 'fire and forget' air-to-surface missiles.

Kamov Ka-27 (NATO 'Helix')

The first edition of DoD's *Soviet Military Power* document, published in September 1981, contained a brief reference to "Hormone variant" helicopters that could be carried in a telescoping hangar on the *Sovremennyi* class of Soviet guided missile destroyers for secondary ASW missions. Photographs were released after two of them had been observed on the stern platform of the *Udaloy*, first of a new class of Soviet ASW guided missile destroyers, during the *Zapad-81* (West-81) series of exercises in the Baltic. Soon afterwards, NATO gave the new helicopters the reporting name 'Helix', and DoD began referring to them by the designation Ka-27. At least 16 were observed on board the *Kiev* class carrier/cruiser *Novorossiysk* during its maiden deployment in 1983, leaving little doubt that the Soviet Navy was eager to replace its Ka-25s with Ka-27s as quickly as possible. By that time, it was apparent that the Ka-27 and the new Kamov civilian helicopter known as the Ka-32 shared the same airframe. When, therefore, an example of the Ka-32 was exhibited at the 1985 Paris Air Show, it became possible to appreciate the high quality of contemporary Kamov engineering.

According to its designer, the Ka-27 was conceived as a completely autonomous "compact truck", able to stow in much the same space as the Ka-25 with its rotors folded, despite its much greater power and capability, and able to operate independently of ground support equipment. Titanium and composite materials are used extensively throughout the airframe, with special emphasis on resistance to corrosion at sea. The twin turboshaft engines are similar to those used in the Mi-24 'Hind' gunship, enabling flight to be maintained on one engine at max takeoff weight. Ease of handling, with a single pilot, is ensured by such features as a 'mix' in the collective control system that maintains constant total rotor thrust during turns to reduce the pilot's work load when landing on a pitching deck and to simplify transition into hover and landing. The autopilot is capable of providing automatic approach and hover on a preselected course, using Doppler.

Three versions of the military Ka-27 may be identified:

Helix-A. Basic ASW version, with probable crew of three. Equipment includes undernose radar, a ventral weapons bay for torpedoes and other stores, sonobuoys, IFF, two radar warning antennae above the tailplane, two ESM radomes above the rear fuselage and tail. About 50 operational. Eighteen ordered for Indian Navy.

Helix-B. Missile target acquisition and midcourse guidance version to replace 'Hormone-B'. Different undernose radome.

Helix-C. Search and rescue and plane guard version. External fuel tank on each side of cabin and winch beside cabin door. Variants of this could provide an answer to the Soviet Navy's long-time need for an infantry assault and vertical replenishment shipboard helicopter.

Power Plant: two Isotov TV3-117V turboshaft engines; each 2,225 shp.

Dimensions: rotor diameter 52 ft 2 in, length of fuselage 37 ft 1 in, height 17 ft 8 1/2 in.

Weights: max payload 8,818 lb internal, 11,023 lb slung; normal gross 24,250 lb, with slung load 27,775 lb.

Performance: max speed 155 mph, service ceiling 19,685 ft, range 497 miles.

Accommodation: flight crew of two, with seat for third person; folding seats for 16 passengers as alternative to mission equipment, litters, or freight.

Armament: not yet determined.



Kamov Ka-25 (NATO 'Hormone-A') (US Navy)



Kamov Ka-27 (NATO 'Helix-A') (Royal Navy)



Kamov Ka-? (NATO 'Hokum') (Herkenning, Netherlands)

Kamov Ka-? (NATO 'Hokum')

An accompanying illustration is believed to be representative of Kamov's 'Hokum', first of the long awaited new generation of combat helicopters suitable for air-to-air as well as air-to-ground missions. All that is known with reasonable confidence is that 'Hokum' has coaxial contra-rotating rotors, a take-off weight in the 12,000 lb class, and probable two-man crew, side by side. Survivability is enhanced by the use of infrared suppressors, infrared decoy dispensers, and armor. 'Hokum' has no

current Western counterpart, and DoD has commented that it "will give the Soviets a significant rotary-wing air superiority capability". Flight testing has already been under way for two years.

Dimensions: rotor diameter 59 ft 8 in, length 52 ft 6 in, height 17 ft 8 in.

Performance: max speed 217 mph, combat radius 155 miles.

Mil (WSK-PZL Swidnik) Mi-2 (NATO 'Hoplite')

Manufacture of this smallest helicopter in the current Mil range was transferred to the WSK-PZL at Swidnik in Poland in 1964. More than 4,500 have been delivered for military and commercial service, with the air forces of Cuba, Czechoslovakia, Poland, Romania, and the Soviet Union among known operators. The USSR has received well over 2,000, and production is continuing.

Power Plant: two Polish-built Isotov GTD-350 turboshaft engines; each 400 shp.

Dimensions: rotor diameter 47 ft 6 3/4 in, length of fuselage 37 ft 4 3/4 in, height 12 ft 3 1/2 in.

Weights: basic operating 5,213 lb, gross 8,157 lb.

Performance: max speed 130 mph at 1,640 ft, service ceiling 13,125 ft, range 360 miles with max fuel, 105 miles with max payload.

Accommodation: pilot on flight deck; eight passengers, 1,543 lb of freight, or four litters and medical attendant in cabin.

Armament: provision for air-to-surface rocket pod, or two 'Sagger' missiles, on each side of cabin.

Mil Mi-6 (NATO 'Hook')

When announced in the autumn of 1957, the Mi-6 was the world's largest helicopter. It was also the first Soviet production helicopter fitted with small fixed wings to offload the main rotor in cruising flight. These wings are normally removed when the aircraft operates in a flying crane role, carrying external freight. More than 860 production Mi-6s are believed to have been delivered for commercial and military service, the latter currently with the air forces of Algeria, Iraq, Peru, the Soviet Union, Syria, and Vietnam. Task of these helicopters is to haul guns, armor, vehicles, supplies, freight, or 70 fully equipped troops in combat areas.

Power Plant: two Soloviev D-25V turboshaft engines; each 5,500 shp.

Dimensions: rotor diameter 114 ft 10 in, length of fuselage 108 ft 10 1/2 in, height 32 ft 4 in.

Weights: empty 60,055 lb, gross 93,700 lb.

Performance: max speed 186 mph, service ceiling 14,750 ft, range 385 miles with 17,637 lb payload.

Accommodation: crew of five; up to 90 passengers, 26,450 lb of freight, or 41 litters and two medical attendants.

Armament: some aircraft have a 12.7 mm gun in the nose.

