

AIRWORTHINESS APPROVAL NOTE NO: 27743 Issue 3

APPLICANT: CAA Internal Purposes

AIRCRAFT TYPE: Various - See List in Section 2 below

REGISTRATION NO: - CONSTRUCTOR'S NO: -

OPERATOR: -

INSTALLER: -

DESIGN ORGANISATION: Experimental Aircraft Association, Petersen Aviation Inc.,
H.Fuller, Maule Flight.

CERTIFICATE CATEGORY: Private

MODIFICATION NO: -

MODIFICATION TITLE: **Validation of FAA-approved aircraft 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 and their engines under STC procedures. (A separate FAA STC is issued for each engine type and for each airframe type).

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 in order to facilitate the use of the fuel by private category aircraft in the UK.

This AAN is concerned with the approval of unleaded motor gasoline for the aircraft only, and does not approve any engine to use unleaded motor gasoline. The use of this fuel in aircraft engines is subject to separate approval under AAN 27744.

Issue 2 of this AAN amends the approval for the Robinson R22 model to extend MOGAS use to those R22 models equipped with Lycoming O-320-B2C or Lycoming O-360-J2A.

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 aircraft modifications validated by this AAN are listed in this section. In every case the aircraft engine must be approved by the CAA to use unleaded motor gasoline conforming with EN228.

<u>Aircraft Make</u>	<u>Aircraft Model</u>	<u>STC No.</u>	<u>STC Holder</u>
Beech	D17S with P&W R-985 with STC SE1860CE	SA2009CE	Petersen Aviation
Beech	33 Series with TCM IO-470-K or -J engines with STC SE2016CE	SA2049CE	Petersen Aviation
Beech	35, A35, B35, C35, D35, E35, F35, G35, and 35R, with TCM E-185 Series, E-225 Series, TCM IO-470-K or -J engines with STC SE3033CE, SE2034CE, or SE2016CE as applicable.	SA2045CE	Petersen Aviation
Beech	35, A35, B35, C35, D35, E35, F35, G35, and 35R, with TCM E-185-1, -8, -11, or E-225-8 engines with STC SE693GL.	SA799GL	Experimental Aircraft Association
Bellanca/ Champion/ Aeronca	7GCAA, 7GCBC, 7AC, S7AC, 7BCM, 7CCM, 7DC, S7DC, S7CCM, 7EC, S7EC, 7FC, 7GC, 7HC, 7JC, 7KC, 7ECA, 7GCB, 7GCBA and 7GCA with Lycoming or TCM engines with STCs SE1931CE, SE2035CE, SE2036CE, SE2029CE, SE2030CE or SE2031CE as applicable.	SA1970CE	Petersen Aviation
Boeing	75 Series with P&W R-985-, or TCM W670- engines with STCs SE1860CE, or SE2028CE as applicable.	SA1934CE	Petersen Aviation
Cessna	120, 140 Series with gravity feed to carburettor and TCM C-85 or C-90 Series engines with STC SE2030CE or SE2031CE as applicable	SA2100CE	Petersen Aviation
Cessna	120, 140 with TCM C-85-12 or -12F engine with STC SE634GL	SA691GL	Experimental Aircraft Association
Cessna	140A with TCM C-90-12F engine with STC SE634GL	SA692GL	Experimental Aircraft Association
Cessna	140A with gravity feed to carburettor and TCM C-90 or C-85 engine with STC SE2031CE or SE2030CE as applicable	SA2096CE	Petersen Aviation
Cessna	150, 150A through 150M, A150K, A150L, A150M, 152 and A152; - aircraft with TCM O-200-A engines with STC SE2031CE, or low-compression Lycoming O-320 engines with STC SE1931CE	SA2048CE	Petersen Aviation
Cessna	150, 150A through 150H, and 150J through 150M - aircraft with TCM O-200-A engines with STC SE634GL	SA633GL	Experimental Aircraft Association

