

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION TYPE CERTIFICATE SHEET E40NE	TCDS NUMBER E40NE REVISION: 9 * DATE: JUNE 22, 1999 INTERNATIONAL AERO ENGINES AG MODELS: V2522-A5 V2525-D5 V2524-A5 V2528-D5 V2527-A5 V2533-A5 V2527E-A5 V2527M-A5 V2530-A5
------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Engines of models described herein conforming with this data sheet (which is part of Type Certificate Number E40NE) and other approved data on file with the Federal Aviation Administration, meet the minimum standards for use in certificated aircraft in accordance with pertinent aircraft data sheets and applicable portions of the Federal Aviation Regulations, provided they are installed, operated, and maintained as prescribed by the approved manufacturer's manuals and other approved instructions.

TYPE CERTIFICATE HOLDER International Aero Engines AG (IAE)
 c/o IAE Airworthiness
 400 Main Street
 East Hartford, CT 06108

I. MODELS	V2530-A5	V2527-A5 & V2527E-A5 V2527M-A5	V2522-A5	V2524-A5
TYPE	Dual rotor, axial flow, high bypass turbofan, single-stage fan; four-stage low pressure compressor, ten-stage high pressure compressor, annular combustor, two-stage high-pressure turbine, five-stage low pressure turbine.			
RATINGS (SEE NOTE 5)				
Maximum continuous at sea level, static thrust, lb	26,950	22,240	19,200	19,200
Takeoff (5 min.) at sea level, static thrust, lb	29,900	24,800	23,040	24,480
OEI (See NOTE 21)				
COMPONENTS	For information refer to the Installation and Operating Manual (IOM); Installation Handbook; Illustrated Parts Catalogue or Approved Parts List.			
PRINCIPAL DIMENSIONS (in)				
Length	126.0205	--	126.0205	--
Normal diameter	66.23	--	66.23	--
Maximum radial projection	43.048	--	43.048	--

★

PAGE	1	2	3	4	5	6	7	8
REV.	9	9	9	9	4	9	9	9

LEGEND: "--" INDICATES "SAME AS PRECEDING MODEL"
 "---" NOT APPLICABLE

I. MODELS	V2528-D5	V2525-D5	V2533-A5	
TYPE	Dual rotor, axial flow, high bypass turbofan, single-stage fan; four-stage low pressure compressor, ten-stage high pressure compressor, annular combustor, two-stage high-pressure turbine, five-stage low pressure turbine.			
RATINGS (SEE NOTE 5)				
Maximum continuous at sea level, static thrust, lb	25,660	23,900	26,950	
Takeoff (5 min.) at sea level, static thrust, lb	28,000	25,000	31,600	
COMPONENTS	For information refer to the Installation and Operating Manual (IOM); Installation Handbook; Illustrated Parts Catalogue or Approved Parts List.			
PRINCIPAL DIMENSIONS (in)				
Length	126.0205	--	--	
Normal diameter	66.23	--	--	
Maximum radial projection	43.665	--	43,048	

I. MODELS (cont.)	V2530-A5 V2533-A5	V2527-A5 V2527E-A5 V2527M-A5	V2522-A5 V2524-A5	V2528-D5	V2525-D5
WEIGHT (DRY) (Includes all essential accessories, but excludes starter, exhaust nozzle, and power source for the ignition system for the -A5 series, and exhaust nozzle for the -D5 series)	2,404 kg/ 5,300 lb	--	--	2,595 kg/ 5,720 lb	--
CENTER OF GRAVITY (in)					
Aft of front mount area centerline	15.7±1.0	--	--	14.1±1.0	--
Below engine centerline	1.7±0.5	--	--	1.6±.5	--
Starboard of engine vertical centerline	0.7±.5	--	--	0.1±.5	--

FUEL (SEE NOTE 10)

OIL (SEE NOTES 11)

CERTIFICATION BASIS

For V2530-A5/V2527-A5/V2527E-A5/V2528-D5/V2525-D5 FAR 33, effective February 1, 1965, as amended by 33-1 through 33-14 inclusive. For V2522-A5/V2524-A5/V2527M-A5/V2533-A5 FAR 33, effective February 1, 1965, as amended by 33-1 through 33-14, inclusive and FAR 33.28, Amendment 33-15.

