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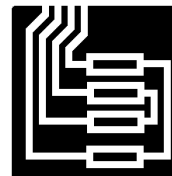
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Xi'an Yun-7/Antonov An-24 - Archived 9/2006

Outlook

- Some opportunities exist for An-24 and Y-7 retrofit work
- The MA60 is currently in production

Note: Icons indicate area(s) of current and potential retrofit/modernization activity



Orientation

Description. Twin-turboprop military and civil transport. The An-24 is the original Soviet version, and the Yun-7 (Y-7) is a Chinese derivative.

Developer/Primary Manufacturer. (Y-7) Xi'an Aircraft Industry (Group) Company Ltd; Xi'an, Shaanxi, People's Republic of China.

(An-24) Antonov Aeronautical Scientific-Technical Complex; Kiev, Ukraine.

Current Status. An-24 production ended in 1979. The MA60, a new version of the Y-7, is currently in

production. Production of earlier Y-7 passenger models has ended. The Y7H-500 cargo version continues to be marketed.

Total Produced. Xi'an produced approximately 153 Y-7/MA60 aircraft through 2004. Three prototype Y-7s were built, plus two Y-7 airframes for static and fatigue testing. Approximately 1,200 An-24s are estimated to have been produced.

Application. Short/medium-range transport.

Price Range. MA60, \$11.0 million in 2004 U.S. dollars.

Technical Data

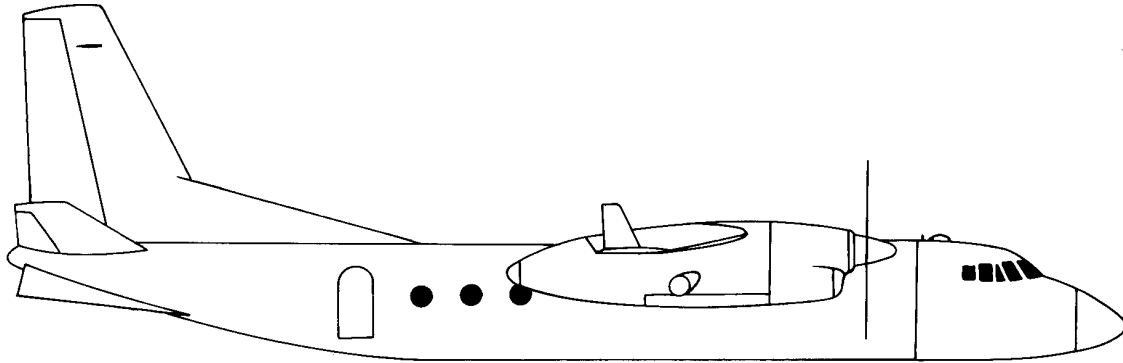
	(Y7-100)	
	<u>Metric</u>	<u>U.S.</u>
Dimensions		
Length	24.22 m	79.46 ft
Height	8.85 m	29.04 ft
Wingspan	29.67 m	97.33 ft
Wing area, gross	75.26 sq m	810.12 sq ft
Weight		
Operating empty weight	14,988 kg	33,042 lb
Maximum payload	5,500 kg	12,125 lb
Maximum TOW	21,800 kg	48,060 lb
Performance		
Maximum level speed	503 km/h	271 kt
Ceiling	8,750 m	28,700 ft

	<u>Metric</u>	<u>U.S.</u>
Range with max payload (52 pax)	910 km	491 nm
Range with full standard fuel	1,982 km	1,070 nm
Range with standard and auxiliary fuel	2,400 km	1,296 nm

Propulsion

Two Dongan WJ5A I turboprops

Thrust (each)	2,080 kW	2,790 shp
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XI'AN Y7-100

Source: Forecast International

Program Review

Background. Approximately 1,200 An-24s were built through 1979, when production ended. Production of the Y-7 began in 1984. The Y-7 received its Chinese certificate of airworthiness in 1980, following production of three prototypes and two additional airframes for static and fatigue testing. First flight of a production Y-7 was announced in February 1984.

A new version of the Y-7, called the MA60, is currently in production. Production of earlier Y-7 passenger

versions has ended. However, the Y7H-500 freighter continues to be marketed.

