KELLY AEROSPACE

Thermal Systems

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Revisions

Rev.	Description	Author	Date	Approved
A	Initial Release	Eric Farmer	2/14/2019	Jeff Barlett
B	(ECN 19-035) Page 5: added NC-17-039 Weight and Balance to Referenced Documents list Page 6, Section 2.2 added sentence referencing NC-17-039 Page 6 Section 2.3: added paragraph describing the CB-2 and A1235 controller options	Eric Farmer	6/27/2019	Jeff Barlett

The latest revision of the maintenance manual can be obtained from the Kelly Aerospace website at www.kellyaerospace.com.

In the event Internet access is not available, please contact the Customer Service Office for inquiry or a copy of the latest revision:

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1. INTRODUCTION

1.1. Purpose

This document is designed for use by the installing agency of Kelly Aerospace Thermal Systems Air Conditioning Kit Number KATS-18-003 or KATS-18-004 as Instructions for Continued Airworthiness in response to Federal Aviation regulation (FAR) Part 23.1529, and Part 23 Appendix G. The ICA includes information required by the operator to adequately maintain the Air Conditioning System installed.

1.2. Scope

This document identifies the Instruction for Continued Airworthiness for the modification of the aircraft for installation of the Kelly Aerospace Thermal Systems Air Conditioning Kit Number KATS-18-003 or KATS-18-004 under the approved STC.

1.3. Document Control

This document shall be released, archived and controlled in accordance with the Kelly Aerospace Thermal Systems document control system. When this document is revised, refer to Section 2.15 ICA Revision and Distribution for information on how to gain FAA acceptance or approval and how to notify customers of changes.

1.4. Airworthiness Limitations

There are no additional Airworthiness Limitations as defined in 14 CFR § 23, Appendix G. G23.4 that result from this modification. The Airworthiness Limitations section is FAA approved and specifies maintenance required under §§43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

1.5. Permission to Use Certain Documents

Permission is granted to any corporation or person applying for approval of a Kelly Aerospace Thermal Systems Air Conditioning System Kit to use and reference appropriate STC documents to accomplish the Instructions for Continued Airworthiness and show compliance with STC engineering data. This permission does not construe suitability of the documents. It is the responsibility of the applicant to determine the suitability of the documents for the ICA.

1.6. Definitions

The following terminology is used within this document:

1) **ACO:** Aircraft Certification Office
2) **AEG:** Aircraft Evaluation Group
3) **CFR:** Code of Federal Regulations
4) **DER:** Designated Engineering Representative
5) **FAA:** Federal Aviation Administration
6) **ICA:** Instructions for Continued Airworthiness
7) **STC:** Supplemental Type Certificate
8) **KATS:** Kelly Aerospace Thermal Systems

2. INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

2.1. Introduction

Content, Scope, Purpose and Arrangement:	This document identifies the Instructions for Continued Airworthiness for the modification of the aircraft by installation of the Kelly Aerospace Thermal Systems Air Conditioning Kit Number KATS-18-003 or KATS-18-004.
Applicability:	Applies to aircraft altered by installation of the Kelly Aerospace Thermal Systems Air Conditioning Kit Number KATS-18-003 or KATS-18-004.
Definition of Abbreviations:	See Section 1.6 Definitions
Precautions:	None
Units of measurement:	None
Referenced publications:	NC-17-032: Mooney M20R, S, TN, U & V Air Conditioning System Drawing List NC-17-033: Mooney M20R, S, TN, U & V Air Conditioning System Kit List NC-17-038: Mooney M20R, S, TN, U & V Air Conditioning System Installation Manual NC-17-039: Mooney M20R, S, TN, U & V Air Conditioning System Weight & Balance AC-01678: M20 Evaporator Installation Details for A1235 AC-01769: M20 Evaporator Installation Details for CB-2 AC-01680: M20R, S, TN, U & V Air Conditioning Schematic for A1235 AC-01681: M20R, S, TN, U & V Air Conditioning Schematic for CB-2 AC-01700: M20 Hot Side AC Installation Details Mooney M20R, M20S, M20TN, M20U or M20V Service and Maintenance Manual Mooney M20R/S, M20TN, M20U or M20V Illustrated Parts Catalog AC 43.13-1B: Acceptable Methods, Techniques, and Practices - Aircraft Inspection and Repair
Retention:	This document or the information contained within, shall be included in the aircraft's permanent records

2.2. Description of Alteration

The Air Conditioning System consists of an electric hermetically sealed compressor and condenser located in the tail cone and evaporator located in the hat rack just aft of the baggage compartment. The system is operated through temperature selection and a climate controller located on the instrument panel. There is both a fan mode only and a cooling mode. R-134a is used as a refrigerant for the system.