Model	Number E40NE Date of Application	Issued/Revised
V2530-A5/V2527-A5	NOV.17 1989 (Orig) OCT 12, 1992 (Rev)	NOV 24, 1992
V2528-D5/V2525-D5	MAR 22, 1990 (Orig) OCT 19, 1992 (Rev)	NOV 24, 1992
V2527E-A5	JUN 6, 1995	AUG 4, 1995
V2522-A5/V2524-A5	JUL 24, 1995	APR 19, 1996
V2533-A5	DEC 16, 1994	AUG 21, 1996
V2527M-A5	FEB 25, 1999	MAY 3, 1999

PRODUCTION BASIS

Production Certification No. 114NE

NOTES

NOTE 1. Maximum permissible engine operating speeds for the engine rotors as follows:

Low Pressure rotor (N1), RPM 5,650 (100%)
 High Pressure rotor (N2), RPM 14,950 (100%)

NOTE 2.

Turbine Exhaust Gas
 Temperature
 (Actual/Indicated °C)
 (See NOTE 19)

	<u>V2530-A5</u>	<u>V2527-A5* & V2527E-A5 & V2527M-A5</u>	<u>V2522-A5</u>	<u>V2524-A5</u>	<u>V2525-D5</u>	<u>V2528-D5</u>
Takeoff (5 min)	650/650	645/635	625/635	635/635	620/620	635/635
Maximum Continuous	610/610	--	--	--	--	--
Start Ground	635/635	--	--	--	--	--
Inflight	635/635	--	--	--	--	--
<u>V2533-A5</u>						
Takeoff (5 min)	670/650					
Maximum Continuous	610/610					
Start Ground	635/635					
Inflight	635/635					

Oil Outlet Temperature

(All Models)

Continuous operation 155°C/311°F
 Transient operation 165°C/329°F maximum
 (15 min.)

*The cockpit and aircraft flight manuals for SCN9A(V2527-A5) will reflect a ground and air start limit of 635°C, but the ECC software allows an actual limit of 645°C. All other and subsequent software versions have a software limit of 635°C.

NOTE 3.

Fuel and oil pressure limits

Fuel Pressure

At inlet to engine system pump, not less than 5 psig above the true vapor pressure of the fuel and not greater than 70 psig with a vapor/liquid ratio of zero.

Oil Pressure

60 psig minimum.

NOTE 4.

Maximum permissible air bleed extraction for the V2522-A5/V2524-A5/V2527-A5/V2527M-A5/V2530-A5/V2527E-A5/V2533-A5 is as follows:

<u>7th Stage Bleed</u>	<u>Max Bleed Limit(2)</u> <u>(% of core flow (WA26))</u>
At or below 90% Corrected high rotor speed	8.2%
From 90% to 97% Corrected high rotor speed	Linear variation from 8.2% to 6.0%
At or above 97% Corrected high rotor speed	6.0%

NOTE 4. (Continued)

<u>10th Stage Bleed(1)</u>	
At or below 61% corrected high rotor speed	13.7%
From 61% to 78% corrected high rotor speed	Linear variation from 13.7% to 12.0%
From 78% to 97% corrected high rotor speed	Linear variation from 12.0% to 6.0%
At or above 97% corrected high rotor speed	6.0%

- (1) No 10th Stage bleed allowed below 22,000 ft. at Max. Continuous Rating and above.
- (2) Simultaneous use of 7th and 10th stage bleed at limiting conditions is allowed only when required by a malfunction and only until the next landing.

Maximum permissible air bleed extraction for the V2525-D5/V2528-D5 is as follows:

Single Stage Bleed:

<u>7th Stage Bleed</u>	<u>Max Single Stage Bleed Limit(2)</u> <u>(% of core flow (WA26)):</u>
At or below 100% corrected N2	9.2%

10th Stage Bleed(1)

From minimum idle to 65% corrected N2	linear variation from 16% to 18%(5)
From 65% to 75% corrected N2	linear variation from 18% to 16%
From 75% to 84% corrected N2	16%
From 84% to 97.5% corrected N2	linear variation from 16% to 7%
From 97.5% to 100% corrected N2	7%

Mixed Stage Bleed:

<u>7th Stage Bleed</u>	<u>Max Mixed Stage Bleed Limit(3)</u> <u>(% of core flow (WA26))</u>
From 79% to 86.5% corrected N2	linear variation from 0% to 9%
From 86.5% to 96% corrected N2	9%

10th Stage Bleed(4)

From 79% to 84% corrected N2	16%
From 84% to 93.6% corrected N2	linear variation from 16% to 4%
From 93.6% to 96% corrected N2	4%

- NOTE 4. (Continued)
- (1) Below 24,000 ft.:
- at ambient temperatures above 40°F, no 10th stage bleed is allowed at Max. Continuous Rating and above.
 - At 40°F ambient temperature and below, a maximum of 2% 10th stage bleed is allowed at takeoff rating and 4% 10th stage bleed at Max. Continuous Rating.
- (2) The allowable 7th and/or 10th stage bleed is in addition to the bleed used for inlet cowl anti-icing.
- (3) Simultaneous use of 7th and 10th stage bleed is allowed at any power condition due to malfunction and only until the next landing.
- (4) When simultaneous bleed flow is required, the addition of the 7th and 10th stage bleed may not exceed the total extraction limits shown below.
- (5) 18% for ambient temperatures of 30°F and below only.