Meanwhile, a sufficient number of Y-7 series aircraft exist to warrant attention for retrofit and modernization purposes. Companies may find opportunities in the areas of airframes, engines, and avionics, both in R&M programs and in programs to develop new variants.

Variants

An-24V Srs I. Basic Soviet-produced version. Powered by Ivchenko AI-24 engines rated at 1,902 kW (2,550 ehp) each.

An-24V Srs II. Improved version first produced in 1968. Powered by AI-24A engines with water injection. Was available in various configurations.

An-24P. Firefighting version.

An-24RV. Similar to the Srs II. Featured Type RU 19-300 auxiliary turbojet in starboard nacelle for engine starting.

An-24T. Specialized freighter version.

An-24RT. Similar to An-24T. Featured Type RU auxiliary turbojet in starboard nacelle.

Y-7. Chinese derivative of An-24. Powered by WJ5A I engines, which are derived from the AI-24A. The engines drive Baoding J16-G10A four-blade propellers.

Y7-100. Improved version of the basic Y-7. Includes three-man flight deck, winglets, and all-new avionics suite.

Y7-100C. Subvariants fitted with alternate avionics systems and seating arrangements per the requirements of the customer. The -100C versions have a five-man crew.

Y7-200A. Y-7 derivative with increased performance, reduced weight, and Pratt & Whitney Canada PW127C turboprop engines (2,050 kW/2,750 shp). First flight occurred in December 1993. Incorporates a fuselage plug forward of the wing, adding approximately 0.5 meters to the aircraft's overall length. Seating capacity ranges from 52 to 56 passengers. The -200A has a two-crew flight deck. The engines drive Hamilton Sundstrand 247F-3 four-blade propellers. The -200A also has a Honeywell GTCP-150CY auxiliary power unit (APU) and Rockwell Collins EFIS 85/86 instrumentation.

In 1998, the Y7-200A was awarded certification by the Civil Aviation Administration of China (CAAC).

Two Y7-200As were delivered to Changan Airlines in October 1999. The carrier was the first operator of the model.

Y7-200B. Powered by WJ5E engines rated at 2,125 kW (2,850 shp). Equipped with Hamilton Sundstrand 14SF four-blade propellers, Rockwell Collins EFIS 85 electronic flight instrumentation system, Honeywell Primus 90 radar, and Rockwell Collins APS-85 autopilot. Features Category II landing capability. Incorporates fuselage plug forward of the wing, which increases the aircraft's overall length by 740 millimeters. Depending on configuration, the aircraft can seat approximately 56 passengers. First flight occurred in November 1990.

Both the Y7-200A and the Y7-200B have been superseded by the MA60.

Y-7E. Version intended to meet the special demands in high-temperature plateau areas. First flight occurred in July 1994.

Y7H. Originally, designated Y-14-100, this is a Chinese derivative of the Antonov An-26 transport. The initial prototype flew in late 1988; three prototypes have been built (one was a converted Y-7). No production aircraft have been completed.

The military version is known as the Y7H, while the civil cargo version is called the Y7H-500. The aircraft uses the wing of the Y7-100 (without winglets), the forward fuselage of the Y7-100, WJ5E engines, and Baoding J16-G10A four-blade propellers. The Y7H-500 has a maximum takeoff weight of 24,000 kilograms (52,910 pounds), a maximum payload of 5,500 kilograms (12,125 pounds), and a range with maximum fuel of 2,650 kilometers (1,431 nautical miles). The military variant can accommodate up to 38 combat-equipped troops or, in the medevac role, 24 stretcher cases and a single attendant.

MA60. Stretched version of the Y7-200A. The MA60 can accommodate 56-60 passengers. It is powered by

two 2,050-kW (2,750-shp) Pratt & Whitney Canada PW127J engines, each of which drives a Hamilton Sundstrand 247F-3 four-blade propeller. The MA60 also has a Honeywell GTCP-150CY auxiliary power unit (APU) and a Rockwell Collins EFIS 85 electronic flight instrumentation system. It is fitted with a new cabin interior.

Maximum zero-fuel weight of the MA60 is 19,500 kilograms (42,990 pounds), an increase of 300 kilograms (660 pounds) compared to that of the Y7-200A. Other weights are essentially unchanged compared to the -200A.