Mil Mi-8 (NATO 'Hip')

Production of the Mi-8, for military and commercial use, totaled 8,100 before this helicopter was superseded by the uprated Mi-17 (see separate entry). An estimated total of 1,615 support Soviet armies in the field. Teamed with Mi-24 gunships, these aircraft make up the most

formidable helicopter attack force in the world. At Soviet army level alone, according to DoD estimates, there are now some 20 helicopter attack regiments, each with up to 60 Mi-8s and Mi-24s. At division level, helicopter detachments are expanding to squadrons. Primary combat task of the Mi-8, for which the crews are well trained, is to put down assault troops, equipment, and supplies behind enemy lines within 15-20 minutes of a nuclear or conventional bombardment/strike. Versions serving with about 40 air forces are as follows:

Hip-C. Basic assault transport. Twin-rack for stores on each side of cabin, able to carry 128 x 57 mm rockets in four packs, or other weapons.

Hip-D. For electronic warfare duties; see page 90.

Hip-E. Standard equipment of Soviet army support forces. One flexibly-mounted 12.7 mm machine-gun in nose. Triple stores rack on each side of cabin, able to carry up to 192 rockets in six suspended packs, plus 4 'Swatter' homing antitank missiles on rails above racks.

Hip-F. Export counterpart of 'Hip-E'. Missile armament changed to six 'Saggers'.

Hip-G. For airborne communications duties; see page 90.

Hip-H. See entry on Mi-17.

Hip-J and K. ECM versions; see page 90.

Power Plant: two Isotov TV2-117A turboshaft engines; each 1,700 shp. Standard fuel capacity 494 gallons, max ferry capacity 977 gallons.

Dimensions: rotor diameter 69 ft 10 1/4 in, length of fuselage 59 ft 7 1/4 in, height 18 ft 6 1/2 in.

Weights: empty 16,007 lb, gross 26,455 lb.

Performance: max speed 161 mph at 3,280 ft, service ceiling 14,760 ft, range 311 miles as passenger transport.

Accommodation: crew of two or three; up to 32 passengers, 8,820 lb of freight, or 12 litters and attendant.

Armament: see individual model descriptions.

Mil Mi-14 (V-14) (NATO 'Haze')

Comparison of photographs of this aircraft and the Mi-8 transport helicopter shows that the Mi-14 has short-



Mil Mi-14 (NATO 'Haze-A') (US Navy)



Mil Mi-24 (NATO 'Hind-D') of Czechoslovak Air Force



Mil Mi-24 (NATO 'Hind-E') with twin-barrel cannon instead of nose turret (Camera Press)

er engine nacelles, with the intakes positioned above the mid-point of the sliding cabin door. Such nacelles, found also on the Mi-24 'Hind' and Mi-17, house TV3-117 turboshaft engines in place of the lower-rated TV2s of the Mi-8. Overall dimensions and dynamic components of the Mi-14 are generally similar to those of the Mi-8, from which it was derived, except that the tail rotor is on the port side of the vertical stabilizer. New features to suit it for its role as a shore-based antisubmarine aircraft include a boat hull of the kind used on the Sikorsky Sea King and a sponson on each side at the rear to confer a degree of amphibious capability. The landing gear is fully retractable. Operational equipment can be seen to include a large undernose radome, a retractable sonar unit housed in the starboard rear of the planing bottom, forward of what appear to be two sonobuoy or signal flare chutes, a towed magnetic anomaly detection (MAD) 'bird' stowed against the rear of the fuselage pod, and a Doppler radar box under the tailboom. Weapons include torpedoes and depth charges carried in a weapons-bay in the bottom of the hull.

The Mi-14 flew for the first time in 1973. About 100 are currently in service with the Soviet Naval Air Force for antisubmarine duties, as Mi-4 replacements, and are designated **Haze-A** by NATO. Ten others (NATO **Haze-B**) are in service for mine countermeasures duty, with a fuselage strake and pod on the starboard side of the cabin, and no MAD. Three Mi-14s have been exported to Bulgaria, four to Cuba, twelve to Libya, at least four to Poland, six to Romania, and eight to East Germany. Production continues.

Power Plant: two Isotov TV3-117 turboshaft engines; each 2,200 shp.

Dimensions: rotor diameter 69 ft 10 1/4 in, length overall incl rotors 83 ft 0 in, height 22 ft 7 3/4 in.

Weights: gross 30,865 lb.

Performance: max speed 143 mph, range 497 miles.

Accommodation: crew of four or five in 'Haze-A'.

Mil Mi-17 (NATO 'Hip-H')

Revealed at the 1981 Paris Air Show, the Mi-17 combines the airframe of the Mi-8 with the uprated power plant, short nacelles, and port-side tail rotor of the Mi-14. The engine air intakes can be fitted with deflectors to prevent the ingestion of sand, dust, or foreign particles at unprepared landing sites. If an engine fails, the output of the other is increased automatically to 2,200 shp for sustained single-engine flight. Export deliveries include 16 to Cuba and others to India and Peru.

Power Plant: two Isotov TV3-117MT turboshaft engines; each 1,900 shp.

Dimensions: rotor diameter 69 ft 10 1/4 in, length of fuselage 60 ft 5 1/4 in, height 15 ft 7 1/4 in.

Weights: empty 15,653 lb, gross 28,660 lb.

Performance: max speed 155 mph, service ceiling 11,800 ft, max range 590 miles with auxiliary fuel.

Mil Mi-24 (NATO 'Hind')

The Mi-24 was designed originally to deliver a squad of eight assault troops into a battlefield. Its weapons were intended then to clear a path past any tanks, anti-aircraft guns, or other obstructions to its progress, but it was not long before training exercises caused a major change in tactics. Today, the Mi-24 is regarded as not only an anti-tank weapon, but capable itself of functioning as a high-speed, nap-of-the-earth 'tank', and of destroying enemy helicopters in air-to-air combat. Other duties include escort of troop-carrying Mi-8s and ground attack. To reduce vulnerability to ground fire, steel and titanium have been substituted for aluminum in critical components, and glassfiber-skinned rotor blades have replaced the original metal blade-pocket design. Variants identified to date are as follows:

Hind-A. Armed assault transport, with large enclosed flight deck for crew of four, and places for up to eight fully-equipped troops in main cabin. Dynamic compo-

nents and TV2-117 engines of Mi-8 fitted initially. Fully retractable landing gear. Auxiliary wings of this version have considerable anhedral. One 12.7 mm machine-gun in nose, slaved to undernose sighting system; four hard-points under stubwings for 32-round packs of 57 mm rockets, up to 3,300 lb of chemical or conventional bombs, or other stores; four AT-2 (NATO 'Swatter') homing antitank missiles on wingtip launchers. Antitorque rotor, originally on starboard side of offset tail pylon, repositioned to port side when TV2 engines were replaced by TV3s on later and converted aircraft. Initial series production Mi-24s were of this model.