<u>Total Simultaneous Bleed Flow</u>	<u>Max Combined Bleed Limit (%WA26)</u>
From 79% to 80% corrected N2	linear variation from 16% to 16.5%
From 80% to 87.5% corrected N2	16.5%
From 87.5% to 91% corrected N2	linear variation from 16.5% to 12.5%
From 91% to 96% corrected N2	12.5%

NOTE 5. The ratings are based on Sea Level Static test stand operation under the following condition:

- Engine inlet air at 59°F and 29.92 in.Hg.
- Specified fuel and oil (see NOTES 10 and 11).
- No fan or compressor air bleed or load on accessory drives.
- Ideal inlet pressure recovery.
- A mixed exhaust system having no internal pressure losses and a mixed primary nozzle velocity coefficient equal to 1.0.
- Takeoff rating is a maximum thrust certified for takeoff operation. The specified takeoff thrust is available at and below:

V2530-A5 & <u>V2533-A5</u>	V2527-A5 & <u>V2527E-A5</u> & <u>V2527M-A5</u>	V2522-A5 <u>V2524-A5</u>	<u>V2528-D5</u>	<u>V2525-D5</u>
ISA+15°C/27°F	ISA+31°C/56°F	ISA+40°C/72°F	ISA+15°C/27°F	ISA+15°C/27°F

Maximum Continuous rating is the maximum thrust certified for continuous operation. The specified thrust is available at and below ISA +18°F (10°C) ambient temperature.

NOTE 6. The accessory drive provisions shown in the following tabulation are incorporated in the V2530-A5/V2527-A5/V2527E-A5/V2527M-A5/V2522-A5/V2524-A5/V2533-A5

<u>Drive</u>	<u>Rotation</u>	<u>Speed Ratio to Turbine Shaft</u>	<u>Torque (lb.-in.) Cont.</u>	<u>Torque (lb.-in.) Static</u>	<u>Overload</u>	<u>Overhang (lb. - in.)</u>
Starter	CCW	0.941:1	-	*	-	550
IDGS	CCW	0.604:1	**	11000	**	800
Fluid Power Pump	CCW	0.267:1	1300	6500	1950	400

CCW = Counterclockwise

* Maximum starter torque = 470 lb.-ft. at zero rpm. The maximum allowable starter torque value is 1175 lb.-ft.

** Maximum allowable continuous torque values are equivalent to 175 horsepower at any engine speed. The following overload conditions can be accommodated.

<u>Horsepower</u>	<u>Duration Time</u>	<u>Recurring Time (Hours)</u>
225	5 minutes	1000
225	5 seconds	1
450	5 seconds	1000

NOTE 6. (cont.) The accessory drive provisions shown in the following tabulation are incorporated in the V2528-D5 / V2525-D5

<u>Drive</u>	<u>Rotation</u>	<u>Speed Ratio to Turbine Shaft</u>	<u>Torque (lb.-in.) Cont.</u>	<u>Torque (lb.-in.) Static</u>	<u>Overload</u>	<u>Overhang (lb. - in.)</u>
Starter	CCW	0.941:1	-	*	-	550
VSCF	CCW	1.582:1	**	5500	**	1000
Fluid Power Pump	CCW	0.275:1	1100	4700	2100	100

CCW = Counterclockwise

* Maximum starter torque = 470 lb.-ft. at zero rpm. The maximum allowable starter torque value is 1175 lb.-ft.

** Maximum allowable continuous torque values are equivalent to 140 horsepower at any engine speed. The following overload conditions can be accommodated.

<u>Horsepower</u>	<u>Duration Time</u>	<u>Recurring Time (Hours)</u>
167	5 minutes	1000
225	5 seconds	1
335	5 seconds	1000

NOTE 7. Power setting, power checks, and control of engine output in all operations is to be based upon International Aero Engines AG engine charts referring to either turbine discharge section gas pressure or low rotor speed. Pressure probes and a low rotor speed sensor are included in the engine assembly for this reason.