Range of the MA60 with a full passenger load is 1,600 kilometers (864 nautical miles). Range with full fuel is 2,450 kilometers (1,322 nautical miles).

MA60-100. Xi'an is developing an improved version of the MA60, called the MA60-100. The range of the new version will be approximately 300 kilometers (162 nautical miles) greater than that of the present MA60. Airframe life will be 30,000-40,000 cycles, an increase from the 25,000 cycles of the current model. Empty weight will be reduced by 400 kilograms (882 pounds). In addition, maximum takeoff weight in hot-and-high conditions is expected to be increased by approximately 900 kilograms (1,984 pounds).

The MA60-100 will also include modifications to the wing and the flight deck. The aircraft will be equipped with the Rockwell Collins Pro Line 21 avionics system. The Pro Line 21 avionics package includes an FMS-3000 flight management system, CNS equipment, an AHS-3000 attitude heading reference system (AHRS), and a TWR-800 weather radar.

The MA60-100 will also be equipped with the Hamilton Sundstrand APS 1000 auxiliary power unit (APU).

MA60-500. Cargo version of the MA60. The MA60-500 is equipped with a rear cargo door. An electric winch and a hydraulic conveyer are installed in the cargo compartment. Maximum payload of the -500 is 5,500 kilograms (12,125 pounds). Range with full load is 1,050 kilometers (567 nautical miles). Range with full fuel is 2,250 kilometers (1,215 nautical miles). One MA60-500 demonstrator has been built.

MA40. Xi'an has begun design work on a smaller version of the MA60, called the MA40, which is intended primarily for use at high-altitude airports. The MA40 would have 40 seats. The new derivative would have essentially the same engines and wing as the MA60, but a shorter fuselage.

MA-MPA. Projected maritime patrol aircraft, based on the MA60, called the MA-MPA or the Fearless Albatross. Previously called the Y7-200BF. The aircraft would have raked wingtips. It would have a

pronounced nose to house a search radar. It would be armed with anti-ship missiles and air-to-air missiles. The aircraft would also have increased range compared to the MA60.

Milestones

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
Oct	1959	First flight of An-24
Sep	1963	An-24 entered service with Aeroflot
	1979	An-24 production ends
Apr	1982	Public showing of Y-7 preproduction model
Feb	1984	First flight of production Y-7 announced
Nov	1990	First flight of Y7-200B
Dec	1993	First flight of Y7-200A
Aug	2000	Initial delivery of MA60

Worldwide Distribution

<u>Region</u>	<u>Country</u>	<u>Total</u>	<u>Variant</u>	<u>Avg. Age (Yr)</u>
<u>Africa</u>	Angola			
	ALADA	1	An-24	34
	Congo, Republic of			
	Republic of Congo Air Force	5	An-24	42
	Trans Air Congo	1	An-24	33
	Ethiopia			
	Ethiopia Air Force	1	An-24	31
	Ghana			
	Golden Airways	2	An-24RV	33
	Guinea			
	Guinea Air Force	1	An-24	31
	Libya			
	Air Libya Tibesti	1	An-24	37
	Mali			
	Mali Air Force	2	An-24	36
	Sudan			
Sudan Air Force	1	An-24	34	
Sudan Airways	1	An-24	32	
Zimbabwe				
Zimbabwe Ministry of Communications	2	MA60	1	
<u>Asia</u>	Afghanistan			
	Ariana Afghan Airlines	1	An-24	37
	Kam-Air	1	An-24RV	32
	Cambodia			
	Cambodia Gov't	2	An-24	35
	China, People's Republic of			
	Changan Airlines	2	MA60	3
		5	Y7-100	15
		2	Y7-200A	6
	China Civil Aviation Flying College	6	Y7-100	17
	China Eastern Airlines	1	Y7-100	19
	China Southern Airlines	2	Y-7	21
		10	Y7-100	17
China United Airlines	2	MA60	3	
	2	Y7-100	18	

