ENGINE - FUEL AND CONTROL - TO PROVIDE A NEW ELECTRONIC ENGINE CONTROL (EEC) WITH THE SCN10A SOFTWARE CONFIGURATION TRIMS - CATEGORY CODE 8 - MOD.ENG-73-0080

1. Planning Information

A. Effectivity

(1) Aircraft: Airbus A320/A321

(2) Engine: V2527-A5 Engines before Serial No.V10150*
V2530-A5 Engines before Serial No.V10150*

*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

This Service Bulletin can be intermixed with SCN-9A, Reference (1), for the V2527-A5 and the V2530-A5.

This Service Bulletin must not be incorporate until Reference(3), Hamilton Standard Service Bulletin EEC-150-20-73-8 has been completed.

B. Reason

(1) Condition

(a) 1.0 N1 TOPPING LOOP ENHANCEMENTS: New A321 33K max takeoff rating at critical high altitude conditions has insufficient N1 redline margin to account for expected N1 transient overshoot characteristics. This could result in transient overshoot of the certified N1 redline limit on snap accels to max takeoff at these conditions on a deteriorated engine.

(b) 2.0 N2 COCKPIT DISPLAY FOR BELOW IDLE: The N2 cockpit display can toggle between 3-9% N2 and "XX" when the engine is rotating below idle in this speed range.

(c) ERRONEOUS COCKPIT FUELFLOW INDICATION AT FUEL ON: An erroneously high cockpit fuel flow indication can be displayed momentarily immediately after fuel pressurization.

(d) 4.0 WEIGHT-ON-WHEELS (WOW) VALIDATION /ACCOMODATION LOGIC: WOW from the A/C can be invalidated by the EEC if a GROUND status is received and Mn is above 0.43. This will result in inhibiting the use of Thurst Reverser (T/R) on landing and the generation of a nuisance maintenance fault.

(e) 5.0 OFF IDLE EGT SPIKING: Short during EGT, spikes which can result in EGT redline exceedance indications in the cockpit have been observed during initial accels off-idle.

(f) 6.0 STARTING EGT BIAS REVISION: EGT biasing currently implemented in A5 SCN 9A results in a 645 C starting EGT limit for the A320 A/C instead of the 635 c limit.

(g) 7.0 INTENTIONALLY OMITTED

(h) 8.0 FLEX TEMPERATURE MODE CHANGES

1 8.1 FLEX TEMPERATURE MODE SELECTION: Flex Temperature Mode engagement requires that the Flex Temperature input from the pilot be greater than the ambient temperature. Variations in the absolute and transient characteristics of the EEC selected T2, relative to the Flex Temperature input by the pilot as the A/C proceeds down the runway during takeoff, can result in unintended changes in the engagement of Flex T/O. This is most likely to occur for minor derated T/O's where the Flex Temperature is set purposely close to the actual ambient temperature obtained from the tower by the pilot.

2 8.2 FLEX TEMPERATURE ARINC LABEL 214: The value of Flex Temperature received by the EEC from the Flight Management computer is echoed back to the A/C on ARINC Label 214. The Flight Management Computer, however, sets its Flex Temperature SSM to No Computed Data (NCD) above 1500 feet, even if the EEC is still operating in Flex T/O Mode. This results in the loss of Flex Temperature indication in th cockpit during T/O.

(i) 9.0 HEAT MANAGEMENT CHANGES

1 9.1 AIR COOLED OIL COOLER (ACOC) SPRING VALVE NUISANCE FAULT: The air valve spring failed detection logic has been inappropriately flagging the spring failed ACOC AIR MOD VLV/HC/EEC

2 9.2 HEAT MANAGEMENT FLIP MODE FAULT RECORDING: The nuisance Flip Mode fault, "HMS-IDG OVTMP W/RECIRC" can be set after engine shutdown. This fault is recorded in EEROM and is a Class II fault which is intended to indicate a heat management system malfunction.

3 9.3 FUEL AND ENGINE OIL T/C FAILSAFE CLOSES AIR VALVE: The following discussion applies to both the engine oil and fuel thermocouples. If the fuel thermocouple is failed in both channels, the failsafe value for the input causes the logic to think the fuel is too cold. The logic responds by closing the air valve.

4 9.4 FUEL TEMPERATURE FAULT DETECTION: Engine vibration has produced numerous fuel thermocouple (T/C) intermittent faults which are being latched failed by the EEC in Revenue Service. This results in the setting of fuel temperature to the failsafed value and the recording and annunciation of a maintenance fault which is often difficult to confirm.

5 9.5 HEAT MANAGEMENT (HMT) RAISED IDLE LOGIC: Several events have been experienced in service where the engine idle has been raised to an undesirable level for on ground operations.

(j) 10.0 MENU MODE FAULT DISPLAY: Logic was previously incorporated to indicate that T/R operation was inhibited due to an invalidated WOW from the A/C. This fault, "REVINH", generates a unique Clear Language Message (CLM), "EIU/LGCIU/WOW". When this fault is recorded in EEC fault memory, the fault acronym "REVINH" should appear on the troubleshooting data menu, but it does not.

(k) 11.0 THRUST REVERSER CHANGES:

1 11.1 A/C PERMISSION SWITCH TEST: The Thurst Reverser A/C permission switch verification test is not performed in both channels on each flight.

2 11.2 REVERSER STOW & LOCK (S&L) AND ARMING VALVE CROSS CHECK FAULTS: Dispatch for 10 days is currently allowed with S&L and Arming Valve cross check faults. Thrust Reverser system status indication is degraded for subsequent Thrust Reverser system failures in this configuration.

3 11.3 REVERSER PRESSURIZED ECAM WARNING: Cross check failures of the Thrust Reverser S&L sensor input to the EEC can inhibit the setting of the "REVERSER PRESSURIZED" ECAM warning.

4 11.4 MONITORING OF T/R STOW TIME: No CLM is presently issued to direct the appropriate maintenance action for a T/R stow time exceedance.

(l) 12.0 NUISANCE EEC SELF-TEST FAULTS: Intermittent aircraft power when the engine is not running or intermittent external resets can inappropriately set internal EEC faults.

(m) 13.0 STARTING CHANGES:

1 13.1 AUTO-START LOCKED ROTOR DETECTION: Starts have occurred in production where the low rotor initially began to rotate but later bound-up prior to attaining idle. The software did not detect the locked rotor. The intent of the auto-start locked low rotor abort logic is to prevent engine starting to idle with the low rotor not turning.

2 13.2 GROUND STARTING ENHANCEMENTS: V2500-A5 engine ground autostarts at high altitudes and with low starter air supply pressures have not been 100% successful during the certification flight test campaign and in initial Revenue Service.

3 13.3 AUTO-START ENHANCEMENT FOR BOWED ROTOR: Field experience with the A1 engine has identified the potential for engine clearance degradation between rotating and static parts following engine restart of a previously shut-down hot engine.

(n) 14.0 ALTERNATOR CIRCUIT NUISANCE FAULT: Annunciations of "ALTERNATOR CIRCUIT FAILED" on ECAM have been seen during in-flight shutdowns on N2 synthesis. This fault is non-dispatchable.

(o) 15.0 INTENTIONALLY OMITTED

(p) 16.0 RATINGS:

1 16.1: New ratings are required for the A321 33K Growth engine.