The power for the Air Conditioning System is tapped off the Main Distribution Bus just downstream of the Battery Master Relay #1 & #2.

An electrical load analysis was done for this STC. If the aircraft has an alternator rated at 100 amps: Do not operate air conditioning while operating standby vacuum pump, pitot heat, fuel boost pump or cigar lighter, do not operate landing light and taxi light simultaneously while operating air conditioning system. Otherwise, an electrical load analysis of the aircraft is required.

See Document NC-17-039 Mooney M20R, S, TN, U & V Air Conditioning System Weight & Balance to see the effect of the Air Conditioning System on the weight and balance for the aircraft.

2.3. Control, Operating Information

The system is operated through temperature/fan speed selection on a climate controller located in the instrument panel or center console.

The system may be operated during all phases of operation to include takeoff and landing.

The air-conditioning system may be operated on the ground and without the engine running by connecting an APU or GPU to the ground power receptacle on the aircraft. The GPU or APU must be of sufficient capacity to run the A/C system with a minimum capacity of 45 amps at 28 volts.

Caution: Do not attempt to operate the air conditioning system with an APU or GPU with the aircraft battery disconnected as this could result in damage to the digital compressor controller.

The system may be operated during level flight, takeoff and landing or on the ground during taxi.

The Air Conditioning System has two optional controllers. KATS-18-003 uses the A1235 Controller while KATS-18-004 uses the CB-2 Controller. The A1235 Controller uses PWM (Pulse Width Modulation) to control the evaporator fan speed. See section 2.3.1 for instructions for using the A1235 controller. The CB-2 Controller uses relays to control the evaporator fan speed. See section 2.3.2 for instructions for using the CB-2 Controller.

2.3.1. Air Conditioning System Normal Checklist: A1235 Climate Controller

Climate Controller Power-On Self Check

1) Climate controller initiates a self-check at power-on. A fault is indicated by the red “FAIL” illuminated. Normal operation defaults to FAN Mode with a fan speed “0”.

Figure 1 – A1235 Controller Front Panel - Self Check Mode

Prior to Engine Start

1) Ensure Air Conditioning is OFF by verifying that the “AC” light is not illuminated; press the “FAN ▼” until the display shows a fan speed of “0”.
2) Follow normal procedures for engine start-up.

Air Conditioning AC Mode

1) Push the AC button to toggle operating modes between “FAN” and “AC”.
2) Select “AC”.
3) Adjust desired temperature using “TEMP” buttons. Evaporator fan speed will adjust automatically based on set temperature and actual temperature indicated.

Figure 2 – A1235 Controller Front Panel – AC Mode

Air Conditioning Fan Mode

1) Ensure the “AC” light is not illuminated; otherwise press the AC button to toggle operating modes between “FAN” and “AC”.
2) Select “FAN”
3) Adjust desired fan speed using “FAN” buttons. Speed Range is “0” to “5”.

Figure 3 – A1235 Controller Front Panel – Fan Mode

Air Conditioning Fault

1) Red “FAIL” light illuminated indicates a fault has occurred.
2) Select “FAN” Mode.

Before Engine Shut-Down

1) Turn “OFF” Air Conditioner.

2.3.2. Air Conditioning System Normal Checklist: CB-2 Climate Controller

Figure 4 – CB-2 Controller

Prior to Engine Start

1) Ensure Air Conditioning is OFF by verifying that there is nothing displayed on the CB-2 climate controller LCD screen.
2) Follow normal procedures for engine start-up.