Hind-B. Similar to 'Hind-A' except that auxiliary wings have neither anhedral nor dihedral and carry only the two inboard weapon stations on each side. This version predated 'Hind-A' and was not built in quantity.

Hind-C. Generally similar to late-model 'Hind-A', but without nose gun and undernose blister fairing, and no missile rails at wingtips.

Hind-D. Basically similar to late-model 'Hind-A', with TV3-117 engines and tail rotor on port side, but with front fuselage completely redesigned and heavily armored for primary gunship role, although transport capability retained. Tandem stations for weapon operator (in nose) and pilot have individual canopies, with rear seat raised to give pilot an unobstructed forward view. Probe fitted forward of top starboard corner of bullet-proof windscreens at extreme nose may be part of low-air-speed sensing device to indicate optimum conditions for minimum dispersion of 57 mm rockets. Under nose is a four-barrel Gatling-type 12.7 mm machine-gun in a turret with a wide range of movement in azimuth and elevation, providing air-to-air as well as air-to-surface capability. Undernose packs for sensors, including radar and low-light-level TV. Wing armament of 'Hind-A' retained. Many small antennae and blisters, including 'Odd Rods' IFF, infrared suppressors and infrared decoy dispensers optional.

Hind-E. As 'Hind-D', for Soviet armed forces, but with four laser-homing AT-6 (NATO 'Spiral') tube-launched antitank missiles instead of 'Swatters', and enlarged undernose sensor pod on port side. Modified 'Hind-E', first shown in service with Soviet forces in photographs published in 1982, has the nose gun turret replaced by a twin-barrel cannon mounted inside a semicylindrical pack on starboard side of fuselage. Bottom of nose smoothly faired above and forward of sensors.

Under the Soviet designation A-10, the Mi-24 has set a number of major FAI-approved records, including the current world speed record for helicopters of 228.9 mph over a 15/25 km course.

Deliveries of all models of the Mi-24 exceed 1,700, from plants in Arsenyev and Rostov, with production continuing at the rate of more than 15 per month. In addition to the Soviet Armed Forces, operators include the air forces of Afghanistan, Algeria, Angola, Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, India, Iraq, Libya, Nicaragua, Poland, Vietnam, and South Yemen. Some export models, including those for India, are designated **Mi-25**, suggesting different equipment standards.

Power Plant: two Isotov TV3-117 turboshaft engines; each 2,200 shp.

Dimensions: rotor diameter 55 ft 9 in, length 60 ft 8 1/2 in, height 21 ft 4 in.

Weights: empty 18,520 lb, gross 24,250 lb.

Performance: ('Hind-D') with full military load: max speed 199 mph, service ceiling 14,750 ft, range 99 miles.

Accommodation ('Hind-D/E'): crew of two; eight troops or four litters in main cabin.

Armament: see individual model descriptions.

Mil Mi-26 (NATO 'Halo')

Design of the Mi-26 heavy-lift helicopter began in the early 1970s to meet the requirement for an aircraft of greater capability than the Mi-6, for day and night operation in all weathers. Except for the four-engined twin-rotor Mi-12, which did not progress beyond prototype testing, it is the heaviest helicopter yet flown anywhere in the world. Its rotor diameter is smaller than that of the Mi-6, but this is offset by the fact that the Mi-26 is the first helicopter to operate successfully with an eight-blade main rotor. Other features include a payload and cargo hold very similar in size to those of a C-130 Hercules, loading via clamshell doors and ramp at the rear of the cabin pod, and main landing gear legs that are adjustable individually in length to facilitate loading and to permit landing on varying surfaces. The Mi-26 began in-field testing and development with the Soviet Air Force in early 1983 and is now fully operational. First export deliveries, of ten for India, are due this year. Infrared suppressors and decoy dispensers are optional on production aircraft.

In the course of establishing five world helicopter payload-to-height records, in 1982, an Mi-26 lifted a total mass of 125,154 lb to a height of 2,000 m, including a payload of 25,000 kg (55,115 lb).

Power Plant: two Lotarev D-136 turboshaft engines; each 11,400 shp.

Dimensions: rotor diameter 105 ft 0 in, length of fuse-

lage 110 ft 8 in, height to top of main rotor head 26 ft 8¾ in.

Weights: empty 62,170 lb, gross 123,450 lb, max payload, internal or external, 44,090 lb.

Performance: max speed 183 mph, service ceiling 15,100 ft, range 497 miles.

Accommodation: crew of five; about 40 tip-up seats along side walls of hold; max seating for about 90 combat-equipped troops. Other loads include two airborne infantry combat vehicles.

Mil Mi-28 (NATO 'Havoc')

Because of its origins as an assault transport, the Mi-24 'Hind' offers a large target for ground fire. When designing the Mi-28, the Mil Bureau was able to begin with a clean sheet of paper and produce a two-man attack helicopter with heavy armament but altogether slimmer and less vulnerable. The best illustration yet available is a DoD artist's impression, showing an aircraft similar in general configuration to its US counterpart, the AH-64 Apache, with stepped cockpits for the weapons operator and pilot, a heavy caliber gun in an undernose turret, and weapon pylons carried on stub wings. It is expected that these will provide for an air-to-air combat capability in addition to the conventional air-to-surface roles.

Knowledge of Soviet design practice suggests that the Mi-28 will have two Isotov TV3-117 turboshaft engines of the kind fitted to the Mi-24 and Ka-27, but its rotor system is believed to be new. Like all current Soviet first-line helicopters, it will be fitted with infrared suppressors, decoy dispensers, and extensive armor. The 1985 edition of DoD's *Soviet Military Power* anticipated deployment of the Mi-28 "in the near future."

Dimensions: rotor diameter 55 ft 9 in, length 57 ft 1 in.
Performance: max speed 186 mph, combat radius 150 miles.

Strategic Missiles

SS-4 (NATO 'Sandal')

Based on German wartime V-2 technology, this is the medium-range ballistic missile (MRBM) that precipitated the Cuba crisis in 1962. An estimated 120 remain operational, near the western borders of the Soviet Union. Replacement with SS-20s is being maintained at a steady pace. About 12 tractors with special trailers, and 20 men, are needed to transport, erect, and fire the SS-4.

Power Plant: one four-chamber RD-214 liquid-propellant (nitric acid/kerosene) sustainer; 163,142 lb thrust in vacuo.

Guidance: inertial.

Warhead: alternative nuclear (1 megaton) or high-explosive.

Dimensions: length 68 ft 0 in, diameter 5 ft 3 in.

Launching weight: 60,000 lb.

Performance: max speed Mach 6.7, max range 1,200 miles.