2 16.2: An enhanced 27K rating (27E) is required for the A320 for TACA.

3 16.3: New ratings are required for the A319.

4 16.4: Temperature gradients at the High Pressure Turbine (HPT) 1st disk exist between idle and takeoff for the A321 installation (30K rating) which could impact HPT life.

(q) 17.0 EPR INDICATION FAULTS DUE TO EEC P2 TO DADC P2 DISAGREEMENT: Flight test has demonstrated the potential to momentarily lose the EPR cockpit display during negative G load maneuvers.

(r) 18.0 START ABORT DUE TO LOSS OF AIRCRAFT 28 VDC: Temporary failures of the aircraft 28 VDC input have resulted in auto-starts being aborted in revenue service without an accompanying ECAM message.

(s) 19.0 WING ANTI-ICE (WAI) MINIMUM PB SCHEDULES: A/C ground handling characteristics with WAI selected has been criticized due to the resulting raised engine idle.

(t) 20.0 SERVICE BLEED OVERRIDE: The EEC currently selects the source of High Pressure Compressor (HPC) customer service bleed (7th vs 10th stage) necessary to meet bleed demand from the lowest pressure source based on Pb. If the A1 Pb trip point is maintained for the A5, a TSFC penalty at low power cruise conditions could impact mission fuel burn for an A5 powered A320 or A319.

(u) 21.0 MIN LIMITS FOR DADC TAT AND ALT INPUTS: The current minimum limits for both DADC T2 (-60C) and Altitude (-1000 FT) do not cover the full range originally specified in the engine specification.

(v) 22.0 MAINTENANCE LOGIC IMPROVEMENTS

1 22.1 CLEAR LANGUAGE MESSAGE (CLM) CORRELATION TO ECAM WARNINGS: Determination of the required maintenance actions for faults identified in the Post Flight Report (PFR) can be less than straight forward.

2 22.2 EEC CONFIGURATION PAGE MENU REVISION: The Data Entry Plug (DEP) configuration is not presently available to the maintainer through Menu Mode.

3 22.3 "ENG 1(2) REVERSER UNLOCKED" MESSAGE IN MENU MODE: Spurious setting of the "ENG 1(2) REVERSER UNLOCKED" ECAM warning have been experienced during operation of the Thrust Reverser Menu Mode test with the latest Flight Warning Computer (FWC) Standard D1E.

4 22.4 PREMATURE TERMINATION OF MENU MODE: Premature terminations of Menu Mode, resulting in the EEC returning to Normal Mode, have been experienced while the system was configured for system bench testing.

5 22.5 MENU MODE TEST ENHANCEMENTS: The EEC self-test and P2/T2 heater test do not report current status of faults upon rerun of the test. This occurs when the test is rerun without leaving the menu.

(w) 23.0 DISPATCH LOGIC: A number of faults which are approved at the engine level for Long Term Dispatch are currently conservatively treated as Short Term Dispatch items.

(x) 24.0 DATA ENTRY PLUG (DEP) FAULT ACCOMODATION LOGIC: The Data Entry Modifier (DEM) cell contents have been modified to include new ratings and aircraft types which requires modification of the DEP fault accomodation logic.

(y) 25.0 OVERSPEED TEST ENHANCEMENTS:

1 25.1: Overspeed nuisance faults have been experienced in the field with A1/A5 engines.

2 25.2: Presently the EEC will record a nuisance FMU overspeed system fault following a real overspeed system activation event.

(z) 26.0 OVERSPEED EVENT RECORDING: None.

(aa) 27.0 INTENTIONALLY OMITTED

(ab) 28.0 INTENTIONALLY OMITTED

(ac) 29.0 PARAMETER SYNTHESIS: New takeoff ratings for the A321 & A319 aircraft installations require EGT biasing for cockpit display to ensure that desired EGT redline limits are compatible with the ECAM displays.

(ad) 30.0 EPR/N1 Reference - PIP (Performance Improvement Package) Modifier A319: A specific EPR Modifier is required for the A319.

(ae) 31.0 INTENTIONALLY OMITTED

(af) 32.0 INTENTIONALLY OMITTED

(ag) 33.0 INTENTIONALLY OMITTED

(ah) 34.0 ARINC MAINTENANCE WORD 1: Flight Warning Computer (FWC) logic does not presently consider EEC interface faults for TRA, Fuel Temperature T/C and Engine Oil temperature T/C faults - Warnings: "ENG ONE TLA FAULT", "ENG THR LEVER FAULT" AND "ENG FUEL HEAT SYSTEM".

(aj) 35.0 INTENTIONALLY OMITTED

(ak) 36.0 ENGINE T2 PROBE vs DADC T2 DISAGREEMENT: Disagreement between engine T2 and DADC T2 does not presently result in any fault recording within the EEC or associated A/C annunication.

(al) 37.0 FUEL ON/OFF DISCRETE CROSSCHECK ENHANCEMENT: Fuel On/Off discrete crosscheck faults can led to a Class I ECAM Warning "ENG 1/2: FUEL VALVE FAULT". Crosscheck faults are classified as Scheduled Maintenance Report (SMR) faults which are approved for long term dispatch.

(am) 28.0 AUTOTHRUST INSINCTIVE DISCONNECT (ID) LOGIC: Though no known problems have been experienced on the V2500 engine installation, sensitivity of the ID signal acquisition in the EEC could be too high.

(2) Background

(a) 1.0 N1 TOPPING LOOP ENHANCEMENTS: The new 33K rating max takeoff steady state N1 is too close to the N1 redline limit for the present N1 topping loop capacility to prevent transient exceedence of the redline limit at high conditions.

(b) 2.0 N2 COCKPIT DISPLAY FOR BELOW IDLE: The EEC Channel B N2 input is derived from one phase of the dedicated alternator's output. the noisy characteristic of this input at low speed can result in inaccurate N2 calculations which can be displayed in the cockpit once the dedicated speed winding input from Channel A has gone out of range low.

(c) 3.0 ERRONEOUS COCKPIT FUELFLOW INDICATION AT FUEL ON: The transient effects of fuel flow initiation on the mass fuel flowmeter signal to the EEC can result in an indicated fuel flow in the cockpit that is higher than actual metered flow.

(d) 4.0 WEIGHT-ON-WHEELS (WOW) VALIDATION /ACCOMODATION LOGIC: WOW from the A/C can be invalidated by the EEC if a GROUND status is received and Mn is above 0.43. This will result in inhibiting the use of Thrust Reverser (T/R) on landing and the generation of a nuisance maintenance fault.

(e) 5.0 OFF IDLE EGT SPIKING: EGT spikes are caused by initial fuel addition to accelerate the engine off-idle, where the LPT initially extracts little to no work, thus resulting in a momentarily high gas temperature spike passing the EGT sensors, This is not harmful to engine hardware based on service experience.

(f) 6.0 STARTING EGT BIAS REVISION: Previous requirements to bias EGT at takeoff for the A320 did not specifically disable this bias for starting.

(g) 7.0 INTENTIONALLLY OMITTED

(h) 8.0 FLEX TEMPERATURE MODE CHANGES

1 8.1 FLEX TEMPERATURE MODE SELECTION: The selection of Flex T/O Mode is currently not frozen until Mn is greater than 0.15.

2 8.2 FLEX TEMPERATURE ARINC LABEL 214: The EEC echoes back the Flex Temperature it receives from the A/C with the "as received" SSM.