Air Conditioning AC Mode

1) Press the lower right button on the CB-2 Climate Controller, the display will first show the logo and software version; then it will show temperature set point, fan speed bar graph, and mode display.
2) Press the bottom left button and toggle between modes with the middle right button.
3) After selecting AC mode, either press the bottom right button to enter or wait 3 seconds and the display will return to the main screen. The snow flake symbol in the bottom center of the display will indicate Air Conditioning mode

Air Conditioning Fan Only Mode

1) Press the bottom left button and toggle between modes with the middle right button.
2) After selecting fan mode, either press the bottom right button to enter or wait 3 seconds and the display will return to the main screen.

To Control Fan Speed

1) Press the middle left button to bring up the fan speed screen.
2) Toggle the fan speed up or down using the middle and upper right buttons. Speed Range is 1 to 3.
3) After selecting desired fan speed press the bottom right button to enter or wait 3 seconds and the display will return to the main screen. The fan speed bar graph on the right side of the screen will show selected fan speed. Fan speed can be controlled in both AC and Fan Only modes.

Changing Temperature Set Point

1) Press the top or middle right buttons to adjust the temperature set point up or down.
2) The set point temperature will be displayed with an SP indication. The CB-2 display will default to the temperature set point.

To display cabin temperature

1) Press and release the bottom right button, the cabin temperature will be displayed with a TEMP indication. After a few seconds the temperature set point will be displayed again.

To turn air conditioning system off

1) Press and hold lower right button.

2.4. Servicing Information

Charging the system with Refrigerant:

Only trained and qualified personnel may service this system.

The Air Conditioning System should contain 34 oz. of R-134A Refrigerant. There are no substitutions permitted.

1) Remove the Left Hand Fuselage Access Door Cover.
2) Connect a Refrigerant Recovery, Recycling & Recharging Machine to the service ports. The service ports are located just aft of the Hat Rack and the Access Door. The small service port is the high pressure side and the large service port is the low pressure side.
3) Following the Refrigerant Recovery, Recycling & Recharging Machine manufacturer's instructions, perform the following:
    a) Evacuate the system.
    b) Pull a vacuum to 500 microns of mercury (.01 PSI) or less and hold for a minimum of 1 hour.
    c) Fill the system with 34 +/- 2 ounces of R-134A Refrigerant.
4) Disconnect the service machine and replace the service port caps.
5) Replace the Left Hand Fuselage Access Door Cover.

Caution: It is vital that the compressor is NOT operated while the system is under vacuum. Doing so will instantly damage the compressor.

2.5. Maintenance Instructions

There are no maintenance requirements for the Air-conditioning System outside of normal 100hr/Annual inspection intervals.

Perform a system functional test after any maintenance is performed on the air-conditioning system. Follow the procedures shown in Section 2.3.1 Air Conditioning System Normal Checklist: A1235 Climate Controller or Section 2.3.2 Air Conditioning System Normal Checklist: CB-2 Climate Controller to ensure system is working correctly.

Note: Before inspections or maintenance is performed it is the responsibility of the owner/operator and maintenance agency to assure that they are in possession of the appropriate revision of the applicable documentation and drawings by referencing the NC-17-032 Mooney M20R, S, TN, U & V Air Conditioning System Drawing List provided with the Air Conditioning System Kit.

2.6. Troubleshooting Information

Failures of the Kelly Aerospace Air Conditioning System can include but may not be limited to the following items:

1) Fan motor failure, characterized by no or little airflow. Corrective action: Troubleshoot the fan motor wiring, relay and fan for proper operation, repair or replace as necessary.

2) Compressor failure, characterized by low amp draw, or little cold air output. Corrective action: Troubleshoot compressor and compressor controller and wiring, repair or replace as necessary.

3) Low or no refrigerant, characterized by little or no cold air. Corrective Action: Inspect system for leaks, repair as necessary, and service system appropriately with R-134A refrigerant. See Section 2.4 Servicing Information.

4) Any or all of these probable failures require inspection as necessary, or system must be secured and placarded until repaired.

2.7. Removal and Replacement Information

When replacement of any refrigerant containing device is necessary, such as a compressor or evaporator, it is necessary to evacuate the refrigerant prior to removal. An EPA approved refrigerant evacuation machine is required. Prior to recharging the system with refrigerant, the system must be evacuated. Allow the vacuum source to remain connected for a minimum of one hour to assure there are no leaks and verify system integrity.