SS-11 (NATO 'Sego')

Three versions of this 1966-70 vintage 'light' ICBM remain operational. Although considerably less capable than later generations of Soviet strategic weapons, and housed in less survivable silos, DoD states that "their destructive potential against softer area targets in the US and Eurasia is significant". Following replacement of a proportion of the original force with SS-17s, a total of 420 SS-11 Mod 2/3s and 100 SS-11 Mod 1s is deployed. Differences are as follows:

SS-11 Mod 1. Single reentry vehicle, of slightly higher yield than that of the comparable US Minuteman, but considerably less accurate, with CEP of 1.4 km (0.87 miles).

SS-11 Mod 2. As Mod 1 but with added penetration aids.

SS-11 Mod 3. First operational Soviet missile with MRVs (three 300 kiloton), CEP 1.1 km (0.7 miles).

Power Plant: two-stage storable liquid-propellant.

Guidance: inertial.

Warhead: single nuclear (Mod 1 and 2); three MRVs (Mod 3).

Dimension: length 66 ft 0 in.

Performance: max range Mod 1 6,835 miles, Mod 2 8,075 miles, Mod 3 6,585 miles.

SS-13 (NATO 'Savage')

In the Minuteman category; only 60 SS-13 ICBMs are deployed, in Mod 2 configuration.

Power Plant: three-stage solid-propellant.

Guidance: inertial, offering CEP of 2 km (1¼ miles).

Warhead: nuclear (750 kilotons).

Dimensions: length 66 ft 0 in, max diameter 6 ft 6 in (first-stage skirt).

Performance: range 5,840 miles.



Artist's impression of Mil Mi-28 (NATO 'Havoc') (DoD)

SS-16 (Soviet designation RS-14)

This three-stage solid-propellant ICBM is basically an SS-20 IRBM with an added stage. Testing of the SS-16, which can be silo or vehicle based, took place in 1972-76, but further production, test, or deployment were to be banned under the nonratified SALT II agreement. DoD's official view is that available information does not allow a conclusive judgment on whether or not the Soviets have deployed the SS-16 but that activities at the Plesetsk test center suggest a probable violation of SALT II.

Power Plant: three-stage solid-propellant.

Guidance: inertial.

Warhead: single RV, nuclear.

Dimension: length 59 ft 0 in.

Performance: range 5,600 miles.

SS-17 (Soviet designation RS-16)

Known in the Soviet Union as the RS-16, this 'light' ICBM (which the US designates SS-17) is designed for cold launch. This means that it is "popped" out of its silo by a gas generator before the main booster motors are fired. As a result, the silo is not heavily damaged and could be reloaded, although this would be a slow process. Since 1975, a total of 150 SS-11 silos have been modified to accept SS-17 missiles, all of which are thought to have been upgraded to Mod 3 standard with four MRVs. The silos, like those for the SS-18 and SS-19 ICBMs, are hardened to resist very high overpressure.

Power Plant: two-stage storable liquid-propellant.

Guidance: inertial.

Warhead: four MRVs (each 750 kilotons).

Dimensions: length 68 ft 0 in, max diameter 8 ft 6 in.

Performance: max range 6,200 miles.

SS-18 (Soviet designation RS-20)

There are 308 of these cold-launched 'heavy' missiles in the Soviet ICBM force. All have been upgraded to Mod 4 standard, with ten MRVs, each with more than 20 times the destructive power of the nuclear bombs dropped on Hiroshima and Nagasaki in 1945. DoD believes that the SS-18 force, by itself, has the capability to destroy more than 80% of US ICBM silos, using two nuclear warheads against each silo. A CEP of under 1,000 ft has been quoted.

Power Plant: two-stage liquid-propellant.

Guidance: inertial.

Warhead: ten MRVs (each 500 kilotons).

Dimensions: length 104 ft 0 in, max diameter 10 ft 0 in.

Performance: max range 6,835 miles.



SS-20 IRBM (DoD)

SS-19 (Soviet designation RS-18)

The Soviet Union's 360 SS-19 Mod 3 missiles are classified as light ICBMs, but the SS-19 force is judged by DoD to have nearly identical capabilities to the 308 larger SS-18s, with the added flexibility of being able to attack targets in Eurasia as well as the US. The hot-launched Mod 3 carries six MRVs and offers a CEP of under 1,000 ft.

Power Plant: two-stage liquid-propellant.

Guidance: inertial.

Warhead: six MIRVs (each 500 kilotons).

Dimensions: length 75 ft 0 in, max diameter 9 ft 0 in.

Performance: max range 6,200 miles.

SS-20

This mobile solid-propellant IRBM represents the most formidable Soviet threat to NATO nations in Western Europe and would not have been subject to any restrictions under SALT II, as its range is less than 5,500 km (3,417 miles). About 423 had been deployed by the late summer of 1985, of which 261 were opposite NATO, with the others targeted on China and Japan. SS-20s could reach the Aleutian Islands and western Alaska from present and likely deployment areas in the eastern USSR, but could not attack the contiguous 48 States. Force expansion is continuing, and the number of deployed SS-20s could increase by 50% by the end of this decade. The missile is carried on a wheeled launcher capable of both on- and off-road operation, which renders detection and targeting difficult. Furthermore, the launcher has the capability of being reloaded, and refire rounds are known to be stockpiled. A CEP of about 1,300 ft is estimated when the SS-20 is fired from a presurveyed site. An improved version, with even greater accuracy, is being flight tested.

Power Plant: two-stage solid-propellant.

Guidance: inertial.

Warhead: three MRVs (each 150 kilotons).

Dimension: length 54 ft 0 in.

Performance: max range 3,100 miles.

SS-X-24

In *Soviet Military Power*, DoD suggests that modified versions of the SS-18 ICBM are likely to be deployed in existing silos in due course. Two completely new solid-propellant ICBMs have also been tested from the range head at Plesetsk, in the north of the Soviet Union. The first of these, designated SS-X-24 in the US, is about the same size as the US Peacekeeper (MX) and is expected to be silo based initially. It could achieve IOC in this form during 1986, with rail-mobile deployment to follow in the late 1980s. The SS-X-24 is expected to be even more accurate than the current SS-18 Mod 4 and SS-19 Mod 3. Eight reentry vehicles were released during the missile's second successful test flight on November 22, 1983.

Power Plant: three-stage solid-propellant.

Guidance: inertial.

Warhead: up to ten MRVs (each 100 kilotons).

Dimension: length 69 ft 0 in.

Performance: max range 6,200 miles.