(i) 9.0 HEAT MANAGEMENT CHANGES

1 9.1 AIR COOLED OIL COOLER (ACOC) SPRING VALVE NUISANCE FAULT: The current design does not properly distinguish between normal and failed operation effectively.

2 9.2 HEAT MANAGEMENT FLIP MODE FAULT RECORDING: On Engine shutdown during soakback, it may be possible for the IDG oil temperature to rise over and stay above the maintenance limit long enough to set the fault flag. At shutdown, there is no fuel flow to use as a cooling medium for the IDG oil.

3 9.3 FUEL AND ENGINE OIL T/C FAILSAFE CLOSES AIR VALVE: The current heat management design does not completely accommodate failures of the fuel and engine oil thermocouples.

4 9.4 FUEL TEMPERATURE FAULT DETECTION: The present EEC fuel T/C input fault detection logic does not accomodate intermittent faults satisfactorily.

5 9.5 HEAT MANAGEMENT (HMT) RAISED IDLE LOGIC: Present HMT logic defaults the fuel temperature used in the raised idle logic, in the event of a dual channel fuel T/C failure, to a value which results in an elevated ground idle.

(j) 10.0 MENU MODE FAULT DISPLAY: The implementation of the REVINH fault omitted the display of its acronym on the MENU MODE troubleshooting display menu.

(k) 11.0 THRUST REVERSER CHANGES:

1 11.1 A/C PERMISSION SWITCH TEST: The verification that the switch is not stuck closed is incorporated as part of the normal Thrust Reverser command logic. This results in the verification of the switch integrity at the end of the flight during normal reverser operation and only in the channel "In Control."

2 11.2 REVERSER STOW & LOCK (S&L) AND ARMING VALVE CROSS CHECK FAULTS: S&L Arming Valve cross check faults currently set only Class II faults.

3 11.3 REVERSER PRESSURIZED ECAM WARNING: The EEc failsafes the ARINC output of the S&L sensor to "UNLOCKED"if the S&L feedback differs between channels. However, the logic in the Flight Warning Computer (FWC) requires the S&L feedback to indicate "LOCKED" before providing a "REVERSER PRESSURIZED" indication on ECAM.

4 11.4 MONITORING OF T/R STOW TIME: Flight Warning Computer (FWC) logic currently sets an ECAM Warning "ENG REV UNLOCKED" if it detects a stow time exceedance.

(l) 12.0 NUISANCE EEC SELF-TEST FAULTS: Externally induced POR's (Power-On-Reset) can interrupt internal EEC self-tests resulting in artificial test failures.

(m) 13.0 STARTING CHANGES:

1 13.1 AUTO-START LOCKED ROTOR DETECTION: The present logic design only considered the case whee the low rotor never turns at all from the beginning of the auto-start sequence. The possibility of binding-up later in the start sequence was not anticipated.

2 13.2 GROUND STARTING ENHANCEMENTS: Non-optimized ground start fuel scheduling results in light-up stall and insufficient engine starting acceleration torque under these conditions.

3 13.3 AUTO-START ENHANCEMENT FOR BOWED ROTOR: Thermal differentials developing after shut-down of a hot engine can produce significant "bowing" of the rotor spool which, coupled with resulting amplification of the natural spool whirl on the subsequent engine start, can result in rubbing leading to clearance degradation and a corresponding loss in engine performance.

(n) 14.0 ALTERNATOR CIRCUIT NUISANCE FAULT: The fault logic associated with the alternator circuit is enabled using N2 synthesis which is intentionally biased for fast enough starting and thus is inaccurate during engine windmilling. This results in the logic determining that the high rotor is turning fast enough for the alternator to meet its minimum output requirement when it is not.

(o) 15.0 INTENTIONALLY OMITTED

(P) 16.0 ratings:

1 16.1: New requirements.

2 16.2: New requirements.

3 16.3: New requirements.

4 16.4: The higher takeoff rating for the A321 30K rating relative to the A320 27K rating results in greater temerature gradients between idle and takeoff if the existing A320 min idle N2 is maintained for the A321.

(q) 17.0 EPR INDICATION FAULTS DUE TO EEC P2 TO DADC P2 DISAGREEMENT: Local air turbulence at the EEC P2/T2 probe causes the check between EEC P2 and DADC P2 to fail the pesent tolerance.

(r) 18.0 START ABORT DUE TO LOSS OF AIRCRAFT 28 VDC: The current design does not adequately address temporary losses of aircraft 28 VDC.

(s) 19.0 WING ANTI-ICE (WAI) MINIMUM PB SCHEDULES: Pilot selection of WAI causes the EEC to raise the minimum Pb schedule to meet the increased bleed requirements.

(t) 20.0 SERVICE BLEED OVERRIDE: The corresponding level of bleed sense point pressure is significantly greater for the A5 than for the A1 engine.

(u) 21.0 MIN LIMITS FOR DADC TAT AND ALT INPUTS: The software was designed to the ICD requirements but the ICD was not in compliance with the original requirements in the engine specification.

(v) 22.0 MAINTENACE LOGIC IMPROVEMENTS

1 22.1 CLEAR LANGUAGE MESSAGE (CLM) CORRELATION TO ECAM WARNINGS: Troubleshooting faults is complicated by the lack of correlation between ECAM warnings and CLM's transmitted from the EEc as summarized in the PFR.

2 22.2 EEC CONFIGURATION PAGE MENU REVISION: New requirement.

3 22.3 "ENG 1(2) REVERSER UNLOCKED" MESSAGE IN MENU MODE: FWC Standard D1E no longer inhibits the setting of this ECAM warning in Phase 1 & 10 when the TRA is not in the reverser area. Since the EEc does not presently transmit TRA to the A/C during Menu Mode operation, execution of the T/R Menu Mode test can now set this warning.

4 22.4 PREMATURE TERMINATION OF MENU MODE: Several non-revenue service configurations associated with system bench testing, including the use of digital pressure inputs to the EEc, use of UART monitoring routines and externally corrupted fault codes, have been shown to have the potential to interrupt the proper operation of Menu Mode.

5 22.5 MENU MODE TEST ENHANCEMENTS: The logic does not clear out all the previously recorded faults before each run.

(w) 23.0 DISPATCH LOGIC: Revenue Service experience was desired before downgrading these faults from Short Term to Long Term Dispatch.

(x) 24.0 DATA ENTRY PLUG (DEP) FAULT ACCOMODATION LOGIC: New requirements.

(y) 25.0 OVERSPEED TEST ENHANCEMENTS:

1 25.1: The specific cause of the test failures has not been determined.

2 25.2: Current EEC logic does not recognize that the overspeed valve in the FMU is hydraulically latched in the overspeed position following system activation. Once the engine spools down in response to the resulting fuel flow reduction, the EEC stops commanding the overspeed valve. Since the valve does not return to the normal position, as commanded by the EEC, the EEC sets the nuisance FMU overspeed system fault.

(z) 26.0 OVERSPEED EVENT RECORDING: New requirement.

(aa) 27.0 INTENTIONALLY OMITTED

(ab) 28.0 INTENTIONALLY OMITTED

(ac) 29.0 PARAMETER SYNTHESIS: New requirements.

(ad) 30.0 EPR/N1 Reference - PIP (Performance Improvement Package) Modifier A319: New requirement.

