

AIRWORTHINESS APPROVAL NOTE NO: 27744 Issue 3

APPLICANT: CAA Internal Purposes

AIRCRAFT TYPE: N/A - Engine Modification

REGISTRATION NO: - CONSTRUCTOR'S NO: -

OPERATOR: -

INSTALLER: -

DESIGN ORGANISATION: Experimental Aircraft Association, Petersen Aviation Inc.

CERTIFICATE CATEGORY: Private

MODIFICATION NO: -

MODIFICATION TITLE: **Validation of FAA-approved engine modifications to enable the use of unleaded motor gasoline, conforming with specification EN228**

**1. Introduction**

The FAA has approved the use of unleaded “autogas”, (conforming with US standards ASTM D-439 and D-4814), for a wide range of aircraft engines under STC procedures. Due to the problems of obtaining Avgas in quantities suitable for private operations from unlicensed aerodromes, the CAA has previously allowed certain aircraft to use leaded motor gasoline conforming with BS:4040, subject to certain conditions. Supplies of BS:4040 are now restricted by environmental legislation. The purpose of this AAN is to validate the FAA-approval of unleaded motor gasoline in aircraft engines in order to facilitate the use of the fuel by private category aircraft in the UK.

This AAN is concerned with the approval of the fuel for engines only, and does not approve any aircraft to use unleaded motor gasoline. The use of this fuel in aircraft is subject to separate approval.

Issue 2 of this AAN amends the Lycoming approvals to add STCs SE2563CE and SE2587CE as relevant to the Robinson R22 helicopter models.

Issue 3 corrects a typographical error entered with STC SE2587CE, for which the applicable engine is O-320-B2C.

**2. Modification Definition**

The FAA-approved engine modifications validated by this AAN are listed in this section:

<u>Engine Make</u>	<u>Engine Model</u>	<u>STC No.</u>	<u>STC Holder</u>
Continental (Teledyne)	A-65-1, -3, -6, -6J, -7, -8, -8F, -8FJ, -8J, -9, -9F, -9FJ, -9J, -12, -12F, -12FJ, -12J, -14, -14F, -14FJ, -14J; O-170-3, O-170-5, O-170-7	SE2029CE	Petersen Aviation
Continental (Teledyne)	A75-3, -6, -6J, -8, -8F, -8J, -8FJ, -9, -9J, C-75-8, -8F, -8FH, -8FHJ, -8FJ, -8J, -12, -12F, -12FH, -12FHJ, -12FJ, -12J, -12B, -12BF, -12BFH, -15, -15F, C85-8, -8F, -8FHJ, -8FJ, -12, -12F, -12FH, -12FHJ, -12FJ, -12J, -14F, -15, -15F.	SE2030CE	Petersen Aviation
Continental (Teledyne/ RR)	C90-8F, -8FJ, -12F, -12FH, -12FJ, -12FP, -14F, -14FH, -14FJ, -16F; O-200A, -B, -C	SE2031CE	Petersen Aviation
Continental (Teledyne)	C-115-1, C-115-2, C-125-1, C-125-2	SE2032CE	Petersen Aviation
Continental (Teledyne)	E-165-2, -3, -4, E-185-1, -2, -3, -5, -8, -9, -10, -11; O-470-7, O-470-7A, O-470-7B	SE2033CE	Petersen Aviation
Continental (Teledyne/ RR)	E-225-2, -4, -8, -9	SE2034CE	Petersen Aviation
Continental (Teledyne)	W670-6A, -6N, -16, -23, -24, -K, -M; R-670-3, -4, -5, -8, -11, -11A	SE2028CE	Petersen Aviation
Continental (Teledyne/ RR)	O-300-A, -B, -C, -D, -E; C145-2, -2H, -2HP	SE2006CE	Petersen Aviation
Continental (Teledyne)	GO-300-A, -B, -C, -D, -E, -F	SE2105CE	Petersen Aviation
Continental (Teledyne)	O-470-4, -11, -11B, -11-CI, -11B-CI, -13, -13A, -15	SE2094CE	Petersen Aviation
Continental (Teledyne)	O-470-A, -E, -J, -K, -L, -R, -S	SE1997CE	Petersen Aviation
Continental (Teledyne)	IO-470-J, -K	SE2016CE	Petersen Aviation
Continental (Teledyne)	A-50-1, -2, -3, -4, -4J, -5, -5J, -6, -6J, -7, -7J, -8, -8J, -9, -9J; A-65-1, -3, -6, -6J, -7, -8, -8F, -8FJ, -8J, -9, -9F, -9FJ, -9J, -12, -12F, -12FJ, -12J, -14, -14F, -14FJ, -14J; O-170-3, -5, -7; A75-3, -6, -6J, -8, -8F, -8J, -8FJ, -9, -9J; A-40, A-40-2, -3, -4, -5; C75-8, -8F, -8FH, -8FHJ, -8FJ, -8J; C75-12, -12F, -12FH, -12FHJ, -12FJ, -12J, -12B, -12BF, -12BFH, -15, -15F;	SE634GL	Experimental Aircraft Association

