International Aero Engines

SERVICE BULLETIN

ENGINE - FUEL AND CONTROL - TO PROVIDE A NEW ELECTRONIC ENGINE CONTROL (EEC) WITH THE SCN9A SOFTWARE CONFIGURATION AND HARDWARE CHANGES TO ADDRESS NACELLE DRAINAGE REQUIREMENTS - CATEGORY CODE 3 - MOD.ENG-73-0052

1. Planning Information

A. Effectivity

(1) Aircraft: Airbus A320

(2) Engine: V2500-A5 Engines before Serial No.V10082*

*The Serial Number data shown is of a preliminary nature and is provided for advanced planning only. A future revision to this Service Bulletin will confirm final serial number effectivity

B. Reason

(1) Condition

(a) Weight on Wheels (WOW) indication/validation/accommodation: If both Landing Gear Control Interface Unit (LGCIU) discretes fail closed (ground), the EEC will operate as it normally does on the ground and no failure will be annunciated.

(b) Thrust Reverser Stow and Lock Sensor Message: If the crosslink is failed or one channel of the FADEC is inoperative, the fault message that indicates the thrust reverser is "unlocked" will not get set when the controlling channel's stow and lock discrete indicates "unlocked".

(c) ARINC N1 and N2 biasing for overspeed: It is possible for the FADEC to be controlling in an ovespeed condition without displaying the appropriate indication and warning in the cockpit.

(d) N2 Cockpit Display for Below Idle Operation: On shutdown the N2 display in the cockpit can stay locked at 5.7 percent (850 rpm).

(e) A321 29K and 30K Ratings: Preliminary ratings used for the A321 flight test need to be updated to meet guaranteed thrust levels at all conditions.

(f) Windmill Boundary: Windmill boundary schedule was set at a higher airspeed than necessary.

(g) Table Data Updates: The Rating Tables only extended as low as -1000 ft. pressure altitude, but fleet experience has shown potential operation between -1000 ft. and -2000 ft. One point in the EPR to N1 conversion table is incorrect. These problems result in a potential slight overboost if the engine is operating below -1000 ft. pressure altitude or if operating in the N1 mode.

(h) Bleed Pressures: The minimum burner pressure schedules do not meet the minimum supply requirements for the Environmental Control system (ECS) and the Cowl Anti-Ice (CAI) system.

(i) Internal Fault Flag: Bit 18 in the first status word of a Clear Language Message record (internal fault flag) is not always set properly. This bit is used by the CFDS to determine the source of the detected fault. when the bit is erroneously set to zero, identification of the correct source may not be possible.

(j) System Test Menu Page: A"*" appears in the top right hand corner of the system test menu instead of a "->".

(k) N1 Rated Mode Idle: High Idle occurs in N1 rated Mode at low altitudes.

(l) N2 Raised Idle Loop: There is a slight instability in a burner pressure based limit on the N2 raised idle loop for the heat management raised idle. The conditions needed to show the instability are remote and the affect settles out quickly. This problem was found during certification.

(m) Fuel Flow Cockpit Indication: Fuel flow cockpit is held constant for 1.5 seconds during each 10 seconds of elapsed time.

(n) N1 Topping Loop: At hot ambient temperatures and high altitude it is possible to get a transient overshoot with the 30K rating which will result in N1 exceeding redline.

(o) EEC Fluid Drainage: The EEC150-20 Upper Shock Mounts are retaining 3.5 to 11.5 cubic centimeters (CC) of fluid, which is in excess of the certification requirement of 3 CC.

(2) Background

(a) Weight on Wheels (WOW) indication/validation/accommodation: When both LGCIU discretes are being received properly and are in agreement, then the data is assumed to be good (no comparison is done with Mach number to verify whether on ground or in the air).

(b) Thrust Reverser Stow and Lock Sensor Message: The controlling channel is not using its own discrete inputs to set this message when there is a crosslink failure or a channel is inoperative.

(c) ARINC N1 and N2 biasing for overspeed: The Flight Warning Computer (FWC) and the Display Management Computer (DMC) do not use the overspeed trip points for the A5 application. Because the FADEC overspeed trip points are lower than those used in the FWC and DMC, the FADEC can detect an overspeed condition before any indication or warning appears in the cockpit.

(d) N2 Cockpit Display for Below Idle Operation: On a shutdown if the last valid value of N2 before an N2 end of conversion failure occurs is above 3.3 percent (500rpm), then the cockpit display of N2 will stay locked at 5.7 percent instead of blanking out.

(e) A321 29K and 30K Ratings: Data in rating tables derived from simulation was insufficiently accurate for all flight conditions and actual flight data was unavailable.

