

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

1E13
Revision 8
Lycoming Engines
TVO-435-A1A
O-435-25
TVO-435-B1A (O-435-25A),
-B1B, -C1A
TVO-435-D1A, -D1B, -E1A,
-F1A, -G1A, -G1B
November 04, 2010

TYPE CERTIFICATE DATA SHEET NO. 1E13

Engines of models described herein conforming with this data sheet (which is a part of type certificate No. 1E13) 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 Civil Air Regulations/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 Lycoming Engines
 An Operating Division of AVCO Corporation
 Williamsport, Pennsylvania 17701

Type Certificate Holder Record Avco Lycoming Division, Avco Corp. transferred TC 1E13 to Lycoming Engines, An Operating
 Division of AVCO Corporation on November 04, 2010

Model: Lycoming	TVO-435-A1A	TVO-435-B1A(-25A), -B1B	TVO-435-C1A	TVO-435-D1A, -D1B
Type: 6HOA Vertical Mounted Direct Drive Turbosupercharged				

Rating (See NOTE 5)

Max. continuous, hp., r.p.m., in. Hg., at:				
Rated pressure altitude ft.	220-3200-30.0-20,000	220-3200-30.3-20,000	250-3200-34.8-20,000	220-3200-27.8-20,000
Sea level pressure altitude ft.	220-3200-27.2-S.L.	220-3200-27.5-S.L.	250-3200-30.0-S.L.	220-3200-26.4-S.L.

Takeoff (5 min.), hp., r.p.m., in. Hg., at:

Rated pressure altitude ft.	260-3200-33.2-15,000	270-3200-35.1-14,000	280-3200-37.0-16,000	270-3200-35.0-18,000
Sea level pressure altitude ft.	260-3200-31.7-S.L.	270-3200-32.8-S.L.	380-3200-34.0-S.L.	270-3200-32.0-S.L.

Fuel (minimum grade aviation gasoline) 100/130	--	--	--	--
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Lubricating oil (lubricants should conform to the specifications as listed or to subsequent revisions thereto.)	Latest Edition of Lycoming Service Instruction No. 1014	--	--	--
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Bore and stroke, in.	4.875 x 3.875	--	--	--
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Displacement, cu. in.	434.0	--	--	--
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Compression ratio	7.3:1	--	--	--
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Weight (dry), lb.	See NOTE 8	--	--	--
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C.G. Location (dry and in horizontal position)

From front face of crankcase, in.	15.30	15.92	--	15.30
Off crankshaft C.L., in.	1.13 below 0.10 right	2.00 below 0.75 left	--	1.55 below 0.45 left

Propeller shaft	Flange type power takeoff	--	--	--
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Crankshaft dampers & balancers	None	--	--	--
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Carburetion#	Marvel-Schebler + MA-6AA	--	--	--
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Turbosupercharger – Kelly Aerospace* models (NOTE 5)	T-1108	--	T-1112	TE-0659
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Ignition, dual	See NOTE 8	--	--	--
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Timing °BTC	25	--	--	--
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Spark plugs	See NOTE 9	--	--	--
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Oil sump capacity	Dry sump	--	--	--
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NOTES	1 thru 10	--	--	--
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Model: Lycoming O-435-25 TVO-435-F1A TVO-435-E1A TVO-435-G1A, -G1B
 Type: 6HOA Vertical Mounted Direct Drive Turbosupercharged

Rating (See NOTE 5)

Max. continuous, hp., r.p.m., in. Hg., at:
 Rated pressure altitude ft. 220-3200-30.0-20,000 250-3200-32.0-20,000 220-3200-27.8-20,000 220-3200-27.9-20,000
 Sea level pressure altitude ft. 220-3200-27.2-S.L. 250-3200-29.7-S.L. 220-3200-26.4-S.L. 220-3200-26.5-S.L.

Takeoff (5 min.), hp., r.p.m., in. Hg., at:
 Rated pressure altitude ft. 260-3200-33.2-15,000 280-3200-37.0-18,000 260-3200-32.7-26,000 280-3200-37.0-18,000
 Sea level pressure altitude ft. 260-3200-31.7-S.L. 280-3200-33.3-S.L. 260-3200-30.8-S.L. 280-3200-33.3-S.L.