<u>Engine Make</u>	<u>Engine Model</u>	<u>STC No.</u>	<u>STC Holder</u>
Continental (Teledyne/ RR)	C85-8, -8F, -8FHJ, -8FJ, -8J; C85-12, -12F, -12FH, -12FHJ, -12FJ, -12J, -14F, -15, -15F. C90-8F, -8FJ, -12F, -12FH, -12FJ, -12FP, -14F, -14FH, -14FJ, -16F; O-200-A, -B, -C;	SE634GL	Experimental Aircraft Association
Continental (Teledyne/ RR)	C-125-1, C-125-2; C145-2, -2H, -2HP; E-165-2, -3, -4; E-185-1, -2, -3, -5, -8, -9, -10, -11; O-470-7, O-470-7A, O-470-7B; E-225-2, -4, -8, -9; O-300-A, -B, -C, -D, -E; GO-300-A, -B, -C, -D, -E, -F; O-470-A, -E, -J, -K, -L, -R, -S; O-470-4, -11, -11B, -13, -13B, -15.	SE693GL	Experimental Aircraft Association
Textron Lycoming	O-145-B1, -B2, -B3, -C1, -C2; GO-145-C1, -C2, -C3	SE2465CE	Petersen Aviation
Textron Lycoming	O-145-A1, -A2	SE2466CE	Petersen Aviation
Textron Lycoming	O-235-C, -C1, -C1B, -E1, -E1B, -C1C, -C1A, -H2C, -C2A, -C2B, -C2C, -E2A, -E2B.	SE2035CE	Petersen Aviation
Textron Lycoming	O-290-A, -AP, -B, -C, -CP, -D, -D2, -D2A, -D2B, -D2C; O-290-1, -3, -11.	SE2036CE	Petersen Aviation
Textron Lycoming	O-320, O-320-A1A, -A1B, -A2A, -A2B, -A2C, -A2D, -A3A, -A3B, -A3C, -C1A, -C1B, -C2A, -C2B, -C2C, -C3A, -C3B, -C3C, -E1A, -E1B, -E1C, -E1F, -E2A, -E2B, -E2C, -E2D, -E2F, -E2G, -E2H, -E3D, -E3H, -E1J.	SE1931CE	Petersen Aviation
Textron Lycoming	O-360-B1A, -B1B, -B2A, -B2B, -D1A, -D2A, -D2B.	SE2574CE	Petersen Aviation
Textron Lycoming	O-360-J2A	SE2563CE (1)	Petersen Aviation
Textron Lycoming	O-320-B2C	SE2587CE (1)	Petersen Aviation
Textron Lycoming	O-435, O-435-A, O-435-C, O-435-C1, O-435-C2, O-435-1, -11, -13.	SE2278CE	Petersen Aviation
Textron Lycoming	O-540-B1A5, -B1B5, -B1D5, -B2A5, -B2B5, -B2C5, -B4A5, -B4B5.	SE1909CE	Petersen Aviation
Textron Lycoming	R-680	SE2412CE	Petersen Aviation
Textron Lycoming	R-680-B2, -BA, -2	SE2413CE	Petersen Aviation