(f) Windmill Boundary: Schedule was made consistent with the one for the A1 engine even though the A5 engine had better windmill characteristics at lower air speeds.

(g) Table Data Updates: Currently rating tables only extend as low as -1000 ft. For the EPR to N1 conversion table one point was incorrectly specified.

(h) Bleed Pressures: A5 engine bleed pressure capabilities differed from original predictions for ECS and CAI.

(i) Internal Fault Flag: Some internal fault flags were incorrectly specified and some were handled incorrectly in the software.

(j) System Test Menu Page: The Logic was incorrect.

(k) N1 Rated Mode Idle: Trim table values not set to desired level.

(l) N2 Raised Idle Loop: The N2 raised idle loop error term is being updated at half the designed rate.

(m) Fuel Flow Cockpit Indication: During the fuel flow interface self-test, the ARINC fuel flow value being output to the cockpit is not updated. This test lasts 1.5 seconds and is run every 10 seconds. As a result, the fuel flow cockpit indication will display a constant value during transients for the duration of the self-test.

(n) N1 Topping Loop: Insufficient N1 redline margin for the 30K rating for the transient engine characteristics at these flight conditions.

(o) EEC Fluid Drainage: During the Nacelle Drainage certification testing, on the A321/V2500-A5, the EEC150-20 upper shock mounts retained fluid in excess of the 3CC maximum allowed. The cause of the fluid retention is a result of the position of the the EEC as mounted on the Fan Case.

(3) Objective

(a) Weight on Wheels (WOW) indication/validation/accommodation: If both LGCIU discretes agree and no failure with the data is present then a verification using Mach Number will be made if WOW indicates aircraft on the ground. If WOW erroneously indicates aircraft on the ground then the ECAM message "Reverser Fault" will be annunciated in the cockpit and the maintenance message "EIU/LGCIU/WOW" will be displayed in the Post Flight Report.

(b) Thrust Reverser Stow and Lock Sensor Message: Use the controlling channel's discrete inputs when there is a crosslink failure or a channel inoperative.

(c) ARINC N1 and N2 biasing for overspeed: Bias the N1 and N2 values above 100 percent such that when the engine is operating at the overspeed values (109.07 percent for N1 and 105.45 percent for N2), the values transmitted over ARINC to the cockpit are the overspeed values used by the FWC and DMC (109.4 percent for N1 and 105.7 percent for N2). This will ensure the proper indication and warning are displayed.

(d) N2 Cockpit Display for Below Idle Operation: Modify the logic such that if an end of conversion failure occurs during a shutdown the cockpit display will be appropriately blanked out.

(e) A321 29K and 30K Ratings: Update the data in the rating tables based on the latest flight test information and Airbus requirements.

(f) Windmill Boundary: Modify the windmill boundary schedule to take advantage of lower A5 windmill capability.

(g) Table Data Updates: The rating table data is revised to include pressure altitudes as low as -2000 ft. and the incorrect point in the EPR to N1 conversion table is corrected.

(h) Bleed Pressures: Modify the minimum Pb requirements for ECS and CAI to reflect A5 characteristics and add further trim capability to the minimum Pb schedules.

(i) Internal Fault Flag: Update the internal fault flag list and modify the logic to provide correct LRU identification at the aircraft level.

(j) System Test Menu Page: Fix the logic to follow the normal convention for identifying follow-on pages.

(k) N1 Rated Mode Idle: Modify trim table values to achieve desired N1 Rated Mode idle.

(l) N2 Raised Idle Loop: Modify the logic such that the error term is updated at the proper rate.

(m) Flow Cockpit Indication: Only perform the fuel flow self-test during initialization.

(n) N1 Topping Loop: Downtrim the N1 topping loop schedule by 1.39 percent to account for the expected transient overshoot so that the N1 redline is not exceeded.

(o) EEC Fluid Drainage: Drill 0.125 in. (3,175 mm) holes in each side of the upper shock mount supports, to allow proper drainage of fluids.

(4) Substantiation

The flight simulation and flight testing of the SCN9A software logic was accomplished at Airbus in Toulouse, France.

(5) Effects of Bulletin on Workshop Procedures:

Removal/Installation	Not affected
Disassembly/Assembly	Not affected
Cleaning	Not affected
Inspection/Check	Not affected
Repair	Not affected
Testing	Not affected

(6) Supplemental Information

None.

C. Description

(1) To provide a new Electronic Engine Control (EEC) with SCN9A software logic that adds many improvements, and hardware changes to address nacelle drainage requirements.

D. Approval

The part number changes and/or part modifications described in Section 2 and 3 of this Service Bulletin have been shown to comply with the applicable Federal Aviation Regulations and are FAA-APPROVED for the Engine Model listed.