(ae) 31.0 INTENTIONALLY OMITTED

(af) 32.0 INTENTIONALLY OMITTED

(ag) 33.0 INTENTIONALLY OMITTED

(ah) 34.0 ARINC MAINTENANCE WORD 1: The ARINC bits used by the FWC logic do not include interface faults.

(aj) 35.0 INTENTIONALLY OMITTED:

(ak) 36.0 ENGINE T2 PROBE vs DADC T2 DISAGREEMENT: Present EEC logic uses engine probe T2 to validate the T2 received from the A/C DADC's. If the two sources disagree, the EEC uses the engine probe T2 to preclude the potential of a bad DADC T2 effecting more than one engine.

(al) 37.0 FUEL ON/OFF DISCRETE CROSSCHECK ENHANCEMENT: Present EEC logic failsafes the Fuel On/Off discrete to "ON" in the event the two channel's fuel valve feedback discretes disagree. This produces an ECAM warning when the pilot shuts the engine down due to the disagreement between the command and feedback indication.

(am) 38.0 AUTOTHRUST INSTINCTIVE DISCONNECT (ID) LOGIC: Analysis and test have demonstrated that the V2500 logic's susceptibility to spurious short duration signals on the ID line can be improved.

(3) Objective

(a) 1.0 N1 TOPPING LOOP ENHANCEMENTS: (1) Incorporate improved N1 loop compensation for all ratings, (2) incorporate a transient N1 topping loop based on the exsisting N2 topping loop (for the 33K rating only) which will provide earlier intervention by the N1 topping loop to minimize N1 overshoots and (3) raise the steady state N1 topping limit (for all ratings other than the 33K) from its present value of 98.7% to 99.5% based on the benefits of item (1). The 33K rating steady state topping limit will be set at the redline value of 100% N1.

(b) 2.0 N2 COCKPIT DISPLAY FOR BELOW IDLE: Modify the channel B N2 processing logic to preclude the display of the potentially noisy Channel B's N2 during shutdown by using the crosstalked value from Channel A. The Channel A logic was also enhanced to preclude toggling as the signal goes out of range low.

(c) 3.0 ERRONEOUS COCKPIT FUELFLOW INDICATION AT FUEL ON: Modify the mass fuel flowmeter processing logic to limit th value of fuel flow sent to the cockpit by the commanded fuel flow for 2.5 seconds following fuel on detection. The mass flowmeter data averaging is also increased from 4 to 8 cycles to improve noise immunity.

(d) 4.0 WEIGHT-ON-WHEELS (WOW) VALIDATION /ACCOMODATION LOGIC: Increase the GROUND/FLIGHT threshold for validating a GROUND WOW indication from the A/C to 0.5 Mn and apply a 20 second confirmation before inhibiting reverser operating and recording a maintenance fault.

(e) 5.0 OFF IDLE EGT SPIKING: New logic has been implemented to: (1) override the Engine 7A Bleed closed and reset the SVA closed 5 degrees during on ground operations and (2) bias cockpit EGT for low power operation as appropriate to effect a true EGT redline equivalent to the engine certified limit of 650 C to provide additional EGT Redline margin

(f) 6.0 STARTING EGT BIAS REVISION: Modify the logic to disable the EGT biasing during starting such that EGT limits for both ground and in-flight starting are consistent for all aircraft installations (A321, A320, A319) as originally intended.

(g) 7.0 INTENTIONALLY OMITTED:

(h) 8.0 FLEX TEMPERATURE MODE CHANGES

1 8.1 FLEX TEMPERATURE MODE SELECTION: Modify the logic to freeze the Flex Mode selection when TLA is greater than Max Climb (MCL).

2 8.2 FLEX TEMPERATURE ARINC LABEL 214: Modify the logic to output on Label 214 the Flex Temperature used and frozen in the power management and not the one received from the A/C.

(i) 9.0 HEAT MANAGEMENT CHANGES

1 9.1 AIR COOLED OIL COOLER (ACOC) SPRING VALVE NUISANCE FAULT: Remove the air valve spring failed detection logic. The logic has been a source of nuisance faults without providing much benefit and is redundant to the test of the ACOC valve done during engine spool-up.

2 9.2 HEAT MANAGEMENT FLIP MODE FAULT RECORDING: Modify the logic such that the Flip Mode nuisance fault will not get set after the engine is shutdown.

3 9.3 FUEL AND ENGINE OIL T/C FAILSAFE CLOSES AIR VALVE: Modify the design to failsafe the fuel temperature to the proper failsafe value so that the fuel will not be inappropriately cold and the air valve inappropriately closed.

4 9.4 FUEL TEMPERATURE FAULT DETECTION: Increase the latch time associated with the fuel temperature crosscheck, rate and range failures from 5 to 30 seconds to provide improved accommodation for T/C intermittent faults. A fuel sensor design modification is also being implemented to address the vibration environment from a hardware point of view.

5 9.5 HEAT MANAGEMENT (HMT) RAISED IDLE LOGIC: Modify the logic to inhibit the raised idle logic on the ground in the event of a dual channel fuel T/C failure.

(j) 10.0 MENU MODE FAULT DISPLAY: Revise the logic to correctly display the fault acronym with the troubleshooting data on the associated menu.

(k) 11.0 THRUST REVERSER CHANGES:

1 11.1 A/C PERMISSION SWITCH TEST: Modify the logic to incorporate the A/C permission switch test into the existing engine spool-up test so that the verification is performed on each flight in both channels of the EEC.

2 11.2 REVERSER STOW & LOCK (S&L) AND ARMING VALVE CROSS CHECK FAULTS: Upgrade cross check faults of the S&L or Arming Valve from Class II to Class I by modifying the logic to set the Class I (NO DISPATCH) "REVERSER SYSTEM FAULT" (270/19) for cross check faults of the S&L Arming Valve.

3 11.3 REVERSER PRESSURIZED ECAM WARNING: Modify the logic to output on ARINC the local S&L feedback, instead of the failsafe value, to prevent inhibiting of the "REVERSER PRESSURIZED" ECAM warning in the presence of S& amp;L cross check faults.

4 11.4 MONITORING OF T/R STOW TIME: Modify the logic to monitor the T/R stow time and generate a CLM (TR TUBES/HCU/TR ACT) to direct the approprite maintenance action.

(l) 12.0 NUISANCE EEC SELF-TEST FAULTS: Modify the logic to verify that the EEC self-test failure did not result from an externally induced POR before recording the associated fault so that nuisance faults do not occur.

(m_ 13.0 STARING CHANGES:

1 13.1 AUTO-START LOCKED ROTOR DETECTION: Change the auto-start locked low rotor logic to abort any start where the low rotor does not rotate, or stops rotating during the start sequence prior to attaining idle.

2 13.2 GROUND STARTING ENHANCEMENTS: Optimize ground start fuel scheduling by making minimum fuelflow a function of altitutde to reduce it to 240 PPH at high altitudes, provisioning for an optimized ground autostart fuel and ignition on speed schedule as a function of altitude, adjusting the autostart ground ignition speed timer to 35 seconds and introducing a raised N2dot acceleration schedule for ground starting to ensure light up at lower altitudes occurs on the Wf/Pb starting schedule. These changes are applied to ground starts only based on the current Ground/Flight starting logic, thus assuring no impact to the air starting characteristics or certification.