<u>Engine Make</u>	<u>Engine Model</u>	<u>STC No.</u>	<u>STC Holder</u>
Textron Lycoming	R-680-6, -B6	SE2409CE	Petersen Aviation
Textron Lycoming	R-680-D5	SE2410CE	Petersen Aviation
Textron Lycoming	R-680-D6	SE2411CE	Petersen Aviation
Textron Lycoming	R-680-4, -B4, -B4B, -B4C, -B4D, -B4E; R-680-5, -7, -8, -11, -17	SE2414CE	Petersen Aviation
Textron Lycoming	R-680-5, -B5	SE2415CE	Petersen Aviation
Textron Lycoming	R-680E1, E2	SE2408CE	Petersen Aviation
Textron Lycoming	O-235-L2C, -K2C	SE790GL	Experimental Aircraft Association
Textron Lycoming	O-320-A, -C, -E; O-235-C, -E, -H; O-290, O-290-A, -AP, -B, -C, -CP, -D, -D2, -D2A, -D2B, -D2C	SE800GL	Experimental Aircraft Association
Textron Lycoming	O-540-B1A5, -B1B5, -B1D5, -B2A5, -B2B5, -B2C5, -B4A5, -B4B5.	SE956GL	Experimental Aircraft Association
Franklin	6A4-150-B3, -B4, -B31; 6A4-165-B3, -B6;	SE2127CE	Petersen Aviation
Franklin	4AC-176-B2, -B3, -BA2, -BA3, -C2, -C3, -D2, -D3, -F2, -F3, O-175-1	SE00128WI	Petersen Aviation
Jacobs	L-5, -5M, -5MB	SE2419CE	Petersen Aviation
Jacobs	L-6, -6, -6MA, -6MB, -6MBA, R-915-3, -5, -7	SE2417CE	Petersen Aviation
Jacobs	R-755-7	SE2420CE	Petersen Aviation
Jacobs	L-4, -4M, -4MA, -4MA7, -4MB, R-755-9	SE2418CE	Petersen Aviation
Jacobs	R-755A1, R-755A2, R-755B1, R-755B2	SE2416CE	Petersen Aviation
Kinner	R-5 Series 2, R-55, R-56; R-540-1, -3	SE00187WI	Petersen Aviation
Pratt & Whitney	R-985-13, -17, -19, -23, -25, -27, -39, -39A, -48, -50, -AN-1, -AN-1M1, -AN-2, -AN-3, -AN-4, -AN-5, -AN-6, -AN-6B, -AN-8, -AN-10, -AN-12, -AN-12B, -AN-14B, -AN-14BM1, -T1B2, -T1B3, -B-4, -B-5, -SB, -SB-2, -SB-3.	SE1860CE	Petersen Aviation
Pratt & Whitney	R-1340-E, -19, -22, -29, -36, -40, -47, -49, -49M1, -51, -AN-1, -AN-2, -51M1, -53, -57, -59, -61, -S1D1, -S3H1, -S3H1G, -S1H2, -S1H1, -S1H4, -S3H2.	SE1864CE	Petersen Aviation

Engine Make	Engine Model	STC No.	STC Holder
Ranger	6-440-C2, (L-440-1), -C3, -C4, -C5, (L-440-2, -3, -4, -7)	SE00129WI	Petersen Aviation
Rolls-Royce	O-300-A, -B, -C, -D	SE00135WI	Petersen Aviation
Rolls-Royce	C90-8F, -8FJ, -12F, -12FH, -12FJ, -12FP, -14F, -14FH, -14FJ, -16F; O-200-A, -B, -C	SE00137WI	Petersen Aviation
Rolls-Royce	C90-8F, -12F, -12FH, -12FP, -14F, -14FH, -16F; O-200-A, -B, -C; O-300-A, -B, -C, -D.	SE898GL	Experimental Aircraft Association
Warner	Super Scarab 40, 50, 50A; R-500-2, -4, -6.	SE2590CE	Petersen Aviation
Warner	Scarab Series 28, 29, 30, 40, 50;	SE2591CE	Petersen Aviation
Warner	Super Scarab 165, 165-A, 165-B, 165-D, R-500-1, -7;	SE2592CE	Petersen Aviation
Warner	Super Scarab 185, 185J, 185K; R-550-1, -3.	SE2593CE	Petersen Aviation