Fuel (minimum grade aviation gasoline) 100/130 -- -- --

Lubricating oil (lubricants should conform to the specifications as listed or to subsequent revision thereto.) MIL-L-6082 Latest Edition of Lycoming - Service Instruction No. 1014 -- --

Bore and stroke, in. 4.875 x 3.875 -- -- --

Displacement, cu. in. 434.0 -- -- --

Compression ratio 7.3:1 -- -- --

Weight (dry), lb. See NOTE 8 -- -- --

C.G. Location (dry and in horizontal position)

From front face of crankcase, in. 15.92 15.94 15.50 --

Off crankshaft C.L., in. 2.00 below 1.75 below 1.55 below --

0.75 left 0.69 left 0.45 left --

Propeller shaft Flange type power takeoff -- -- --

Crankshaft dampers & balancers None -- -- --

Carburetion# Marvel-Schebler + MA-6-AA -- -- --

Turbocharger - Kelly Aerospace* models (NOTE 5) T-1108 TK-0659 -- --

Ignition, dual See NOTE 8 -- -- --

Timing °BTC 25 -- -- --

Spark plugs See NOTE 9 -- -- --

Oil sump capacity, qt. Dry sump 10 Dry sump --

Usable oil (nose 15° up or down) — 6 — —

NOTES 1 thru 11 1,2,3,4,5,6,7,8,9,10,12 1 thru 10 --

"- -" indicates "same as preceding model"

"—" indicates "does not apply"

See latest edition of Lycoming SI 1523 for alternate approved Carburetors

+ Marvel-Schebler formerly Volare, Precision Airmotive Corporation, Facet Aerospace Products Company, and Borg Warner Corporation

* Kelly Aerospace, formerly AiResearch

Certification basis:

<u>Regulations and Amendments</u>	<u>Model</u>	<u>Date of Application</u>	<u>Date Type Certificate 1E13 Issued/Revised</u>
CAR 13 As Amended to June 15, 1956 13-1, 13-2, 13-3 13-4	TVO-435-A1A	January 5, 1961	May 12, 1961
	TVO-435-B1A	July 24, 1962	November 21, 1962
	TVO-435-C1A	October 24, 1962	November 21, 1962
	O-435-25	May 29, 1963	June 10, 1963
FAR 33, 33-1 Effective February 1, 1965	TVO 435-D1A	March 4, 1966	March 10, 1966
	O-435-25A	March 4, 1966	March 10, 1966
	TVO-435-B1B	June 20, 1966	June 20, 1966
	33-2 TVO-435-D1B	January 17, 1967	February 23, 1967
	33-3 TVO-435-E1A	January 17, 1967	March 7, 1967
	TVO-435-F1A	May 17, 1967	January 22, 1968
	O-435-G1A	December 28, 1967	January 11, 1968
	O-435-G1B	November 15, 1968	November 25, 1968

Production basis: Production Certificate No. 3.

NOTE 1. Maximum permissible temperatures:

Cylinder Head (Well Type Thermocouple)	Cylinder Base *	Oil Inlet	Exhaust Gas (Turbo Inlet at Location Shown on Lycoming Dwg. No. 63147) **	Carburetor Inlet Air
500°F	300°F 325°F (O-435-25)	235°F	1650°F	325°F (A1A), (D1A) 330°F (B1A), (B1B) 320°F (C1A) 325°F (O-435-25), (D1B) (E1A), (F1A), (G1A), (G1B)

* This parameter dispensed with where pistons internally cooled by oil jets. (See NOTE 10)

** Drawing No. 63251 for -D1A, -D1B, -E1A, -G1A & -G1B; Drawing No. 63282 for -F1A.

NOTE 2. Pressure range and temperature rise.

	Maximum	Minimum	Idle
Fuel Pressure Limits: (above carburetor entrance air pressure) (at inlet to carburetor)	8 p.s.i.	4 p.s.i.	
Oil pressure limits: (Model -F1A)	70 p.s.i.. (O-435-25 75 ± 10) 85 p.s.i.	50 p.s.i. 65 p.s.i.	25 p.s.i. 25 p.s.i.

Model	Carb. Inlet Air Pressure (Max.) in. Hg.	Manifold Pressure (Max.) in. Hg.	Compressor Temperature Rise (Max.) °F
TVO-435-A1A	38	34.5	240
-B1A, -B1B	39	37	240
-C1A	41	39	230
-D1A, -D1B	39	37	220
-E1A	38	34	240
-F1A, -G1A, -G1B	39	37	220
O-435-25	38	34.5	240

NOTE 3. The following accessory provisions are available:

Accessory	All Except		Rotation Facing Drive Pad	Speed Ratio to Crankshaft	Maximum Torque (in. -lb.)		Maximum Overhang Moment (in. -lb.)
	-F1A	-F1A			Cont.	Static	
Starter	*	—	c	1.000:1	—	12,000	300
Alternator	—	*	cc	2.250:1	60	400	175
Generator ***	*	—	c	2.600:1	500	2,200	400
Fuel Pump	*	—	cc	.803:1	25	450	25
Vacuum Pump	*	—	c	1.219:1	200	800	25
Vacuum Pump	—	*	c	1.105:1	200	800	25
Hydraulic Pump	**	—	c	1.083:1	400	1,650	175
Tachometer	*	—	cc	.500:1	7	50	—
Tachometer	—	*	cc	.500:1	7	50	5
Dual drives mounting on hydraulic pump pad:							
Hydraulic Pump	—	*	c	1.105:1	400	1,650	175
Fuel Pump	—	*	c	.789:1	25	450	25

* Standard

** Supplied as optional equipment.

*** Not available as generator drive when fitted with hand crank starter jaw.

NOTE 4. This engine is approved for helicopter application and operation in a vertical mount installation.

NOTE 5. These engine models are equipped with Kelly Aerospace (formerly AiResearch) turbosupercharger Models T-1106, T-1112 or TE-0659, as indicated on pages 1 and 2 of this data sheet. An integral automatic power control makes standard day, sea level ratings available at other than standard conditions up to critical altitudes. Performance data for these engines are presented on Lycoming Curve Nos. 12814 (A1A), 12886 (B1A (-25A), and (B1B), 12888 (C1A), 13023 (D1A and D1B), 13057 (E1A), 13076 (F1A), 13092 (G1A and G1B), and 12814 (O-435-25).

NOTE 6. The turbocharger control is servo-operated from either engine oil or an external supply of MIL-H-5606 hydraulic fluid at a pressure of 60 - 70 p.s.i. This control is not equipped to use "Skydrol" fluid.

NOTE 7. The turbocharger meets the containment requirements of CAR 13.116 and does not require external protection.

NOTE 8. Ignition and Weights:

<u>Models</u>	<u>Ignition, dual[#]</u>	<u>Weight (dry) lb.</u>
TVO-435-A1A	TCM S6RN-200 & S6LN-204	468
-B1A, (-25A)	TCM S6RN-200 & S6LN-204	478
-B1B	TCM S6RN-1208 & S6LN-1209	479
-C1A	TCM S6RN-200 & S6LN-204	478
-D1A	TCM S6RN-1208 & S6LN-1209	465
-D1B	TCM S6RN-200 & S6LN-204	464
-E1A	TCM S6RN-200 & S6LN-204	462
-F1A	TCM S6LN-1208 & S6RN-1209	490
-G1A	TCM S6RN-1208 & S6LN-1209	465
-G1B	TCM S6RN-200 & S6LN-204	464
O-435-25	TCM S6RN-200 & S6LN-204	493

TCM formerly Bendix.

NOTE 9. Spark plugs: See latest revision of Lycoming Service Instruction No. 1042 for approved equipment.

NOTE 10. These engines incorporate the following similarities or differences:

<u>Model</u>	<u>Characteristics</u>
TVO-435-A1A	Six cylinder, air cooled, horizontally opposed, vertical mounted, direct drive turbosupercharged engine with internal piston cooling oil jets.
TVO-435-B1A	Similar to -A1A except that cylinder assemblies are machined for long reach spark plugs.
TVO-435-B1B	Same as -B1A except has TCM (formerly Bendix) S6RN-1208 and S6LN-1209 magnetos.
TVO-435-C1A	Similar to -B1A except incorporates T-1112 turbosupercharger.
O-435-25	Military model similar to -A1A except has cylinder assemblies similar to -B1A.
TVO-435-D1A	Similar to TVO-435-B1A except incorporates TK-0659 turbosupercharger and TCM (formerly Bendix) S6RN-1208 (retard breaker) and S6LN-1209 magnetos.
TVO-435-D1B	Same as -D1A except for incorporation of TCM (formerly Bendix) S-200 series magnetos.
TVO-435-E1A	Same as -A1A except for incorporation of Kelly Aerospace (formerly AiResearch) TK-0659 turbosupercharger.
TVO-435-F1A	Similar to -D1A except is wet sump, has different accessory section and higher power rating.
TVO-435-G1A	Similar to -D1A except has different automatic waste gate control setting for higher power rating.
TVO-435-G1B	Same as -G1A except has different magnetos.

NOTE 11. Military Models O-435-25 and O-435-25A are similar and identical to TVO-435 Models -A1A and -B1A, respectively. When installed in certificated aircraft, the corresponding civil model designation and type certificate number should be added to the engine data plate.

NOTE 12. Starters, generators and alternators approved for use on these engines are listed in the latest revision of Lycoming Service Instruction No. 1154 (-F1A only).

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