<u>Aircraft Make</u>	<u>Aircraft Model</u>	<u>STC No.</u>	<u>STC Holder</u>
Cessna	170, 170A, 170B with TCM C145-2, -2H with STC SE693GL	SA762GL	Experimental Aircraft Association
Cessna	170A, 170B with gravity feed to carburettor and TCM C145 or O-300 engine with STC SE2006CE	SA2019CE	Petersen Aviation
Cessna	172, 172A through 172H with TCM O-300- engines with STC SE2006CE, and 172I, K, L & M with Lycoming O-320-E2D engine with STC SE1931CE	SA1948CE	Petersen Aviation
Cessna	172, 172A, B, C, D, E, F, G, & H with TCM O-300-A, -B, -C, or -D with STC SE693GL	SA761GL	Experimental Aircraft Association
Cessna	172I, K, L, M with Lycoming O-320-E2D with STC SE800GL	SA801GL	Experimental Aircraft Association
Cessna	175, 175A, 175B, 175C, P172D with gravity feed to carburettor and TCM GO-300 engine with STC SE2105CE	SA2138CE	Petersen Aviation
Cessna	175, 175A, 175B, 175C, P172D with GO-300-A, -B, -C, -D, or -E engine with STC SE693GL	SA763GL	Experimental Aircraft Association
Cessna	177 with Lycoming O-320-E2D engine with STC SE1931CE	SA2010CE	Petersen Aviation
Cessna	177 with Lycoming O-320-E2D engine with STC SE800GL	SA803GL	Experimental Aircraft Association
Cessna	180, 180A through 180H, 180J with TCM O-470-A, -J, -K, -L, -R, -S engines with STC SE1997CE	SA2001CE	Petersen Aviation
Cessna	180, 180A through 180H, 180J, 180K with TCM O-470-A, -J, -K, -L, -R engines with STC SE693GL	SA695GL	Experimental Aircraft Association
Cessna	182, 182A through 182H, 182J through 182N and 182P with TCM O-470-L, -R, -S engines with STC SE1997CE	SA2000CE	Petersen Aviation
Cessna	182, 182A through 182H, 182J through 182N and 182P with TCM O-470-L, -R, -S engines with STC SE693GL	SA694GL	Experimental Aircraft Association
Cessna	188, 188A, 188B with TCM O-470-R engine with STC SE1997CE	SA2013CE	Petersen Aviation
Cessna	190, 195, 195A, 195B with TCM engines with STC SE2028CE, or Jacobs engines with STCs SE2416CE, SE2417CE, or SE2418CE	SA2421CE	Petersen Aviation

<u>Aircraft Make</u>	<u>Aircraft Model</u>	<u>STC No.</u>	<u>STC Holder</u>
Cessna	305B, 305E, T0-1D, 0-1D, 0-1F with TCM O-470- engines with STC SE2094CE	SA2098CE	Petersen Aviation
Cessna	305A, 305C, 305D, 305F, 0-1A, 0-1E, 0-1G with TCM O-470- engines with STC SE2094CE	SA2099CE	Petersen Aviation
Cessna	305A, 305C, 305D, 305F, 0-1A, 0-1E, 0-1G with TCM O-470-11 or -11B engine with STC SE693GL	SA759GL	Experimental Aircraft Association
Cessna	305B, 305E, T0-1A, 0-1D, 0-1F with TCM O-470-15 engine with STC SE693GL	SA760GL	Experimental Aircraft Association
DHC	DHC-2 with P&W R-985 with STC SE1860CE	SA1882CE	Petersen Aviation
Luscombe	8, 8A, 8C, 8D, 8E, 8F, T-8F with TCM A-50-1, A-65-1, A-75-8J, C-85-12, C-90-12F with STC SE634GL	SA730GL	Experimental Aircraft Association
Maule	M-4, M-4C, M-4S, M-4T with gravity feed to carburettor and TCM O-300 engine with STC SE2006CE	SA2097CE	Petersen Aviation
Maule	M-5-235, M-6-235, M-7-235, M-7-235A, M-7-235B, MX-7-235C, MX-7-235, M-7-235C; - with Lycoming O-540-B4B5 engines modified to STC SE1909CE	SA2963SO	Maule Flight
Piper	J3C-40, J3C-50, J3C-50S, J3C-65 L-4, L-4A, L-4B, L-4H, L-4J, J3C-65S, PA-11, PA-11S with TCM A-40-4, A-50-1, A-65-1, -8E engines with STC SE634GL	SA736GL	Experimental Aircraft Association
Piper	J-3 with TCM A-40 engine with STC SE634GL	SA775GL	Experimental Aircraft Association
Piper	J3F-50, J3F-50S, J3F-60, J3F-60S, J3F-65, J3F-65S with TCM engines with STC SE634GL	SA832GL	Experimental Aircraft Association
Piper	J3L, J3L-S, J3L-65, J3L-65S with TCM engines with STC SE634GL	SA833GL	Experimental Aircraft Association
Piper	J-3C-65, J3C-65S, PA-11, PA-11S with gravity feed to carburettor and TCM A-65-(), C-75-(), C-85-(), and C-90-() engines with STCs SE2029CE, SE2030CE, or SE2031CE	SA2080CE	Petersen Aviation