NOTE 8. For inflight operation during icing conditions, the minimum allowable fan speed is 24.8% (1,400 RPM).

NOTE 9. Lightning and EMI protection capability of the electronic engine control system, including cables, are specified in the V2500-A5/-D5 Installation and Operating Manual, (IAE-0043/IAE-0174), Section 4.12.

- NOTE 10. Fuels and fuel additives conforming to the specifications listed in the latest applicable issue of the International Aero Engines V2500A5/-D5 Installation and Operating Manual (IAE-0043)/(IAE-0174). These fuels may be used separately or mixed in any proportions without adversely affecting the engine operation or power output.
- NOTE 11. Oils conforming to the specifications listed in the International Aero Engines V2500-A5/-D5 Installation and Operating Manual (IAE-0043)/(IAE-0174), latest revision, are approved for use in the V2500-A5/-D5 engine.
- NOTE 12. The V2500-A5/-D5 engines meet Federal Aviation Administration requirements for adequate turbine disk integrity and rotor blade containment and does not require external armoring. Certain engine parts are life limited. These limits are listed in the FAA approved International Aero Engines AG V2500 Turbofan Engine Manual. Time Limit Section, Chapter 5.
- NOTE 13. The engine meets the smoke and hydrocarbon emission requirements of FAR 34 and the carbon monoxide and nitrogen oxide requirements of International Civil Aviation Organization Standards.
- NOTE 14. The V2500-A5/-D5 engine meets the fuel venting emissions requirements of FAR 34.
- NOTE 15. The maximum permissible V2500-A5/-D5 engine inlet distortion limit is specified in the International Aero Engines V2500-A5/D5 Installation and Operating Manual (IAE-0043/IAE-0174).
- NOTE 16. Information regarding transient rotor shaft overspeed rpm, as well as transient gas overtemperature and number of overtemperature occurrences, is specified in the Maintenance Document.
- NOTE 17. Supplemental Type Certificate SE1091NE approves installation of a fan thrust reverser and exhaust system on the V2500-A5 series models. The thrust reverser/exhaust system identified as Drawing Number 745D8018, consists of the fan thrust reverser, common nozzle assembly, tail plug, and pylon installation kit, and consists of parts listed in IAE Thrust Reverser Type Design Bill-of-Material, Serial No. N5004.
- NOTE 18. Time limited dispatch (TLD) limits for the V2500-A5/-D5 FADEC control system are listed in the V2500 Installation and Operating Manual (IOM) (IAE-0043; V2500-A5) (IAE-0174; V2500-D5), Section 4.13. The technical data substantiating the IOM TLD limits are contained in IAE V2500 Reports IAE-0184 (V2500-A5), PWA-6564, and PWA-6243.
- NOTE 19. EEC software provides the capability of biasing indicated versus actual EGT values so as to provide consistent displayed EGT limit values to the aircraft. The actual versus indicated EGT values are controlled by a combination of EEC software, and Data Entry Plug (DEP) wiring scheme. Engine EGT limits are controlled by EEC P/N and DEP P/N, and are only implemented by specific service bulletin instructions. The engine data plate also reflects the engine limits configuration. NOTE 2 gives the maximum permissible approved EGT values for individual engine models, although these maximum values may not be implemented on all models. See the Installation and Operating Manual, Document No. IAE-0174(D5) or IAE-0043(A5), for information defining the EGT limit values currently assigned to specific engine models.
- NOTE 20. Model Description:
- | | |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| V2527-A5: | Basic Model, Airbus A320 applications. |
| V2530-A5: | Basic Model, Airbus A321 applications. |
| V2528-D5: | Base Model, Douglas MD-90 applications. |
| V2525-D5: | Base model, Douglas MD-90 applications. |
| V2527E-A5: | Enhanced takeoff thrust model, Airbus A320 applications.
The V2527E-A5 provides increased takeoff thrust at altitudes above sea level relative to the V2527-A5 base model. |
| V2527M-A5: | Enhanced climb thrust for Airbus A319 applications. |
| V2522-A5: | Reduced thrust model, Airbus A319 applications. |
| V2524-A5: | Reduced thrust model, Airbus A319 applications. |
| V2533-A5: | Increased takeoff thrust model, Airbus A321 applications. |

NOTE 21.

Use of takeoff thrust for more than five minutes (not to exceed ten minutes) is approved for use only in the event of an inoperative engine due to shutdown or failure.

---THE END---