SS-X-25

This new ICBM is about the same size as the US Minuteman, with a single reentry vehicle. DoD states that it has apparently been designed for mobile deployment from a home base comprising launcher garages with sliding roofs. The system includes massive off-road wheeled transporter/erector/launchers and necessary mobile support equipment for refires from the launcher. Two home bases were stated to be nearing operational capability in 1985.

Power Plant: three-stage solid-propellant.

Guidance: inertial.

Warhead: single RV (550 kilotons).

Dimension: length 59 ft 0 in.

Performance: range 6,525 miles.

Sixth-Generation ICBMs

According to DoD, activity at test ranges indicates that two further Soviet ICBMs are under development. A replacement for the SS-18 was nearing the flight-test stage in early 1985. Additionally, a solid-propellant missile that may be larger than the SS-X-24 will begin flight tests soon. Both missiles are expected to have better accuracy and greater throw-weights than their predecessors.

AS-3 (NATO 'Kangaroo')

'Kangaroo' was a standard air-to-surface missile on Tu-95 'Bear' strategic bombers from the early 1960s. It is replaced by the supersonic AS-4 'Kitchen' on aircraft uprated to 'Bear-G' standard.

AS-4 (NATO 'Kitchen')

Developed as a standoff weapon for the Tu-22 strategic bomber, and now carried also by the Tu-95 ('Bear-G') and variable-geometry 'Backfire', the AS-4 was first seen on a single Tu-22 ('Blinder-B') in 1961. Most of the 22 Tu-22s which participated in the 1967 Aviation Day display at Domodedovo carried an AS-4, semisubmerged in the fuselage, and production by 1976 was stated by the UK Defence Minister to total around 1,000. The missile, which has been seen in more than one form, has an aeroplane configuration, with stubby delta wings and cruciform tail surfaces. Propulsion is believed to be by liquid-propellant rocket motor. Alternative nuclear (200 kiloton) or 2,200 lb high-explosive warheads can be assumed.

Guidance: inertial, with radar terminal homing.

Dimensions: span 9 ft 10 in, length 37 ft 0 in.

Weight: 13,225 lb.

Performance: max speed above Mach 2, range 185 miles at low altitude.

AS-6 (NATO 'Kingfish')

This advanced air-to-surface missile was first photographed by the pilot of a Japan Air Self-Defense Force F-86F in December 1977 under the port wing of a Tu-16 ('Badger'). It is standard armament of modified 'Badger-Gs', which carry a 'Kingfish' under each wing. Variable-geometry 'Backfire' bombers can carry up to three, as alternatives to 'Kitchens'. Propulsion is said to be by liquid-propellant rocket motor, with inertial midcourse guidance and active radar terminal homing, giving exceptional accuracy. The warhead can be either nuclear (200 kiloton) or 2,200 lb high explosive.

Dimensions: span 8 ft 2½ in, length 34 ft 6 in.

Weight: 11,000 lb.

Performance: max speed Mach 3, range 135 miles at low altitude.

AS-15

After at least six years of development testing, including launches from 'Backfire' bombers, the Soviet Union began deployment of its new-generation AS-15 long-range air-launched cruise missiles on 'Bear-H' strategic bombers in 1984. The AS-15 will also arm the new supersonic 'Blackjack' bomber, providing the Soviet strategic attack force with greatly improved capabilities for low level and standoff attack in both theater and international operations. Configuration of the AS-15 is similar to that of USAF's much smaller General Dynamics ground-launched cruise missile. Submarine-launched and ground-launched versions are under development, as the SS-NX-21 and SSC-X-4, respectively. All have a guidance system similar to the US Tercom, making possible a CEP of about 150 ft, and a nuclear warhead.

Dimensions: span 10 ft 8 in, length 23 ft 0 in.

Performance: range 1,850 miles.

Airborne and Tactical Defense Missiles

AS-2 (NATO 'Kipper')

First seen 24 years ago, at the 1961 Aviation Day display, this aeroplane-configuration missile, with underslung turbojet engine, was described by the commentator at Tushino as an antishipping weapon. Radar is carried in the nose of the Tu-16 carrier aircraft, and guidance is believed to comprise preprogrammed flight under autopilot control, with optional command override, and active radar terminal homing. A 2,200 lb high-explosive warhead is fitted.



AS-4 (NATO 'Kitchen') on Tu-26 ('Backfire-B')



AS-2 (NATO 'Kipper') on Tu-16 ('Badger-C')

Dimensions: span 15 ft 0 in, length 32 ft 10 in.

Weight: 9,260 lb.

Performance: max speed Mach 1.2, range 132 miles.

AS-5 (NATO 'Kelt')

According to the UK Minister of Defence, well over 1,000 AS-5s had been delivered by the spring of 1976. About 25 were used operationally during the October 1973 war between Israel and the Arab states, when Tu-16s from Egypt launched them against Israeli targets. Only five eluded the air and ground defenses.

The transonic AS-5 has a similar aeroplane-type configuration to that of the turbojet-powered AS-1 ('Kennel'), which it superseded. The switch to liquid rocket propulsion eliminated the need for a ram air intake and permitted the use of a larger radar inside the hemispherical nose fairing. Guidance is said to be by autopilot on a preprogrammed flight path, with radar terminal homing



AT-2 (NATO 'Swatter') on Mi-24 ('Hind-D')



AA-3 (NATO 'Anab') on Su-15/21

that can be switched from active to passive as required. A 2,200 lb high-explosive warhead is standard.

Dimensions: span 14 ft 1¼ in, length 28 ft 2 in.

Weight: 7,715 lb.

Performance: max speed Mach 0.9 at low altitude, Mach 1.2 at 30,000 ft, range 100 miles at low altitude, 200 miles at height.

AS-7 (NATO 'Kerry')

Carried by the Su-17 'Fitter', Su-24 'Fencer', and Yak-38 'Forger', this tactical air-to-surface rocket motor, radio command guidance system, and 220 lb high-explosive warhead.

Dimension: length 11 ft 6 in.

Weight: under 880 lb.

Performance: max speed Mach 0.6, max range 7 miles.

AS-X-9

A reported antiradiation missile, with a range of 50-56 miles, to arm the Su-24 ('Fencer').

AS-10

This is a semiactive laser homing weapon with a solid-propellant rocket motor. It is said to be operational on MiG-27, Su-17, and Su-24 attack aircraft.

Dimension: length 9 ft 10 in.

Performance: max speed Mach 0.8, max range 6.2 miles.

AT-2 (NATO 'Swatter')

This standard Soviet antitank weapon formed the original missile armament of the Mi-24 ('Hind-A and D') helicopter gunship and is carried by the 'Hip-E' version of the Mi-8. The solid-propellant 'Swatter' is steered in flight via elevons on the trailing-edges of its rear-mounted cruciform wings and embodies terminal homing.