3 13.3 AUTO-START ENHANCEMENT FOR BOWED ROTOR: Modify the logic to provide the provisions for incorporating by TRIM an additional 30 seconds of dry motoring of the engine on the starter before initiating fuel pressurization for all Auto-starts on the ground. This additional motoring will reduce thermals on the rotor spool and provide priming of the Number 3 bearing which is designed to control rotor spool whirl, thus minimizing the potential for rotor rub. The TRIMS for A5 SCN 10 will be initialized to the current A5 values, thus effecting no change to the current starting logic. A separate trim is also added to the starter cut-out (SCO) speed to reduce the SCO for ground starting from 42.6% to 40.1% N2 to enhance starter life.

(n) 14.0 ALTERNATOR CIRCUIT NUISANCE FAULT: Modify the logic to enable the fault detection on the alternator circuit only when the required sensor input signals are avilable so that nuisance faults will not be inappropriately set.

(o) 15.0 INTENTIONALLY OMITTED

(p) 16.0 RATINGS:

1 16.1:Implement new T/O, MCT, MCL & Breakpoint Ratings for the A321 33K engine which is selectable via the DEP.

2 16.2: Implement new T/O, MCT, MCL, Breakpoint Ratings fo the A320 27K engine which is selectable via the DEP.

3 16.3: Implement ne T/O, MCT, MCL, Breakpoint, Min Pb, N1 Reverse, N1 Idle, N1 Topping and N2 Idles Ratings for the A319 which is selectable via the DEP.

4 16.4: Implement the provision for providing a separately trimable min idle N2 schedule for the A321 should an HPT life concern arise on the A5. The A5 SCN 10 min idle N2 TRIMS will be initialized to the current A320 idle levels.

(q) 17.0 EPR INDICATION FAULTS DUE TO EEC P2 TO DADC P2 DISAGREEMENT: Incorporate a percent of point tolerance berween EEC & DADC P2 to accommodate the potential error observed during negative G load maneuvers.

(r) 18.0 START ABORT DUE TO LOSS OF AIRCRAFT 28 VDC: Change the logic so that a temporary loss of aircraft 28 VDC will not permanently inhibit the starting logic.

(s) 19.0 WING ANTI-ICE (WAI) MINIMUM PB SCHEDULES: WAI selection on ground causes the A/C Bleed Zone Controller to command the WAI valve open for 30 seconds to verify operation of th valve. Therefore, the logic in the EEC is modified to invoke the higher Pb schedule for only 40 seconds following WAI selection on the ground.

(t) 20.0 SERVICE BLEED OVERRIDE: Reduce the Pb service bleed trip point for the A5 engine to optimize its fuel burn benefit while maintaining the required service bleed pressure capability for low power cruise operation.

(u) 21.0 MIN LIMITS FOR DADC TAT AND ALT INPUTS: Modify the input processing logic to account for the originally intended required input range for T2 (-80 C) and altitude (-2000 FT).

(v) 22.0 MAINTENANCE LOGIC IMPROVEMENTS

1 22.1 CLEAR LANGUAGE MESSAGE (CLM) CORRELATION TO ECAM WARNINGS: A number of CLM's have been added to cover ECAM warnings which are listed in the PFR which currently do not have associated CLM's from the EEC. The new CLM's are as follows:

VSV MECH/GLD VLV/STRT
FAN INSP/HC/EEC
STRT DUCT/BLD VLV/STR
VSV MECH/BLD VLV/LPC
ENG INSP/CNA/LPC
VSV MECH/HP/BLD/HP INSP'
CHK AIR SUP/STRT/VSV
VSV MCH/HP VLV/ENG INSP
HC/HCU/NLKACTS
TUBES/LKACTS/NLKACTS
IGN1/115VAC/EEC
IGN2/115VAC/EEC
TR TUBES/HCU/TR ACT
HC/PROX SW/T/R UP ACT
HCU/T/R UP ACT/PROX SW

2 22.2 EEC CONFIGURATION PAGE MENU REVISION: The DEP configuration, as it is marked on the plug itself, has been added to the existing EEC Configuration page menu screen to aid in maintenance.

3 22.3 "ENG 1(2) REVERSER UNLOCKED" MESSAGE IN MENU MODE: Modify the logic so that the EEC will transmit the TRA position to the A/C during the T/R Menu Mode test to prevent spurious setting of the "ENG 1(2) REVERSER UNLOCKED ECAM" warning.

4 22.4 PREMATURE TERMINATION OF MENU MODE: Modify the associated code to preclude premature interruptions to Menu Mode while configured for system bench testing.

5 22.5 MENU MODE TEST ENHANCEMENTS: Clear all faults from the previous run before a rerun of the EEC self-test or P2/T2 heater test is done so that current status of the faults will be reported.

(w) 23.0 DISPATCH LOGIC: Modify the logic to downgrade the following faults to Long Term Dispatch: (1) Cross check faults between channels for the following signals... Pb, P5 Pamb, P2; Starter Air Valve & Fuel On/Off discrete feedbacks and Air Cooled Oil Cooler & Spill Valve LVDT feedbacks; (2) wraparound faults for Tenth Stage Makeup solenoid and Pb Heater relay discrete outputs and Air Cooled Oil Cooler and Spill Valve torque motor outputs; and (3) track checks on the Air Cooled Oil Cooler and Spill Valve torque motor loops. Additionally, a "Scheduled Maintenance Report" was created and the number of fault cells allocated to this fault class was established at 60. The Class III (Unlimited) fault recording design was also modified to record the last occurrence of a fault, rather than the first occuerrence, to aid in the confirmation of performed

maintenance actions.

(x) 24.0 DATA ENTRY PLUG (DEP) FAULT ACCOMODATION LOGIC: Modify the DEP fault logic to default to the A321 if the plug is invalid.

(y) 25.0 OVERSPEED TEST ENHANCEMENTS:

1 25.1: Continuing review of the overspeed test criteria has identified the following changes aimed at addressing the field events: (1) Modify the logic to eliminate the potential for single pass failures setting an overspeed fault; (2) delete the overspeed test done on engine spool-up as it is redundant to the test done on engine spool-down and (3) record additional fault information associated with a detected overspeed fault to aid in identifying the specific test that is setting the overspeed fault.

2 25.2: Modify the EEC logic to account for the hydraulic latching of the overspeed valve following a real overspeed event to avoid the setting of the nuisance FMU overspeed system fault.

(z) 26.0 OVERSPEED EVENT RECORDING: Provide a CLM, "71-00-00 PROPULSION SYSTEM", and add the capability to record appropriate parametric data in EEROM at the time of an overspeed event to aid in the troubleshooting of such an event.

(aa) 27.0 INTENTIONALLY OMITTED

(ab) 28.0 INTENTIONALLY OMITTED

(ac) 29.0 PARAMETER SYNTHESIS: Incorporate EGT biasing for cockpit display max continuous and takeoff operation which is appropriate for each particular thrust rating and aircraft installation.

(ad) 30.0 EPR/N1 Reference - PIP (Performance Improvement Package) Modifier A319: Implement a specific A319 PIP EPR modifier table.

