Engineering Report

CopaAir Maintenance Services, Inc.
20590 SW Citrus BLVD
Indiantown FL, 34956

Installation and de-rated operation of a Continental A65-14 on a Taylorcraft BC-12D.

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Section 1

SCOPE:
It has been determined that a Continental A65-14 can be safely installed and operated in a Taylorcraft BC12-D if de-rated to 65HP. No changes to engine mount, engine cowling, engine accessories, engine instrumentation is needed to make the change, if the engine is de-rated to a maximum continuous RPM of 2350 in level flight.

PURPOSE:
The purpose of this report is to provide information relative to the installation of a Continental A65-14 in a Taylorcraft BC12-D. Additionally, this report is intended to provide the information necessary to operate and allow for the continued airworthiness of the engine.

PROCEDURE:
The installation, operation and subsequent maintenance of these certificated products are performed in accordance with Continental Maintenance and Overhaul Manual, Form X-30008 and the Taylorcraft BC12-D Service Manual.
Standard procedures are in accordance with FAA Advisory Circular 43.13-1B and industry standards, unless otherwise noted.

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Section 2

Engine Comparison:

The Continental A65-14 (as operated as a 75HP engine) differs from the originally installed A65-8 (65HP) in horsepower, RPM and internal cooling capacity. The data below can be found in Type Certificate E-205 and is included in the appendix of this report.

The Continental A65-8 produces 65HP at 2350 RPM. The Continental A65-14 produces 75HP at 2675RPM. To accommodate the extra heat created from the higher RPM and horsepower, holes are drilled in the connecting rods to squirt oil in the opposing cylinder. Pistons with more cooling fins on the underside are also installed to take greater advantage of splash lubrication and subsequent cooling. Finally, the valve train (rocker arms, exhaust valves, seats and guides) are also upgraded to handle the higher heat stress. The final dry weight is identical for both engines.

All of these changes are negligible, however, if the propeller is not re-pitched to allow the A65 engine to turn at the higher RPM. No changes to carburetor jetting or magneto timing are made. The higher horsepower is only achieved thru higher RPM. The internal changes are only to provide greater cooling capacity.

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Section 3

Method of De-Rating Engine Operation:

The Continental A65-14 can be de-rated and operated at 65HP simply by limiting propeller RPM to a maximum continuous RPM of 2350, in level flight. Limiting the propeller is done by having a propeller shop pitch the propeller accordingly so that the engine, at full throttle, cannot turn past 2350 RPM in level flight.

The current installation is a McCauley 1B90 propeller CF7249. This propeller does not exceed the limitation of 2350RPM and does therefore not exceed the originally certified 65HP. This propeller may be re-pitched to achieve better climb or cruise performance, provided it does not exceed the maximum rated RPM of 2350 in continuous level flight.

Subsequent installations of other manufacturer propellers should be made using approved propellers for the A65, as listed in the Taylorcraft BC12-D Type Certificate, A-696. Maximum, continuous rpm in level flight must not exceed 2350RPM.

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Section 4

Instructions for Continued Airworthiness:

Introduction: This aircraft is a 1946 Taylorcraft BC12-D with a Continental A65-14 engine and a McCaulley 1B90, propeller. The purpose for this modification is to provide increased reliability of the engine due to better cooling capacity.

Description: The engine installed in this aircraft has been modified to provide more cooling capacity per Continental specifications. Changes to the pistons, connecting rods and valve train all provide for greater oil lubrication and cooling, as well as better heat tolerance.

Control, operation information: NONE

Servicing information: Never use any fuel that has an octane rating less than 80/87. Use of ethanol blended gasoline is prohibited unless otherwise approved.
Follow manufacturer instructions for further servicing information.

Maintenance Instructions: Service and maintenance for the A65-14 is the same as the A65-8. Manufacture maintenance manuals and service letters that apply to the A65-8 will generally apply to the A65-14. Use Form X-30008 in the general service and maintenance of the engine.

The current installation is a McCauley 1B90 propeller CF7249. This propeller does not exceed the limitation of 2350RPM and does therefore not exceed the originally certified 65HP. This propeller may be re-pitched to achieve better climb or cruise performance, provided it does not exceed the maximum rated RPM of 2350 in continuous level flight.

Subsequent installations of other propellers of various make and model must be made using approved propellers for the A65, as listed in the Taylorcraft BC12-D Type Certificate, A-696. Maximum, continuous rpm in level flight must not exceed 2350RPM.

Troubleshooting information: Continental maintenance manual, Form X-30008 (or latest revision) is applicable to the A65-14 engine.

Removal and Replacement Information: See Taylocraft BC12-D Maintenance manual for engine removal and installation.

Diagrams: NONE

Special Inspection Requirement: NONE:

Application of Protective Treatments: NONE

Data: See Type Certificate E-205 for applicable engine data.