(1) This STC requires an anti-knock index (RON+MON)/2 of 91 or above, which is higher than the minimum specified by EN228. Consequently the operators of aircraft embodying this STC must ensure that the fuel conforms to EN228 and has an anti-knock rating of 91 or above.

The embodiment of the engine modification, including placards and document changes, must be in accordance with the relevant STC Holder's instructions. All conditions specified on the Supplemental Type Certificate must be adhered to.

### 3. **Approval Procedures**

This modification validation has been carried out in accordance with BCAR B2-2 and BCAR B4-2.

### 4. **Basis Of Validation**

These modifications have been approved by the FAA on the basis of compliance with FAR 33 or CAR 10/13 as applicable. These standards are broadly equivalent to those applicable in the UK, and are accepted as the basis of validation.

The justification of compliance presented by the STC Holders is in respect of engine operation using US motor gasolines conforming with ASTM D439 or ASTM D4814. Unleaded motor gasolines available in the UK conform with the European (and British) specification EN228. Approval of any engine to operate using EN228 on the basis of the FAA approval is dependent upon acceptance of the equivalence of EN228 with ASTM D439 and D4814 in all respects affecting airworthiness.

### 5. **Compliance With The Basis Of Validation**

Under the provisions of BCAR B2-2 the certification of these modifications by the State of design is accepted without investigation. The US Certification Basis is CAR 10/13/FAR 33. Details are given in the FAA Supplemental Type Certificates referenced in (2) above.

An investigation into the use of motor gasoline for aviation purposes has been carried out by the Institute of Aviation, Dresden University, Germany. Part 1, "Fuel Investigations" of their report reference L-6/97-50160/97 details a comparison of gasolines from Europe and the USA, including D4814 and EN228. The report concludes that these fuels may be regarded as identical in the context of the approvals provided under the FAA STCs. Also, FAA Advisory Circular AC 23.1521-1B states that "automobile gasolines....conforming to D439 and D4814 are essentially identical and may be used interchangeably". On the basis of this information from Germany and the US it is accepted that an approval to operate using fuels conforming with D439 or D4814 is equally valid when fuel conforming with EN228 is used.

## **6. Conditions Affecting This Approval**

The validation of these modifications under BCAR B2-2 and B4-2 is limited to engines installed in single-engine aircraft with maximum authorised weights not exceeding 2730 kg, powered by piston engines not exceeding 350 hp.

Attention is drawn to the condition stated on the FAA STCs that the compatibility of the modifications with other previously approved modifications, (installed on the particular aircraft, including the engine), must be verified by the installer. Where the potential for interactions between modifications exists, the advice of the CAA shall be sought.

This approval applies to the engine alone. Use of motor gasoline in the aircraft requires additional approval. The use of motor gasoline in aircraft is subject to certain restrictions as defined in the applicable CAA Airworthiness Notices and the aircraft limitations.

## **7. Continued Airworthiness**

The influence of the modifications on Airworthiness Directive, Service Bulletin eligibility and other data must be considered and the publications monitored accordingly. The maintenance schedule should be amended to include reference to this material additional to the original design

## **8. Survey**

No CAA survey is required.

## **9. Authorisation of Release to Service**

The embodiment of the engine modification must be included in the subsequent certification of release to service of the aircraft.

**10. Approval**

Subject to the conditions of Section 6, these modifications are approved for embodiment on the applicable engines as listed in Section 2, provided that each modification conforms with the contents of this AAN, and is within the applicability of the modification as approved by the FAA.

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M. Mazzoletti  
For the Civil Aviation Authority

Date 14 July 2004

**APPROVED BY EASA UNDER APPROVAL NUMBER 2004-3355  
DATED 1 APRIL 2004**