<u>Aircraft Make</u>	<u>Aircraft Model</u>	<u>STC No.</u>	<u>STC Holder</u>
Piper	J4, J4A, J4A-S with TCM A-50-1, A-65-1 engines with STC SE634GL	SA737GL	Experimental Aircraft Association
Piper	J4E, L-4E, with TCM A-75-9 engine with STC SE634GL	SA738GL	Experimental Aircraft Association
Piper	J4E, J4A-S with gravity feed to carburettor and TCM A-65-() engines with STC SE2029CE	SA2146CE	Petersen Aviation
Piper	J4E, L-4E with gravity feed to carburettor and TCM A-75-() engines with STC SE2030CE	SA2147CE	Petersen Aviation
Piper	PA-12, PA-12S with Lycoming O-235-(), O-290-(), O-320-() engines with STC SE1931CE, SE2035CE, or SE2036CE.	SA2075CE	Petersen Aviation
Piper	PA-14 with gravity feed to carburettor and Lycoming O-235-() engines with STC SE2035CE.	SA2083CE	Petersen Aviation
Piper	PA-16, PA-16S with gravity feed to carburettor and Lycoming O-235-() engines with STC SE2035CE.	SA2082CE	Petersen Aviation
Piper	PA-17 with TCM A-65-8 or -8F engines with STC SE634GL	SA766GL	Experimental Aircraft Association
Piper	PA-18, PA-18S, PA-18-105, PA-18S-105, PA-18A, PA-18-150, PA-18A-150, PA-18S-150, PA-18AS-150, PA-18S-135, PA-18AS-135, PA-18-125, PA-18S-125, PA-18-135, PA-18A-135, PA-19, PA-19S, with Lycoming O-235-(), O-290-(), or O-320-() engines with STC SE1931CE, SE2035CE, or SE2036CE, or with TCM C-90 engines with STC SE2031CE.	SA1961CE	Petersen Aviation
Piper	PA-20 with Lycoming O-320 engine with STC SE1931CE	SA2012CE	Petersen Aviation
Piper	PA-22, PA-22-108, PA-22-135, PA-22S-135, PA-22-150 and PA-22S-150 with Lycoming O-320-A2A, -A2B, O-235-(), O-290-() with STC SE1931CE, SE2035CE, or SE2036CE as applicable	SA1949CE	Petersen Aviation