List of Special Tools: NONE

For Commuter Aircraft: NONE

Recommended Overhaul Periods: The recommended TBO of the A65 Series engine is listed in TCM SIL98-9 as 1800 hours or 12 years.

Airworthiness Limitations Section: NONE

Revision: In the event a change is necessary, a letter will be submitted to the local FSDO office of the revised FAA form 337 and revised ICA. The FAA inspector accepts the change by signing Block 3 and including the following statement. “The attached revised/new ICA Dated XX-XX-XX for the above aircraft or component major alteration has been accepted by the FAA, superseding the ICA dated XX-XX-XX.” Once the revision has been accepted, a maintenance record entry will be made, identifying the revision, its location and date of the form 337.

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

E-205
Revision 16
CONTINENTAL
A-65-1, -3,-6,-6J,-7
A-65-8 (O-170-3,O-170-7), -8F-8FJ, -8J
A-65-9 (O-170-5), -9F, -9FJ, -9J
A-65-12, -12F, 12FJ, -12J
A-65-14, -14F, -14FJ, -14J

November 1, 1973

TYPE CERTIFICATE DATA SHEET NO. E-205

Engines of models described herein conforming with this data sheet (which is a part of type certificate No. E-205) 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 — Teledyne Continental Motors
2000 9th Street
Mobile, Alabama 36615

Model A-65	-1	-3, -6	-7	-8, -9	-12	-14
Type	4HOA	- -	- -	- -	- -	- -
Rating, ICAO or ARDC standard atmosphere						
Max. continuous hp. r.p.m. at F.T. sea level pressure alt.	65-2350	65-2300	- -	- -	- -	- -
Takeoff hp. (5 min.) r.p.m. at full throttle	65-2350	65-2300	- -	- -	- -	75-2675
Fuel (minimum grade aviation gasoline)	See NOTE 9	- -	- -	- -	- -	- -
Lubricating Oil, Ambient Air Temperature, °F	Oil Grade					- -
Below 40	SAE 20	- -	- -	- -	- -	- -
Above 40	SAE 40	- -	- -	- -	- -	- -
Bore and stroke, in.	3.875 x 3.625	- -	- -	- -	- -	- -
Displacement, cu. in.	171	- -	- -	- -	- -	- -
Compression ratio	6.3:1	- -	- -	- -	- -	170
Weight (dry) lb. (See NOTE 3)	163	173, 176	163	170, 173	171	
						- -
C.G. Location						- -
Fwd. of mounting face, in.	6.8	6.2	6.8	6.2	- -	
Below prop shaft, in.	1.2	1.5	1.2	1.5	- -	- -
Propeller shaft (SAE No.) (See NOTE 2 for flanged type)	0 (Taper)	- -	- -	- -	- -	
Carburetor (see NOTE 2 for injectors)	Stromberg NA-S3A1 or NA-S3B carburetor with 1-1/4 in. venturi or Marvel-Schebler MA-3PA carburetor with 1-7/32 in. venturi					

Model A-65	-1	-3, -6	-7	-8, -9	-12	-14
Ignition	Single, Scintilla SF-4L or Eisemann AM-4, Case 47	Dual, Scintilla SF-4R, Eisemann AM-4, Case 47, Slick Electro 443	Single, Scintilla SF-4L, Eisemann AM-4 or Case 47	Dual, Scintilla S4RN -20, -21, SF-4R, S4LN-20 or S4LN-21, Eisemann LA-4 or AM-4, Case 4-CAMA, 4-CAME, 47 (with impulse coupling on Eisemann and Case magnetos retard 25°) Slick Electro 443, or 4003 (-8 Series only)	Dual Scintilla S4RN-20, -21, SF-4R, S4LN-21, Eisemann LA-4 or AM-4 (with impulse coupling retard 25°) Case 47, Slick Electro 447.	Dual, Scintilla S4N-20, -21, SF -4R, S4LN-20 or -21, Eisemann LA-4 AM-4, Case 4-CAMA, 4-CAME, 47 (with impulse coupling on Eisemann and Case magnetos retard 25°), Slick-Electro 443
Timing, °BTC	30	- -	- -	- -	- -	- -
Spark plugs	See NOTE 10	- -	- -	- -	- -	- -
Oil sump and capacity (qt.)	Wet - 4½	- -	- -	- -	- -	- -
Exhaust port	Up	- -	Down	- -	- -	- -
NOTES	1,3,5,6,9,10,11	1,2,3,5,6,9, 10,11	1,3,5,6,9, 10,11	1,2,3,4,5,7, 8,9,10,11	1,2,3,5,8,9, 10,11	1,2,3,5,7,9, 10,11

"- -" indicates "same as preceding model"
"—" indicates "not applicable"

Certification basis CAR 13
Type Certificate No. 205

Production basis Production Certificate No. 7. Production Certificate No. 508 (for all models except A-65-1, -3, -6, -6J, -7, -8F, -8FJ, -9F, -9FJ, -12F, -12FJ, -12J, -14F, -14FJ, -14J)

NOTE 1. Maximum permissible cylinder head, barrel and oil inlet temperature, 550°F., 350°F. and 220°F., respectively. Oil pressure limits: 30 to 60 p.s.i.g.