If a component needs to be removed or replaced, review the NC-17-038 Mooney M20R, S, TN, U & V Air Conditioning System Installation Manual.

Reference: AC-01700 M20 Hot Side AC Installation Detail for basic structural information

Reference: AC-01678 M20 Evaporator Installation Details for A1235 for basic structural information

Reference: AC-01769 M20 Evaporator Installation Details for CB-2 for basic structural information

Reference: AC-01680 M20R, S, TN, U & V Air Conditioning Schematic for A1235 for electrical information

Reference: AC-01681 M20R, S, TN, U & V Air Conditioning Schematic for CB-2 for electrical information

All required KATS drawings and documents are provided by Kelly Aerospace Thermal Systems in either Kit Number KATS-18-003 (A1235) or KATS-18-004 (CB-2). Replacement documents may be obtained by contacting Kelly Aerospace by calling 440-951-4744.

2.8. Diagrams

AC-01678 M20 Evaporator Installation Details for A1235

AC-01769 M20 Evaporator Installation Details for CB-2

AC-01680 M20R, S, TN, U & V Air Conditioning Schematic for A1235

AC-01681 M20R, S, TN, U & V Air Conditioning Schematic for CB-2

AC-01700 M20 Hot Side AC Installation Details

All required KATS drawings and diagrams are provided by Kelly Aerospace Thermal Systems in Kit Number KATS-16-002 (A1235) or KATS-16-003 (CB-2). Replacement documents may be obtained by contacting Kelly Aerospace by calling 440-951-4744.

2.9. Special Inspection Requirements

Inspect the system during 100 Hour and/or Annual inspections.

During the annual or 100 hour inspections check for the following items:

1. Security of attachment of all components.
2. Evidence of any leaks.
3. Fretting or cracking of any sheet metal structures.
4. Insect or animal nests in condenser or evaporator sections.
5. Bent or obstructed fins on the condenser and evaporator coils.
6. Loose or missing hardware.
7. Loose or chaffing tubing.
8. Loose or chaffing wires.

2.10. Application of Protective Treatments

None, N/A.

2.11. Data Related to Structural Fasteners

Structural fasteners should be installed per AC43.13-1B.

Unless otherwise specified, use the following torque values.	
6-32 UNC	7-9 inch-lbs.
8-32 UNC	17-19 inch-lbs.
10-24 UNC	20-22 inch-lbs.
10-32 UNF	28-31 inch-lbs.
1/4-20 UNC	70-75 inch-lbs.
1/4-28 UNF	90-94 inch-lbs.
5/16-24 UNF	120-145 inch-lbs.
3/8-24 UNF	200-250 inch-lbs.
7/16-20 UNF	520-630 inch-lbs.
Table 1 – Fastener Torque Specifications	

Unless otherwise specified, use the following torque values.	
5/8-18 UNF	15-20 inch.-lbs.
3/4-16 UNF	21-27 inch-lbs.
7/8-14 UNF	28-33 inch-lbs.
7/8-18 UNS	28-33 inch-lbs.
Table 2 – A/C Hose Fitting Torque Specifications	

Refer to the Mooney Maintenance Manual.

2.12. Special Tools

An EPA approved refrigerant evacuation machine is required.

2.13. Additional Instructions

None

2.14. Overhaul Period

No additional overhaul time limitations.

2.15. ICA Revision and Distribution

To revise this ICA, a letter must be submitted to the ACO along with the revised ICA. The ACO will obtain AEG acceptance and approve any revision to Section1.4 Airworthiness Limitations. After FAA acceptance / approval Kelly Aerospace will release the revised ICA for customer use and provide any required notification of the revision.

2.16. Assistance

The customer may refer questions regarding this equipment and its installation to the manufacturer, Kelly Aerospace Thermal Systems. Kelly Aerospace customer assistance may be contacted during normal business hour via telephone 440-951-4744 or email from Kelly Aerospace website at www.kellyaerospace.com.

2.17. Implementation and Record Keeping

Modification of an aircraft by this Supplemental Type Certificate obligates the aircraft operator to include the maintenance information provided by this document in the operator's aircraft maintenance manual and/or the operator's aircraft scheduled maintenance program.