E. Compliance

Category Code 3

Not later than 750 hours after receipt of this Service Bulletin.

F. Manpower

Estimated Manhours to incorporate the full intent of this Bulletin:

Venue	Estimated Manhours
(1) In Service	TOTAL: 1 hour 16 minutes
(a) To gain access	
(i) Install warning notices ..	5 minutes
(ii) Open the fan cowls	7 minutes
(iii) Remove the EEC	23 minutes
TOTAL	35 minutes
(b) To return to flyable status	
(i) Install the EEC	28 minutes
(ii) Close the fan cowls ..	8 minutes
(iii) Remove the warning notices	5 minutes
TOTAL	41 minutes
(2) At overhaul	Not Applicable

G. Material - Price and Availability

(1) Modification Kit not required.

(2) See "Material Information" section for prices and availability of future spares.

H. Tooling - Price and Availability

None.

I. Weight and Balance

(1) Weight change .. .. .. None

(2) Moment arm .. .. .. No effect

(3) Datum .. .. Engine front mount centerline (Power Plant Station P.P.S.100)

J. Electrical Load Data

This Service Bulletin has no effect on the aircraft electrical load.

K. References

(1) Internal Reference No.

93VZ012

(2) Other references

Hamilton Standard Service Bulletin EEC150-20-73-2

Hamilton Standard Service Bulletin EEC150-20-73-3.

V2500 Aircraft Maintenance Manual

V2500 Engine Illustrated Parts Catalog

L. Other Publications Affected

(1) V2500-A5 Engine Illustrated Parts Catalog, Chapter/Section 73-22-34, Figure 1, to add the new parts.

2. Accomplishment Instructions

A. The Source Demonstration requirements of this rework means that any facility not authorized to accomplish this rework either utilize the Authorized Vendors listed below or contact IAE Technical Services to determine if a qualification program can be initiated at their facility.

IAE-INTERNATIONAL AERO ENGINES AG
Corporate Center II
628 Hebron Ave.
Glastonbury, CT 06033-2595 USA
ATTN: Director Technical Services

B. The Authorized Rework Vendor for this bulletin is listed below:

Hamilton Standard
97 Newberry Road
East Windsor, CT 06088 USA

C. The designation by IAE of an authorized rework vendor indicates that the vendor has demonstrated the necessary capability to enable it to carry out the rework. However, IAE makes no warranties or representations concerning the qualifications or quality standards of the vendors to carry out the rework, and accepts no responsibility whatsoever for any work that may be carried out by a rework vendor, other than when IAE is listed as the vendor. Authorized rework vendors do not act as agents or representatives of IAE.

D. Pre-Requisite Instructions

(1) On the aircraft panel 115VU, put a warning notice to tell the persons not to start the engine.

(2) On the aircraft panel 50VU, make sure that the ON legend on the EDG FADEC GND PWR push button switch is OFF and install a warning notice.

(3) Open the Fan Cowls by the use of the approved procedure in Reference (3), Chapter/Section 71-13-00, (TASK 71-13-00-010-010).

E. Removal Instructions

(1) Remove the 2A2989 Electronic Engine Control by the approved procedure given in Reference (3), Chapter/Section 73-22-34, Removal/Installation. Refer to Figure 1.

F. Rework Instructions

(1) Do a modification of the 2A2989 Electronic engine Control (See Reference (4), Chapter/Section 73-22-34, Fig/Item No.01-280) and reidentify by the procedures given in Reference (2).

Procedure	Supplementary Information
(a) Send the Electronic Engine Control to the approved vendor to be modified.	See Figure 1 and References (1) and (2).

G. Installation Instructions

(1) Install the 2A3098 Electronic Engine Control (1 off) by the approved procedure given in Reference (3), Chapter/Section 73-22-34, Removal/Installation. See Figure 1.