NOTE 2. The following additional models of A-65 series engines are also eligible:

Engine Model	Characteristic Component	Dry Weight Increase (lb.)
A-65-6J, -8J, -9J	High Model A Fuel Injector or Ex-Cell-0 A-42	3 for High Model A or 4 for Ex-Cell-0 A-42
A-65-12J, -14J	Ex-Cell-0 Model A-42 Fuel Injector	4
A-65-8F, -9F, -12F, -14F	Flanged propeller shaft, 5-1/2 in. dia. with 6 equally spaced .621 dia. holes on 4.375 bolt circle	1
A-65-8FJ, -9FJ, -12FJ, -14FJ	Flanged propeller shaft, 5-1/2 in. dia. with 6 equally spaced .621 dia. holes on 4.375 bolt circle, and fuel injector as above	See above

NOTE 3. Engine S/N's lower than 340793 incorporate a crankcase for use with conical rubber shock mountings. With Scintilla SF-4R magnetos, add 5 lb. to dry weight. With Case magnetos, add 4 lb. For -1 engine with Scintilla SF-4L magneto, add 3 lb.

NOTE 4. Military models O-170-3 and O-170-5 are identical to models A-65-8 and A-65-9 respectively. Model O-170-7 same as -3 except for improved valves and valve guides, pistons and piston rings; also provisions for Annesley 75 and Beech R-002 propellers. When these military engines are installed in certificated aircraft, the appropriate civil model designation and T.C. 205 should be included on the nameplate.

NOTE 5. The following typical accessories are eligible as noted at the indicated additional weight:

Starter	Weight (lb.)
Eclipse Type 635 (Electric), for Models A-65-6 and -9, F and J only	16
Eclipse Type E-80 (Electric), for Models A-65-6 and -9, F and J only	18
Hummer Type X (Mechanical) - Models A-65-6 and -9, F and J only	14
Delco-Remy CMC No. 50309 (Electric) - Models A-65-12, F and J only	16
Generator	
Delco-Remy CMC No. 40435 - Models A-65-12, F and J only	10
Fuel Pump (provisions optional)	
AC type CP 8527	4
AC type 1523843 or 3843 (CMC No. 40585)	2
Miscellaneous	
Oil Filter, Fram PB-500 (CMC No. 40581)	3
Air Filter and Scoop, Nos. A-5810 or A-40522	3
Radio Shielding	3
Harrison Oil Radiator Model HE431-9 (CMC No. 40601) -Models 12, F and J only	4

NOTE 6. Approvals for Models A-65-1, -3, -6, -6J, -7 and -7J expired November 17, 1941. No engines of these models manufactured after that date or with S/N's above the following, are eligible for use in certificated aircraft:

Models	Serial No.
A-65-1	379991
A-65-3	387593
A-65-6	389096
A-65-6J	373296
A-65-7	575897

NOTE 7. Model A-65-14 differs from A-65-8 only in that it incorporates special pistons, rocker arms and exhaust valves, seats and guides.

NOTE 8. Model A-65-12 differs from A-65-8 only in that C-75-12 type crankcase and accessories section are incorporated.

NOTE 9. All models using Stromberg NA-S3A1 or NA-83B carburetors eligible for use of 73 octane grade fuel except A-65-14 model which is limited to use of 80/87 octane fuel.
All models using Marvel-Schebler MA-3PA carburetor are limited to use of 80/87 octane fuel.

NOTE 10. These models are approved for tractor or pusher operation.

NOTE 11. The following spark plugs are approved for use on these engines:

AC	A88, HS88, S88, S88D, HSR88, SR88, SR88D, HSR83P
Auto Lite	18A-1, B4, B4S, BH4S, SH2K, SH2M, H15, SH15, SH15R, SH20, SH20A, SH200A, SH260
BG	4B2, 4B2S, 417, 417S, RB485-S, 706, 706R, 706S, 706SR, RB955-S
Champion	C26, C26S, C27, C27S, M26, M31A, LM31S, RHM38P, REM40E, ED41N, D41N, EM41E, EM41N, M41N, EM42E, M42E, 62S
Decker	D-26
Red Seal	SA190, SE190, SJ190, SE230, SJ230
Safir	B-57

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