(ae) 31.0 INTENTIONALLY OMITTED

(af) 32.0 INTENTIONALLY OMITTED

(ag) 33.0 INTENTIONALLY OMITTED

(ah) 34.0 ARINC MAINTENANCE WORD 1. Modify the definition of the associated EEC ARINC bits to include EEC interface faults.

(aj) 35.0 INTENTIONALLY OMITTED

(ak) 36.0 ENGINE T2 PROBE vs DADC T2 DISAGREEMENT: Modify the EEC fault logic to record a Scheduled Maintenance Fault in EEC fault memory if the engine probe and DADC T2's disagree by more than an allowed tolerance for more than a specified time above a certain Mn.

(al) 37.0 FUEL ON/OFF DISCRETE CROSSCHECK ENHANCEMENT: Modify the fuel valve crosscheck fault accomodation logic to synthesize the fuel valve feedback from the fuel valve command for all cases where the position of the valve can not be determined. Continue to failsafe the fuel valve position to Fuel ON, if other engine parametrs do not confirm that the engine has been shut down following command of Fuel OFF.

(am) 38.0 AUTOTHRUST INSTINCTIVE DISCONNECT (ID) LOGIC: Modify the EEC ID logic to require a 2 pass confirmation of the ID discrete input to the EEC before allowing disconnection of the Autothrust system to reduce the susceptibility to spurious signals on the ID line.

(4) Substantiation

The flight simulation and flight testing of the SCN10A 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 SCN10A software logic with version 026/026 trims. This software version provides changes to starting, auto start enhancement for bowed rotor, logic for new growth 33K rating and 27K enhanced (TACA) ratings, maintenance logic improvements, start schedule enhancements, changes to the DEP logic, plus several other improvements/fixes.

Part I - If the Electronic Engine Control is sent to one of the addresses listed in Paragraph 2. B., Accomplishment Instructions

(a) A new EEC can be obtained from the supplier referenced in Part I of this Service Bulletin. The removed part is returned, programmed, identified with the new part number and installed again.

Part II - If IAE is requested to assist or coordinate the reprogramming of the electronic Engine Control

(b) The EEC can be programmed on the engine, by the procedure given in Part II of this Service Bulletin, and identified with the new part number.

D. Approval

Incorporation of this Service Bulletin on A320/A321 aircraft is authorized by Reference (4), Airbus Service Bulletin A320-73-1042, Revision 1.

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 8

Accomplish based upon experience with the prior configuration.

F. Manpower

Estimated Manhours to incorporate the full intent of Part I 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

Estimated Manhours to incorporate the full intent of Part II of this Bulletin:

Venue	Estimated Manhours
(1) In Service	TOTAL: 1 hour 25 minutes
(a) To gain access	
(i) Install warning notices ..	5 minutes
(ii) Open the fan cowls	7 minutes
(iii) Program the EEC	1 hour
TOTAL	1 hour 12 minutes
(2) At overhaul	TOTAL: 1 hour
(a) Program the EEC	1 hour

G. Material - Price and Availability

(1) Modification Kit not required.

(2) This Service Bulletin will be done at no cost to the operator.

H. Tooling - Price and Availability

The tools and equipment that follow are necessary to do the procedure given in Part II of this Service Bulletin.

(1) A dedicated (recommendation) IBM compatible computer, with the following minimum requirements:

(a) 80286 processor

(b) 512 Kbytes RAM

(c) 1.44 Mbyte, 3.5" floppy disk drive

(d) Dual channel RS-422 asynchronous communication board (HS recommends Model DS202 by Qua Tech Incorporated) with the following setup:

Channel A EEC - COM3 (Base address 2E8, IRQ level 5)
Channel B EEC - COM4 (Base address 3E8, IRQ level 5)

(e) MSDOS operating system (version 3.0 or higher)

NOTE: The IBM computer date/time must be current prior to performing this procedure.

(f) Virus scan program such as "VI-SPY" is recommended.

(2) Hamilton Standard diskette called out in Reference (2). This diskette contains the EEC150-20: application code, trims, memory clear utilities, and software loader.

(3) EEC150-20 communication cables as defined in Table 1.

(4) EEC150-20 Nameplate PN 751333-1.

EEC SIGNAL NAME	EEC CONNECTOR	QUA-TECH CONNECTOR	QUA-TECH SIGNAL NAME
UART IN LINE B CHA	P1-b	PA-2	TXD+
UART IN LINE A CHA	P1-H	PA-7	TXD-
UART OUT LINE A CHA	P1-c	PA-4	RXD+
UART OUT LINE B CHA	P1-J	PA-8	RXD-
BOOT DISC CHA	P1-D	N/A	N/A
BITE DISC CHA	P1-Z	N/A	N/A
BOOT/BITE RTN CHA	P1-m	N/A	N/A
UART IN LINE B CHB	P7-b	PB-2	TXD+
UART IN LINE A CHB	P7-H	PB-7	TXD-
UART OUT LINE A CHB	P7-c	PB-4	RXD+
UART OUT LINE B CHB	P7-J	PB-8	RXD-
BOOT DISC CHB	P7-D	N/A	N/A
BITE DISC CHB	P7-Z	N/A	N/A
BOOT/BITE RTN CHB	P7-m	N/A	N/A

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Table 1
Communication Connections

Communication Connections
Table 1

I. Weight and Balance

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

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

(3) Datum .. .. Engine front mount centerline (Powerplant 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.

95VZ013

(2) Other References

V2500-ENG-73-0052 (Engine - Fuel and Control - To Provide a New Electronic Engine Control (EEC) With the SCN9A Version 021/121 Software Configuration and Hardware Changes to Address Nacelle Drainage Requirements)

Hamilton Standard Service Bulletin EEC150-20-73-10

Hamilton Standard Service Bulletin EEC150-20-73-8

Airbus Service Bulletin A320-73-1042, Revision 1

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

Part I - If the Electronic Engine Control is sent to one of the addresses listed in Paragraph 2. B., 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-INTERNTIONAL 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. Removal Instructions

(1) Remove the 808050-4-020 (2A3098) Electronic Engine Control by the approved procedure given in Reference (5), Chapter/Section 73-22-34, Removal/Installation. Refer to Figure 1.

E. Rework Instructions

(1) Do a modification of the 808050-4-020 (2A3098) Electronic Engine Control (See Reference (6), 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 Elctronic Engine Control to the approved vendor to be modified.	See Figure 1 and Reference (2).

F. Installation Instructions

(1) Install the 808050-4-024 (2A3210) Electronic Engine Control (1 off) by the approved procedure given in Reference (5), Chapter/Section 73-22-34, Removal/Installation. See Figure 1.

G. Recording Instructions

(1) A record of accomplishment is necessary.

Part II - If IAE is requested to assist or coordinate the reprogramming of the Electronic Engine Control

NOTE: This procedure can only be accomplished by maintenance personnel that have been trained by an IAE representative.

A. Isolate aircraft electrical system and gain access to the EEC by doing the pre-requisite procedures given in steps 2A., B., C. and D. in Reference (5), Chapter/Section 73-22-34, Removal/Installation, (the removal procedure).

NOTE: Only turn back-on aircraft 28VDC when instructed to in the following procedure.

B. General

(1) Hamilton Standard electronic Engine Control, Model EEC150-20, software is programmed into the EEC using an IBM compatible computer and Hamilton Standard supplied software.

(a) Disassembly of the EEC is not required.