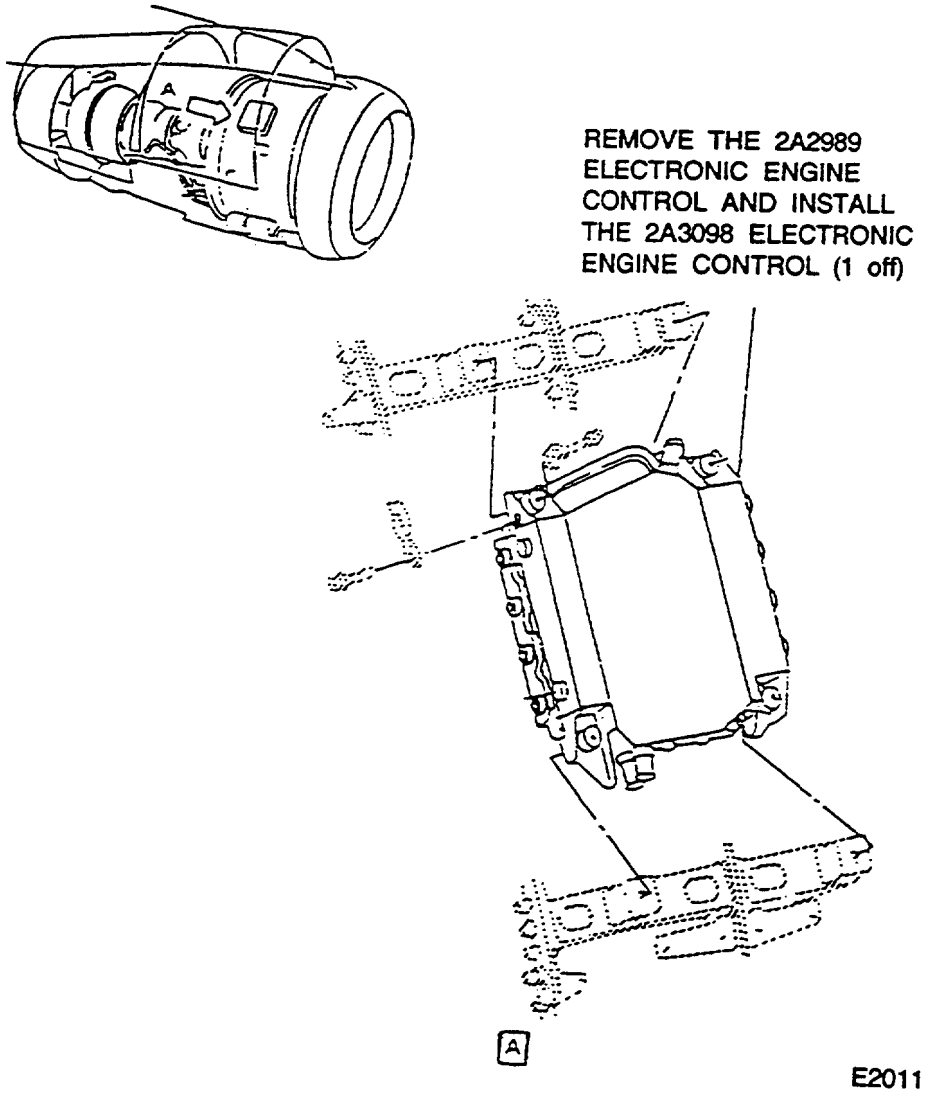
H. Post-Requisite Instructions

(1) Close the Fan Cowls by the use of the approved procedure in Reference (3), Chapter/Section 71-13-00 (TASK 71-13-00-410-010).

(2) Remove the warning notices.

I. Recording Instructions

(1) A record of accomplishment is necessary.



Location of Electronic Engine Control (EEC)
Fig.1

3. Material Information

Applicability: For each V2500 Engine to incorporate this Bulletin.

A. Kits associated with this Bulletin:

None.

B. Parts affected by this Bulletin:

New Part No. (ATA No.)	Qty.	Est'd Unit Price ($)	Keyword	Old Part No. (IPC No.)	Instructions/ Disposition
2A3098 (73-22-34)	1		Control, Electronic Engine	2A2989 (01-280)	(1D) (A) (B)

C. Instruction/Disposition Code Statements:

(1D) The New part can be obtained through modification by the approved procedure in Reference (1). Purchase the New parts from or return the Old parts for modification to the approved vendor given in the Accomplishment Instructions.

Note (C) gives the new Hamilton Standard part number.

(A) New part is currently available.
(B) HSD P/L 808050-4-020

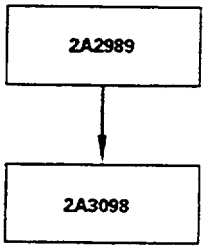
NOTE: The estimated 1994 unit prices shown are provided for planning purposes only and do not constitute a firm quotation. Consult the IAE Price Catalog or contact IAE's Spare Parts Sales Department for information concerning firm prices.

MODIFICATIONS

BASE LINE

V2500 - ENG - 73 - 0052
PROVIDE A NEW ELECTRONIC
ENGINE CONTROL WITH SCN9A
VERSION 021 SOFTWARE

PART NUMBER CHANGE



E2012A

Family Tree - Electronic Engine Control (EEC) Catalog Sequence No. 73-22-34, Fig 01, Item 280
Fig.2

Printed in Great Britain