<u>Region</u>	<u>Country</u>	<u>Total</u>	<u>Variant</u>	<u>Avg. Age (Yr)</u>
<u>Asia</u> (continued)	PRC Air Force	23	Y-7	19
	PRC Navy	4	Y-7	17
	China, People's Republic of (continued)			
	Sichuan Airlines	1	MA60	5
		4	Y7-100	16
	Wuhan Airlines	3	MA60	3
		6	Y7-100	16
	Kazakhstan			
	SCAT	5	An-24	36
	Korea, North			
	North Korea Air Force	8	An-24	30
	Laos			
	Laos Air Force	3	An-24	30
		2	Y-7	21
	Mongolia			
	MIAT Mongolian Airlines	3	An-24	39
		7	An-24RV	32
	Mongolia Air Force	6	An-24	32
	Sri Lanka			
	Lionair	2	An-24RV	33
	Tajikistan			
	Tajikistan Airlines	1	An-24RV	32
	Uzbekistan			
Uzbekistan Air Force	1	An-24	29	
<u>Europe</u>	Armenia			
	Armenian Airlines	1	An-24RV	34
	Belarus			
	Belarus Air Force	1	An-24	30
	Belavia	6	An-24	36
		6	An-24RV	33
	Gomelavia	1	An-24RV	33
	Bulgaria			
	Aviostart	2	An-24	36
	Bulgaria Air Force	2	An-24	29
	Vega Airlines	1	An-24	37
	Georgia			
	Georgia Air Force	1	An-24	31
	Lithuania			
	Lithuanian Airlines	2	An-24	37
		2	An-24RV	34
	Moldova			
	Aerocom	1	An-24	34
		1	An-24RV	33
	Air Moldova	4	An-24	36
		2	An-24RV	32
	Romania			
	Romania Air Force	2	An-24	31
	Tarom	1	An-24RV	28
	Russia			
	Adygeya Avia	1	An-24	37
	Aeroflot-Nord	3	An-24RV	31
	ALK	8	An-24	37
		4	An-24RV	33

<u>Region</u>	<u>Country</u>	<u>Total</u>	<u>Variant</u>	<u>Avg. Age (Yr)</u>
<u>Europe</u> (continued)	Russia (continued)			
	Alrosa Mirny Air Enterprise	8	An-24	34
	Astair	1	An-24	29
		1	An-24RV	31
	Astrakhan Airlines	3	An-24	33
	Avialesookhrana	1	An-24	29
		1	An-24RV	29
	BAL	9	An-24	35
		1	An-24RV	33
	Bravia	1	An-24	35
	Bural	2	An-24	35
		1	An-24RV	32
	Chukotavia	1	An-24RV	32
	Chuvashia Airlines	1	An-24RV	35
	Dalavia	15	An-24	34
		1	An-24RV	30
	Flight Inspections & Systems	1	An-24	35
	Izhavia	1	An-24RV	32
	Karat	1	An-24	35
	Katekavia	1	An-24RV	31
	Kirov Air Enterprise	2	An-24	35
		1	An-24RV	35
	Komiaviatrans	13	An-24	37
	Komiinteravia	2	An-24RV	32
	KVZ	1	An-24	39
	Omskavia	2	An-24	37
		1	An-24RV	31
	Orenburg Airlines	3	An-24	35
	Perm Airlines	2	An-24	40
	Polar Airlines	4	An-24	36
	Russia Air Force	95	An-24	31
	Russia Navy	10	An-24	37
	Ryazanaviatrans	2	An-24RV	29
	Saransk Air Enterprise	2	An-24RV	32
	Saravia	1	An-24RV	30
	SAT Airlines	5	An-24RV	31
	Sibaviatrans	1	An-24RV	31
	Tambov Avia	2	An-24RV	33
	Tomskavia	1	An-24	34
	Ural Airlines	1	An-24	37
		1	An-24RV	30
	UTair Aviation	5	An-24	34
		2	An-24RV	32
	Vladivostok Air	1	An-24RV	31
	Volga-Aviaexpress	1	An-24RV	38
	Yakutia Air	6	An-24	36
		6	An-24RV	31
	Yamal Airlines	1	An-24RV	31
	Zapolyarye Aviakompania	2	An-24RV	32
	Slovakia			
	Slovakia Air Force	2	An-24	26
	Turkey			
	Top Air	1	An-24	31