(b) Data integrity of the Hamilton Standard supplied software is performed as part of the reprogramming procedure.

(c) A bit-for-bit memory verification test is included as part of the reprogramming procedure.

(d) No functional, thermal cycle, or vibration testing is required for units reprogrammed in accordance with this Service instruction.

(e) The EEC can be reprogrammed at room ambient conditions or while it is installed on the engine.

(2) The tools specified in Paragraph 1. H. are necessary to accomplish this procedure.

C. Do the steps that follow to reprogram the Electronic Engine Control (EEC) without removing it from the engine.

(1) Verify that the model number on the identification plate of the unit is "EEC150-20".

(2) Record the current unit part number and the unit serial number from the nameplate. Thus information will input into your computer.

(3) Connect commercial power to all necessary reprogramming equipment.

(4) Remove the harness connector from the EEC connector marked J1 and connect the programming harness connector marked P1 to the EEC connector marked J1. Ensure that the red engagement stripe on the EEC connector J1 is fully covered.

(5) Remove the harness connector from the EEC connector marked J7 and connect th programming harness connector marked P7 to the EEC connector marked J7.

(a) Make sure that the red engagement stripe on the EEC connector J7 is fully covered.

(6) If the computer and power supply connections to the cables are permanent, skip to step C. (12).

(7) Connect the programming harness connector marked "ch. a uart" to the IBM compatible computer UART board connectors for the channel A RS-422 Port (COM3). Make sure that these connectors are properly mated.

(8) Connect the programming harness marked "ch. b uart" to the IBM compatible computer UART board connectors for the channel B RS-422 Port (COM4). Make sure that the connectors are properly mated.

NOTE: UART connections can differ for different IBM Compatible Computers.

NOTE: It is important to verify that the connectors are correctly installed for correct loader operation. Hamilton Standard recommends labeling the RS-422 COM3 port as "ch. a uart" and COM4 port as "ch. b uart"on the computer to reduce errors.

(9) Intentionally left blank.

(10) Intentionally left blank.

(11) Intentionally left blank.

(12) Locate the BOOT/BITE switches for channel A and channel B. Set the BOOT/BITE switches to the ON (closed) position.

(13) Turn on the aircraft 28VDC power supply to the EEC.

(14) Turn on the power to the IBM compatible computer.

NOTE: Please make sure that the Disk Drive "A" has no disks present, prior to power on of the computer.

(15) Wait for the MSDOS prompt "C:\> to appear on the IBM compatible computer.

NOTE: The procedure uses disk drive "A" to identify the location of the floppy drive in the computer system. If your computer is configured with the 3.5 inch floppy drive at a different designation, substitute that designation into the procedure.

(16) Obtain the Hamilton Standard reprogramming diskette which is given in Reference (2).

(a) Make sure that the write protection tab of the diskette is covering the "hole".

NOTE: If necessary, you can remove the stickers from the corner of the disk and move the protecting device to close the hole.

(b) Insert the diskette into the floppy drive designated as "A" on the IBM compatible computer.

(17) The display will show the "C:\>". Type a: then press the RETURN key.

NOTE: Some computers have the RETURN key designated ENTER.

(18) The display will show the "A:\>" prompt.

(a) Type LDR150 then press the RETURN key. This starts the UART programming utility.

1 Several messages will appear including the program identification, version number, time and the UTC/P&W document property rights notice.

2 If there is a configuration error on the diskette, the program will display the appropriate error message and abort the programming process. Refer to Table 3 for a summary of error code description and troubleshooting suggestions.

(19) The UART programming utility LDR150, will display the following message: "Enter operator;s name performing download:[ ]>"

(a) The field between the brackets will always be empty the first time the program is executed on the diskette.

(b) Subsequent execution of the program will display the last name entered.

1 If the operator is the same, press the RETURN key to continue.

2 If a different name is present than the operator or no name is present, the operator should enter his/her name and press the RETURN key.

(20) The LDR150 program will display the following message:

WARNING - EEC Fault Memory Will Be Cleared By This Program. If an EEC Fault Dump Is Required Prior to Programming, enter Q to Quit of C to Continue [Q/C]:

(a) If a fault dump has already been accomplished or is not required, type C, then press the RETURN key.

(b) If a fault dump is required or the operator wishes to terminate the programming procedure, type Q then press the RETURN key.

(c) If the operator selects the quit option, turn off the 28VDC power to the EEC and go to step C. (36).

(21) The LDR150 program will now prompt with the following message: "Enter the 9 character EEC Serial Number : [XXXX-XXXX]>". From the Hamilton Standard nameplate, enter the nine character EEC serial number and press the RETURN key.

NOTE: For steps (22) and (23), if the EEC 150-20 part number on the nameplate between the dashes is a single digit, enter a zero immediately preceeding this digit.

Example: P/N 808050-4-024 would be entered as 8008050-04-024.

(22) The LDR150 program will now prompt with the following message: "Enter the 13 character Current EEC HW Part No.: [XXXXXX-XX-XXX]>". From the Hamilton Standard nameplate, enter the 13 character EEC Hardware Part Number and press the RETURN key.

(23) The LDR150 program will now prompt with the following message: "Enter the 13 character EEC HW Part No.: [XXXXXX-XX-XXX]>". From Reference (2), the Service Bulletin, enter the 13 character EEC Hardware Part Number and press the RETURN key.

(24) The LDR150 program will now prompt with the following message: "Enter Trim Checksum Value for "xxxxxx.xxx:>". The xxxxxx.xxx designation is the name of the Trim File being loaded to the EEC. From Reference (2), the Service Bulletin, enter the trim checksum value and press the RETURN key.

(25) The LDR program will now prompt with the following message: "Do you wish to reenter the above entries [Y/N/Q]:".

(a) To proceed with programming process, type N, then press the RETURN kdy. Continue with step C. (25).

(b) To correct any errors in the data entered, type Y, then press RETURN. Continue with step C. (19).

(c) To quit the programming process, type Q, then press RETURN. Turn off the 28 VDC power to the EEC and continue with step C. (36).

(26) At this point the screen will be initialized to display the activity of the programming process.

(a) Status messages will scroll across the screen.

(b) If an error occurs, see Table 3 for a summary of error code description and troubleshooting suggestions.

(27) The LRD150 program will prompt with the following message:

```
Turn Off the BITE and BOOT switches to the EEC
            then
Turn Off POWER to the EEC and wait at least 5 seconds
            then
Turn On POWER to the EEC

Press the RETURN Key When Ready to Continue
```

Locate the BOOT/BITE switches on your test equipment, and set the BOOT/BITE switches to the OFF (open) position.

(28) Switch off the 28 VDC Aircraft supply to the EEC, wait 5 seconds, then switch on the 28 VDC power supply to the EEC.

(29) On the IBM compatible computer, press the RETURN key.

(30) Wait until the LDR150 program prompts with the following message:

```
Turn ON the BITE and BOOT switches to the EEC
              then
Turn Off POWER to the EEC and wait at least 5 seconds
              then
Turn ON POWER to the EEC
...Press the RETURN Key When Ready to Continue
```

Locate the BOOT/BITE switches on your test equipment, and set the BOOT/BITE switches to the ON (closed position.

(31) Switch off the 28VDC aircraft supply power to the EEC, wait 5 seconds, then switch on the 28VDC aircrft supply to the EEC.

(32) On the IBM compatible computer, press the RETURN key.