<u>Aircraft Make</u>	<u>Aircraft Model</u>	<u>STC No.</u>	<u>STC Holder</u>
Piper	PA-25 and PA-25-235 with Lycoming O-540-B Series engine with STC SE1909CE	SA1932CE	Petersen Aviation
Piper	PA-28-140, -150, -151 with Lycoming O-320-E2A, -A2B, -E3D engines with STC SE800GL	SA802GL	Experimental Aircraft Association
Piper	PA-28-140, -150, -151 with Lycoming O-320-A2B, -E2A, -E2D, -E3D engines with STC SE1931CE	SA1963CE	Petersen Aviation
Piper	PA-28-235 with Lycoming O-540-B2B5, B1B5, B4B5 with STC SE1909CE	SA1964CE	Petersen Aviation
Reims Cessna	150G, H, J, K, L, M, FA150K, L; - aircraft with TCM O-200-A engines with STC SE2031CE, or low-compression Lycoming O-320 engines with STC SE1931CE	SA00216WI	Petersen Aviation
Reims Cessna	F172D, E, F, G, H, K, L, M with TCM O-300- engines with STC SE2006CE, and with Lycoming O-320-E2D engine with STC SE1931CE	SA00215WI	Petersen Aviation
Reims Cessna	F182P with TCM O-300- engines with STC SE2006CE, and with Lycoming O-320-E2D engine with STC SE1931CE	SA00214WI	Petersen Aviation
Robinson	R22 with STC SH462NE and Lycoming O-320-A2B or A2C engine with STC SE1931CE	SH2011CE	Howard Fuller
Robinson	R22, R22 ALPHA, R22 BETA, R22 MARINER, with Lycoming O-320-B2C engine with STC SE2587CE. R22 BETA II, R22 MARINER II, with Lycoming O-360-J2A engine with STC SE2563CE.	SH760NE (1)	Howard Fuller
Stinson	108, 108-1, 108-2, 108-3 with gravity feed to carburettor and Franklin 6A4-() engines with STC SE2127CE.	SA2128CE	Petersen Aviation
Stinson	SR-5, -5A, -5B, -5C, -5E, L-12; - with gravity feed and Lycoming R-680-() radial engines with STCs SE2409CE, SE2413CE, or SE2414CE as applicable	SA00002WI	Petersen Aviation

<u>Aircraft Make</u>	<u>Aircraft Model</u>	<u>STC No.</u>	<u>STC Holder</u>
Stinson	L-5B, -5C, -5D, -5E, -5E-1, -5G; - with gravity feed and Lycoming O-435-() engines with STC SE2278CE	SA2396CE	Petersen Aviation
Taylorcraft	BC, BCS, BC-65, BCS-65, BC12-65(L-2H), BCS12-65, BC12-D, BCS12-D, BC12-D1, BCS12-D1, BC12D-85, BCS12D-85 BC12D-4-85, BCS12D-4-85 with TCM A-50-1, A- 65-1, -7, -8, C85-8F, -12F engines with STC SE634GL	SA768GL	Experimental Aircraft Association
Taylorcraft	19 and F19 with TCM C-85-12, -12F, or O-200-A engine with STC SE634GL	SA769GL	Experimental Aircraft Association
Taylorcraft	DC-65 (L-2, L-2C), DCO-65 (L-2A, L-2B, L-2M) with TCM A-65-8 engine with STC SE634GL	SA770GL	Experimental Aircraft Association
Taylorcraft	BC-65, BCS-65, BC12-65(L-2H), BCS12-65, BC12-D, BCS12-D, BC12-D1, BCS12-D1, BC12D-85, BCS12D-85, BC12D-4-85, BCS12D-4-85 with TCM A-50-1, A- 65-1, -7, -8, C85-8F, -12F engines with STC SE2029CE or SE2030CE	SA2085CE	Petersen Aviation
Taylorcraft	19 and F19 with TCM C-85-12, -12F, or O-200-A engine with STC SE2030CE or SE2031CE	SA2076CE	Petersen Aviation
Taylorcraft	DC-65 (L-2, L-2C), DCO-65 (L-2A, L-2B, L-2M) with TCM A-65-8 engine with STC SE2029CE	SA2086CE	Petersen Aviation
Univair/Erco/ Alon/Forney/ Mooney	415-D, E, G, F-1, F-1A, A-2, A-2A, M10 with TCM C75-12, -12F, C85- 12, -12F, C-90-12F, -16F engines with STC SE634GL	SA798GL	Experimental Aircraft Association
Univair/Erco/ Alon/Forney/ Mooney	415-C, 415CD with TCM A-65-8, C75-12, -12F, engines with STC SE634GL	SA821GL	Experimental Aircraft Association

- (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 conform to EN228 and has an anti-knock rating of 91 or above. For those aircraft the first line of the placard under Paragraph 5 must be amended as follows:
Use freshly obtained fuel conforming with the specification EN228 and anti-knock index $(RON+MON)/2$ of 91 or above.