Dimensions: span 2 ft 2 in, length 3 ft 9¾ in.

Weight: 65 lb.

Performance: cruising speed 335 mph, range 1,640-11,500 ft.

AT-3 (NATO 'Sagger')

In conformity with the Soviet practice of not supplying advanced equipment on its export aircraft, the wire-guided 'Sagger' replaces 'Swatter' on the 'Hip-F' version of the Mi-8, as well as arming the Polish-built Mi-2, and Gazelles of the Yugoslav services.

Dimensions: span 1 ft 6 in, length 2 ft 10¼ in.

Weight: 25 lb.

Performance: speed 270 mph, range 1,650-9,850 ft.

AT-6 (NATO 'Spiral')

Unlike previous Soviet helicopter-launched antitank missiles, 'Spiral' does not appear to have a surface-launched application. Few details are yet available, except that it is tube-launched and homes on targets illuminated by a laser designator. It equips the 'Hind-E' version of the Mi-24 and is said to have a range of 4.3 to 6.2 miles.

AA-2 (NATO 'Atoll')

Designated K-13A in the USSR, 'Atoll' is the Soviet counterpart to the American Sidewinder 1A (AIM-9B), to which it is almost identical in size, configuration, and infrared guidance. It has long been standard armament on home and export versions of the MiG-21 and is carried by export models of the MiG-23 and Sukhoi Su-22. A solid-propellant rocket motor and 13 lb fragmentation warhead are fitted.

Dimensions: length 9 ft 2 in, body diameter 4.72 in, fin span 1 ft 8¾ in.

Weight: 154 lb.

Performance: cruising speed Mach 2.5, range 3 to 4 miles.

AA-2-2 (NATO 'Advanced Atoll')

The multirole versions of the MiG-21 (NATO 'Fishbed-J, K, L, and N') can carry a radar homing version of 'Atoll' on the outer stores pylon under each wing, in addition to a standard infrared homing 'Atoll' on the inboard pylon. The radar version is known as 'Advanced Atoll'. Length is increased to at least 9 ft 10 in.

AA-3 (NATO 'Anab')

This solid-propellant air-to-air missile was first observed as armament of the Yak-28P all-weather fighters that took part in the 1961 Aviation Day display at Tushino. Subsequently, it became standard also on Sukhoi Su-15/21 interceptors. Each aircraft normally carries one 'Anab' with an I/J-band semiactive radar seeker and one with an infrared homing head.

Dimensions: length 13 ft 5 in (IR) or 13 ft 1 in (SAR), body diameter 11 in, wing span 4 ft 3 in.

Performance: range over 10 miles.

AA-5 (NATO 'Ash')

Several thousand of these large air-to-air missiles were

produced as armament for the Tu-28P interceptors of *Voyska PVO*. The version with infrared homing head is normally carried on the inboard pylon under each wing of the Tu-28P, with an I/J-band semiactive radar homing version on each outboard pylon.

Dimensions: length 17 ft 4 1/2 in (IR) or 17 ft 0 in (SAR), body diameter 12 in, wing span 4 ft 3 in.

Performance: range 18.5 miles.

AA-6 (NATO 'Acrid')

This air-to-air missile was identified during 1975 as one of the weapons carried by the 'Foxbat-A' interceptor version of the MiG-25. Its configuration is similar to that of 'Anab' but it is considerably larger, with a 220 lb warhead. Photographs suggest that the version of 'Acrid' with an infrared homing head is normally carried on each inboard underwing pylon, with a radar homing version on each outer pylon. The wingtip fairings on the fighter, different in shape from those of 'Foxbat-B', are thought to house continuous-wave target illuminating equipment for the radar homing missiles.

Dimensions: length 20 ft 7 1/2 in (radar version), 19 ft 0 in (IR version).

Weight: 1,650 lb.

Performance: cruising speed Mach 2.2, range at least 23 miles.

AA-7 (NATO 'Apex')

This long-range air-to-air missile is one of the two types carried as standard armament by interceptor versions of the MiG-23 and is reported to be an alternative weapon for the MiG-25. 'Apex' has a solid-propellant rocket motor and is deployed in both infrared and semiactive radar homing versions. Warhead weight is 88 lb.

Dimensions: length 15 ft 1 1/4 in, body diameter 8.75 in, wing span 3 ft 5 1/2 in.

Weight: 705 lb.

Performance: range 20 miles.

AA-8 (NATO 'Aphid')

Second type of missile carried by the MiG-23, and also by late-model MiG-21s, Su-15/21s, and Yak-38s, 'Aphid' is a highly maneuverable close-range solid-propellant weapon with infrared homing guidance and a 13.2 lb warhead.

Dimensions: length 7 ft 2 1/2 in, body diameter 4.75 in, wing span 1 ft 3 3/4 in.

Weight: 121 lb.

Performance: range under 1,650 ft min, 3-4.3 miles max.

AA-9

This radar homing long-range missile is reported to have achieved successes against simulated cruise missiles after 'lookdown/shootdown' launch from a MiG-25M interceptor. It is standard armament on the MiG-31.

Performance: range 25-28 miles at height, 12.5 miles at S/L.

AA-10

The AA-10 has generally similar capabilities to those of the AA-9, but is intended for use over medium ranges. It forms the basic interception armament of the MiG-29 and Sukhoi Su-27 counterair fighters.

Antihelicopter 'Grail'

In addition to AT-3 antitank missiles, Gazelle helicopters license-built by SOKO for the Yugoslav Air Force carry SA-7 'Grail' tube-launched IR homing missiles for use against other helicopters. A similar installation on some Mi-24 helicopters has been reported.



Artist's impression of ABM-1 (NATO 'Galosh') launch (DoD)



SA-3 (NATO 'Goa')

one open end on frequent occasions since 1964. No details of the missile could be discerned, except that the first stage has four combustion chambers. A single nuclear warhead is fitted. Missile range is said to be more than 200 miles.

ABM-X-3

The Soviet Union is believed to have at least two new ABM development programs under way. One, designated ABM-X-3 by DoD, is said to be a rapidly deployable system using a phased-array radar, missile-tracking radar, and a new missile. Its availability would permit the Soviets to deploy a nationwide ABM system relatively quickly, should they decide to do so. In addition, the SA-10 and SA-X-12 surface-to-air missiles may have the potential to intercept some types of US strategic ballistic missiles.

SA-2 (NATO 'Guideline')

This land-mobile surface-to-air missile has been operational since 1959 and continues in first-line service in some 22 countries. It was used extensively in combat in North Vietnam and the Middle East and has been improved through several versions as a result of experience gained. SA-2 launchers are thought to remain operational at 350 sites in the Soviet Union, although the number declines annually. Data for export version:

Power Plant: liquid-propellant sustainer, burning nitric acid and hydrocarbon propellants; solid-propellant booster.