<u>Region</u>	<u>Country</u>	<u>Total</u>	<u>Variant</u>	<u>Avg. Age (Yr)</u>
<u>Europe</u> (continued)	Ukraine			
	Aviant	1	An-24RV	28
	Donbassaero	3	An-24	37
	Lugansk Airlines	1	An-24	33
	Lviv Airlines Ukraine West	1	An-24	39
	Motor Sich Airlines	1	An-24	33
		2	An-24RV	33
	Ukraine Air Force	32	An-24	30
	Volare Airlines	1	An-24RV	34
<u>Latin America/ Caribbean</u>	Cuba			
	Aerocaribbean	1	An-24RV	32
	Cuba Air Force	1	An-24	29
	Cubana	3	An-24	32
		3	An-24RV	30
	Peru			
T doble A	1	An-24RV	29	
<u>Middle East</u>	Iran			
	Iran Air Force	2	Y-7	7
	Syria			
	Syria Air Force	2	An-24	30
	UAE			
	Daallo Airlines	1	An-24RV	33
	Irbis	1	An-24RV	28
Yemen				
Yemen Air Force	6	An-24	30	

Opportunities

AIRFRAME

Cargo Conversions. In mid-2001, the first Y-7 converted from a passenger layout to a cargo configuration was delivered by Xi'an to Changan Airlines. The carrier was also expected to later take delivery of two more converted Y-7 freighters.

PROPULSION

WJ5E. In 1988, Dongan Engine Manufacturing Company began development of the WJ5E turboprop, with assistance from General Electric. The WJ5E is an improved version of the WJ5A I, which powers the Y7-100.

Modifications to the high-pressure compressor and the turbine have resulted in specific fuel consumption being reduced from 265 to 240 gm/hp/hr at sea level and maximum power. Turbine efficiency has been increased and an improved fuel controller installed. The WJ5E has been used on the Y7-200B and the Y7H freighter. Since engine power and size remain the same as its predecessor, the new engine could well be refitted to existing Y7-100 aircraft.

ELECTRONICS

IFF. In October 2003, Slovakia awarded a contract to BAE Systems Communication, Navigation, Identification and Reconnaissance to upgrade its national identification friend or foe (IFF) system. The contract is the first in a five-year series of contracts with a total estimated value of \$25 million. The initial contract is valued at \$3.0 million.

The first year of the contract includes long-range IFF interrogators for ground-based radar platforms, as well as transponders for various Slovakian military aircraft, including An-24s.

Windshear Detection Systems. Windshear is a sudden change in wind speed and/or direction that can cause an aircraft to stall or lose altitude rapidly. Several companies supply windshear detection systems, including Hamilton Sundstrand, Honeywell, Rockwell Collins, Rosemount Aerospace, Safe Flight Instrument Corp, and Westinghouse. A number of operators may fit their Y7-100s with such equipment. An-24 operators

may also choose to install such equipment on their fleets.

Y7-200B Avionics. The Y7-200B flight deck meets Category II landing requirements, having been modified from the Y7-100's flight deck configuration. Systems include the Rockwell Collins EFIS 85 electronic flight instrumentation system and APS-85 autopilot. Stall-warning and ground-proximity warning systems have also been incorporated. The Collins EFIS 85 has been jointly produced by Suzhou Aircraft Instrument Factory

in the PRC. Some of these avionics systems could be retrofitted to Y7-100s.

TCAS II. The TCAS II traffic alert/collision avoidance system informs pilots of the location of other aircraft and issues recommendations for vertical avoidance maneuvers. It is possible that at least some An-24 and Y7-100 operators will install this system on their aircraft. TCAS II suppliers include Honeywell, Rockwell Collins, and Thales.

FI's Opportunity Outlook

Program	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
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AIRFRAME

Cargo Conversions

Available <=====> 30+ Y-7/Y7-100 (PRC)

Program	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
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PROPULSION

WJ5E

Available <=====> 30+ Y7-100 (PRC)

Program	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
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ELECTRONICS

IFF

In Progress +=====> 2 An-24 (Slovakia)

Windshear Detection Systems

Available <=====> 30+ Y7-100 (PRC)

Available <=====> 200+ An-24 (Int'l)

Y7-200B Avionics

Available <=====> 30+ Y7-100 (PRC)

TCAS II

Available <=====> 30+ Y7-100 (PRC)

Available <=====> 200+ An-24 (Int'l)

Program	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
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