The embodiment of the referenced aircraft and engine modifications, including placards and document changes, must be in accordance with the relevant STC Holder's instructions except where superseded by this AAN. All conditions specified on the applicable Supplemental Type Certificates must be adhered to, except where superseded by this AAN. Note: Some of the STCs specify Flight Manual Supplements. These Supplements are NOT required to be included in the Flight Manuals of UK-registered aircraft as the equivalent information applicable to the UK is provided by placards and Airworthiness Notices.

3. Approval Procedures

This modification validation has been carried out in accordance with BCAR B2-2, 4.2.1.

4. Basis Of Validation

These modifications have been approved by the FAA on the basis of compliance with FAR 23, FAR 27, CAR 3, or CAR 4a as applicable. These standards are broadly equivalent to those applicable in the UK, and are accepted as the basis of validation. In all cases, approval of the engine to use the fuel is a prerequisite to approval of the aircraft.

The justification of compliance presented by the STC Holders is in respect of 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 aircraft 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, 4.2.1 the certification of these aircraft modifications by the State of design is accepted without investigation. The US Certification Basis is CAR 3/CAR 4/FAR 23/FAR 27. Details are given in the FAA Supplemental Type Certificates referenced in (2) above.

CAA validation of the FAA Supplemental Type Certificates for the engines, as referenced above, is given by AAN 27744.

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.

These modifications are assessed as having no adverse effect on the aircraft noise, and the status of the aircraft relative to the noise legislation is unaffected. The existing noise certificate, if any, remains valid.

There are additional limitations to be complied with when using motor gasoline which are based on UK service experience and assessment of fuel vapour pressure characteristics with pressure and temperature, (See Airworthiness Notice 98C). The following information shall be displayed conspicuously on a placard in full view of the pilot:

<p>USE OF UNLEADED MOGAS (See Airworthiness Notice 98C)</p> <ul style="list-style-type: none">- Use freshly obtained fuel conforming with the specification EN228.- Test the fuel to ensure that it is free from water and alcohol.- Inspect fuel system non-metallic pipes and seals daily for deterioration and leaks.- Verify correct functioning of the carburettor heating system.- Verify take-off power prior to committing to take-off.- Fuel tank temperature not to exceed 20 degrees Celsius.- Maximum operating altitude 6000 ft. <p>CARBURETTOR ICING AND VAPOUR LOCK ARE MORE LIKELY WITH MOGAS</p>

Where this placard is in conflict with the information provided by the STC Holder, this placard shall supersede any conflicting placard specified by the STC Holder. The Flight Manual Supplements associated with some of the STCs are not required to be included in the Flight Manuals of UK-registered aircraft.

Note: The inspection of the fuel system is recommended whatever type of fuel is used. It is required when mogas is used because generally the fuel will not be obtainable from aerodrome fuel installations in full compliance with ANO Article 112, and so will not be protected from contaminants to the same extent as Avgas.

6. Conditions Affecting This Approval

This approval applies to the use of motor gasoline conforming with the specification EN228 only. Additional limitations are applicable when the fuel is not obtained from aerodrome fuel installations in full compliance with ANO Article 112. These limitations are given in Airworthiness Notice 98C.

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 is granted to the aircraft on the understanding that the engine is to a standard approved for use of motor gasoline conforming with EN228.

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

Records of fuel supply shall be retained; (date, location of purchase, quantity purchased, method of storage). The fuel shall be checked for the presence of water if the aircraft has been standing for more than 24 hours. The inspection prior to first flight of the day, and other scheduled inspections shall include examination of seals and non-metallic fuel system pipes and components for evidence of leaks or deterioration. (See "Note" under (5) above).

Some of the Flight Manual Supplements associated with some of the STCs specify that leaded fuel shall be used for a defined initial period following valve overhaul or engine replacement. Whilst these Supplements are not required to be included in the Flight Manuals of UK-registered aircraft, the instruction to use leaded fuel for initial operation shall be complied with and included in the aircraft maintenance records.

8. Survey

No CAA survey is required.

9. Authorisation of Release to Service

The embodiment of the modifications 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 aircraft 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

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