Guidance: automatic radio command, with radar tracking of target. Some late versions employ radar terminal homing.

Warhead: high-explosive, weight 288 lb.

Dimensions: length 34 ft 9 in, body diameter 1 ft 8 in, wing span 5 ft 7 in.

Launching weight: 5,070 lb.

Performance: max speed Mach 3.5, slant range 31 miles, effective ceiling 82,000 ft.

SA-3 (NATO 'Goa')

Soviet counterpart of the American Hawk, the SA-3 is deployed by the Soviet Union at more than 300 sites and by about 24 of its allies and friends as a mobile low-altitude system (on two-, three-, and four-round launchers) to complement the medium/high-altitude SA-2. As the SA-N-1, it is also the most widely-used surface-to-air missile in the Soviet Navy and is fired from a roll-stabilized twin-round launcher.

Power Plant: two-stage solid-propellant.

Guidance: radio command, with radar terminal homing.

Warhead: high-explosive, weight 132 lb.

Dimensions: length 22 ft 0 in, body diameter 1 ft 6 in, wing span 4 ft 0 in.

Launching weight: 1,402 lb.

Performance: max speed Mach 2, slant range 15-18.5 miles, effective ceiling over 43,000 ft.

SA-4 (NATO 'Ganef')

Ramjet propulsion gives this anti-aircraft missile a very long range. Its usefulness is further enhanced by its mobility, as it is carried on a twin-round tracked launch vehicle that is itself air-transportable in the An-22 military freighter. The SA-4 was first displayed publicly in 1964 and is a standard Soviet weapon (approx 1,400 launchers) for defense of combat areas. It is operational also with Bulgarian, East German, Hungarian, Polish, and Czechoslovak forces.

Power Plant: ramjet sustainer; four wrap-around solid-propellant boosters.

Guidance: radio command, with semiactive radar terminal homing.

Warhead: high-explosive, weight 220-300 lb.

Dimensions: length 28 ft 10 1/2 in, body diameter 2 ft 8 in, wing span 7 ft 6 in.

Launching weight: approx 5,500 lb.

Performance: max speed Mach 2.5, slant range 43 miles, effective ceiling 80,000 ft.

SA-5 (NATO 'Gammon')

The SA-5 is described by DoD as a surface-to-air weapon to provide long-range, high-altitude defense for Soviet targets. A drawing released in Washington suggests that its configuration is unusual for a Soviet missile, with long-chord cruciform delta wings, small tail surfaces, and four wrap-around jettisonable boosters. More than 2,000 SA-5s are said to be deployed at more than 100 sites, with significant deployments outside the USSR, in Eastern Europe, Mongolia, and Syria.

Power Plant: two-stage solid-propellant, possibly with terminal propulsion for warhead.

Guidance: semiactive radar homing.

Dimensions: length 34 ft 9 in, body diameter 2 ft 10 in, wing span 9 ft 6 in.

Performance: max speed above Mach 3.5, slant range 185 miles, effective ceiling 95,000 ft.

SA-6 (NATO 'Gainful')

This mobile weapon system took an unexpectedly heavy toll of Israeli aircraft during the October 1973 war. Its unique integral all-solid rocket/ramjet propulsion system was a decade in advance of comparable Western technology, and the US-supplied ECM equipment that enabled Israeli aircraft to survive attack by other missiles proved ineffective against the SA-6. First shown on its

Surface-to-Air Missiles

ABM-1 (NATO 'Galosh')

Keeping within the terms of the SALT I agreement, as amended by the 1974 Moscow Summit meeting, the USSR maintains around Moscow the world's only operational ABM (antiballistic missile) system. Its purpose is to provide a measure of protection for Soviet military and civil central command authorities during a nuclear war, and this has required major upgrading of the system in the past five years. When fully operational, perhaps by next year, it will provide a two-layer defense based on a total of 100 silo-based launchers for long-range modified ABM-1 'Galosh' interceptors designed to engage targets outside the atmosphere and high-acceleration interceptors to engage targets within the atmosphere. The launchers may be reloadable and will be supported by engagement and guidance radars, plus a large new radar at Pushkino designed to control ABM engagements.

Missiles purported to be 'Galosh' have been paraded through Moscow inside containers about 65 ft long with

three-round tracked transporter/launcher in Moscow in November 1967, the missile has since been produced in very large quantities. Export models have been acquired by many nations, including Algeria, Angola, Bulgaria, Cuba, Czechoslovakia, Egypt, East Germany, Guinea, Hungary, India, Iraq, Kuwait, Libya, Mozambique, Peru, Poland, Romania, Syria, Tanzania, Vietnam, North and South Yemen, Yugoslavia, and Zambia.

Power Plant: solid-propellant booster. After burnout, its empty casing becomes a ramjet combustion chamber for ram air mixed with the exhaust from a solid-propellant gas generator.

Guidance: radio command; semiactive radar terminal homing.



SA-8 (NATO 'Gecko')



SA-12 air defense system (DoD)

Warhead: high-explosive, weight 176 lb.
Dimensions: length 20 ft 4 in, body diameter 1 ft 1.2 in.
Launching weight: 1,212 lb.
Performance: max speed Mach 2.8, range 18.5 miles, effective ceiling 59,000 ft.

SA-7 (NATO 'Grail')

This Soviet counterpart of the US shoulder-fired, heat-seeking Redeye first proved its effectiveness in Vietnam against slower, low-flying aircraft and helicopters. It repeated the process during the 1973 Arab-Israeli war, despite countermeasures. In addition to being a standard weapon throughout the Warsaw Pact forces since 1968, it has been supplied to about 39 other nations and is used by various guerrilla/terrorist movements. Designed for use by infantry, the tube-launched SA-7 is also carried by vehicles, including ships, in batteries of four, six, and eight, for both offensive and defensive employment, with radar aiming. Some are deployed on helicopters for antihelicopter combat use.

Power Plant: solid-propellant booster/sustainer.
Guidance: infrared homing with filter to screen out decoy flares.

Warhead: high-explosive, weight 5.5 lb.
Dimensions: length 4 ft 3 in, body diameter 2.75 in.
Launching weight: 20 lb.
Performance: max speed Mach 1.5, slant range 5-6 miles, effective ceiling 5,000 ft.

SA-8 (NATO 'Gecko')

First displayed publicly during the parade through Moscow's Red Square on November 7, 1975, this short-range, all-weather system is unique among Soviet tactical air defense weapons in that all components needed to conduct a target engagement are on a single vehicle. In the original SA-8A version, two pairs of exposed missiles were carried, ready to fire; the later SA-8B system has six missiles in launcher-containers. Missile configuration is conventional, with canard foreplane control surfaces and fixed tail-fins. Fire control equipment and four- to six-round launcher are mounted on a rotating turret, carried by a three-axle six-wheel amphibious vehicle. Surveillance radar, with an estimated range of 18 miles, folds down behind the launcher, enabling the weapon system to be airlifted by Soviet transport aircraft. The tracking radar is of the pulsed type, with an estimated range of 12-15 miles. The SA-8B uses the same missile as the well-established but enigmatic naval SA-N-4 system. Each vehicle carries up to six reload missiles. About 700 SA-8 vehicles are thought to be in Soviet service; export customers include Angola, Guinea, India, Jordan, Kuwait, Libya, Poland, and Syria.

Power Plant: probably dual-thrust solid-propellant.
Guidance: command guidance by proportional navigation. Semiactive radar terminal homing.

Warhead: high-explosive, about 90-110 lb weight.
Dimensions: length 10 ft 6 in, body diameter 8.25 in.
Launching weight: 440 lb.
Performance: range 6-8 miles, effective ceiling 20,000 ft.

SA-9 (NATO 'Gaskin')

This weapon system, deployed initially in 1968, comprises a BRDM-2 amphibious vehicle carrying a box launcher for two pairs of infrared homing missiles. The launcher rests flat on the rear of the vehicle when not required to be ready for launch. Four reload rounds are stowed in the BRDM-2. In addition to the Soviet Union, operators include most Warsaw Pact states and 11 other nations. (See also the SA-13 entry.)

Dimensions: length 5 ft 9 in, body diameter 4.33 in.
Launching weight: 66 lb.
Performance: range 5 miles, effective ceiling 16,400 ft.

SA-10 (NATO 'Grumble')

If press reports are to be believed, this weapon threatens the viability of US cruise missiles. A single-stage rocket motor is said to accelerate the SA-10 at 100g to a cruising speed of Mach 6. A range of up to 60 miles and all-altitude capability are suggested, with active radar terminal homing and multiple target engagement capability. Reported dimensions are a length of 23 ft 6 in and body diameter of 17.7 in. By the spring of 1985, the SA-10 was operational at some 60 sites in the USSR, with 520 launchers and four missiles per launcher. A landmobile version, carried on a four-axle truck, was expected to deploy during 1985.

SA-11 (NATO 'Gadfly')

This new weapon system comprises a four-rail tracked launch vehicle for Mach 3.5 radar-guided missiles with a reported ability to deal with targets at altitudes between 100 and 46,000 ft and at ranges up to 18.5 miles. SA-11s are being deployed alongside SA-6s. Missile length is 18 ft.

SA-12

This formidable container-launched weapon is considered capable of dual-mode operation against aircraft and intermediate-range and submarine-launched missiles. The SA-12 is in production. Little reliable information is available, but a DoD drawing has suggested a missile of fairly conventional configuration, about the

same size as the SA-10. A complete fire unit could include two twin-round erector-launchers, a reload vehicle, two planar-array radar vehicles, and a command vehicle, all tracked for maximum capability. A range of 60 miles is expected.

SA-13 (NATO 'Gopher')

Deployed on a tracked vehicle in the late 1970s, the SA-13 is a replacement for the SA-9, providing improved capability in rough terrain and increased storage for reload missiles. Together with the ZSU-23-4 tracked gun vehicle, it equips the antiaircraft batteries of motorized rifle and tank regiments. Range is about 5 miles at altitudes between 165 ft and 16,500 ft.

SA-14 (NATO 'Gremlin')

This updated version of the SA-7 is believed to have a more powerful motor, giving higher speed and an effective ceiling of about 14,000 ft.

New Infantry SAM

To overcome the limitations of shoulder-fired, infrared homing missiles like the SA-7, the Soviet Union has been developing improved infantry SAMs for some years. One type, of which deployment is about to start, uses a laser beam for beam-riding guidance.

SA-N-1 (NATO 'Goa')

Ship-launched variant of SA-3, carried on roll-stabilized twin launchers by 43 ships of the Soviet Navy.

SA-N-2 (NATO 'Guideline')

Ship-launched version of SA-2. On cruiser *Dzerzhinski* only.

SA-N-3 (NATO 'Goblet')

The twin-round surface-to-air missile launchers fitted to many of the latest Soviet naval vessels, including *Kiev* class carrier/cruisers, helicopter cruisers *Moskva* and *Leningrad*, and *Kara* and *Kresta II* cruisers, carry a new and more effective missile than the SA-N-1 ('Goa'). This is said to have an antiship capability and to carry an 88 lb high-explosive warhead. The original version has a range of 18.6 miles and effective ceiling of 82,000 ft. A later version has a range of 34 miles.
Dimension: length 19 ft 8 in.
Weight: 1,200 lb.

SA-N-4

This naval close-range surface-to-air weapon system is operational on at least nine classes of ships of the Soviet Navy. The retractable twin-round 'pop-up' launcher is housed inside a bin on deck. The missiles are similar to those used in the land-based mobile SA-8B system.

SA-N-5

At least 169 small Soviet ships have this simple air defense system, which carries four SA-7 'Grail' launchers in a framework that can be slewed for aiming.

SA-N-6

This missile is housed in 12 vertical launch tubes under the foredeck of the Soviet battle cruiser *Kirov* and is carried also by *Slava* class cruisers. It is assumed to deal with the same multiple threats as the US Navy's Aegis area defense system. No authentic information on the SA-N-6 missile is available, although some relationship to the land-based SA-10 seems likely. Best estimates suggest a length of about 23 ft, effective ceiling of at least 100,000 ft, and range of 37 miles at Mach 6, carrying a 200 lb warhead. Likely features include multiple target detection and tracking, midcourse guidance, terminal homing, and high resistance to ECM and jamming.

SA-N-7

Two single-rail launchers for this new missile are fitted in each ship of the *Sovremenny* class of guided missile destroyers. The sophistication and rapid-fire potential of the weapon system is indicated by the requirement for six associated fire control/target illuminating radars. The SA-N-7 itself is thought to be a naval equivalent of the land-based SA-11.

SA-N-8

Nothing is known positively about this vertically launched missile system carried by the new *Udaloy* class of antisubmarine ships.

SA-NX-9

In addition to the SA-N-4 and SA-N-6 surface-to-air missile systems installed in the *Kirov*, its sister ship, the *Frunze*, has provisions for a total of 128 shorter-range SA-NX-9 missiles. These will be shared between two rows of four vertical launchers, on each side of the stern helicopter pad, and two rectangular groups of four launchers on the forecastle. No other details are available. ■