(33) Wait until the LDR150 program prompts with the following message:

Turn Off POWER to the EEC

...Press the RETURN Key When Ready to Continue

Switch off the 28VDC aircraft supply to the EEC.

(34) On the IBM compatible computer, press the RETURN key.

(35) The LDR150 program will now display the status of the programming process. Record the name of the log file for hard copy report of the process.

(a) If successful programming occurred, the following message will be displayed:

EEC REPROGRAMMING SUCCESSFULLY COMPLETED
Record the log file name "VLXXXX.LOG" for lter printout.

If desired, record the log file name "VLXXXX.LOG" for later printout."

(b) If the programming was unsuccessful, the following message will be displayed:

****DOWNLOAD PROCESS ABORTED - ERROR CODE "X" ****Record the log file name "VLXXXX.LOG" for later printout.

If desired, record the log file name "VLXXX.LOG" for later printout.

The "X" refers to the tyupe of error that caused the process to abort. Table 1 describes the error codes and action to be taken.

(36) Press the RETURN key to terminate the program and return to the MSDOS prompt "A:\>".

(37) A paper copy of the log file can be made by the IBM compatible computer if a printer is available. You can do this as follows:

NOTE: You can remove the diskette, write protect the diskette, and move to a system with a printer if no printer is connected to the original system. Complete the commands listed below to make a paper copy.

(a) At the MSDOS prompt, type PRINT VLXXX.LOG.

(b) Press the RETURN key.

(c) Wait until the printer is finished before proceeding to the next step.

(d) Remove the diskette, write protect the diskette.

(38) Disconnect the EEC reprogramming electrical connectors from J1 and J7.

(39) Reconnect the aircraft electrical harness connectors to J1 and J7.

(40) Identify the Electronic Engine Control by the procedure specified in Reference (2).

(41) Close-up the engine and remove the remaining notices by doing the post-requisite procedures given in the steps 6, 7 and 8 in Reference (5), Chapter/Section 73-22-34 Removal/Installation,(the installation procedure) and the Recording Instructions given in Part I, Paragraph G.

(42) Do the post-installation test specified in Reference (5), Chapter/Section 71-00-00, as required for removal/installation of an Electronic Engine Control.

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EEC SIGNAL NAME	EEC CONNECTOR	POWER SUPPLY
GTP CHA	P3-m	+28VDC
GTP RTN CHA	P3-r	RTN
GTP CHB	P9-m	+28VDC
GTP RTN CHB	P9-r	RTN

Table 2
Power Supply Connections

Power Supply Connections
Table 2

ERROR CODE	ERROR TYPE	ACTION
E1	EEC VERIFY ERROR - Data verify error in EEC - Compare failed or location could not be programmed	Try procedure 3 times, if still bad return EEC unit
E2	COMMUNICATION ERROR - Communication problem between EEC and IBM compatible computer	Check BITE, cables, power supply. UART board, and EEC. Retry 3 times.
E3	CONFIGURATION ERROR - Configuration data comparison failed. (Possible Hardware P/N mismatch, EEC compatibility mismatch, Trim Checksum mismatch)	Operator data entered incorrect or incorrect data on existing nameplate. Check data - retry with the correct information.
E4	SYSTEM PROBLEM - Poor operating environment, bad disk, or program aborted by operator.	If the process was not terminated by the operator, check that the disk is not write protected, or replace disk and retry.

Table 3
Error Code Definitions

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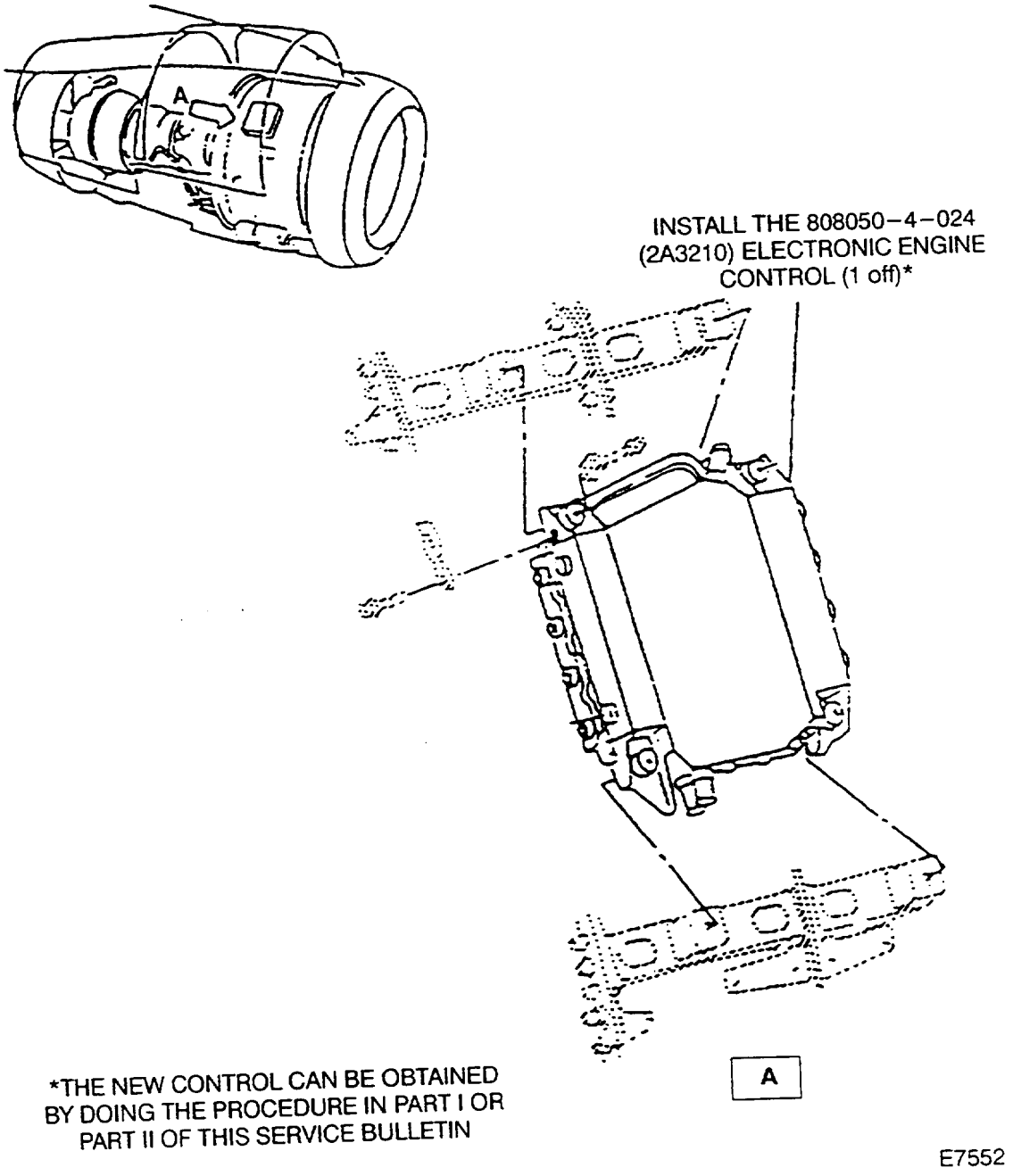
Error Code Definitions
Table 3



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:

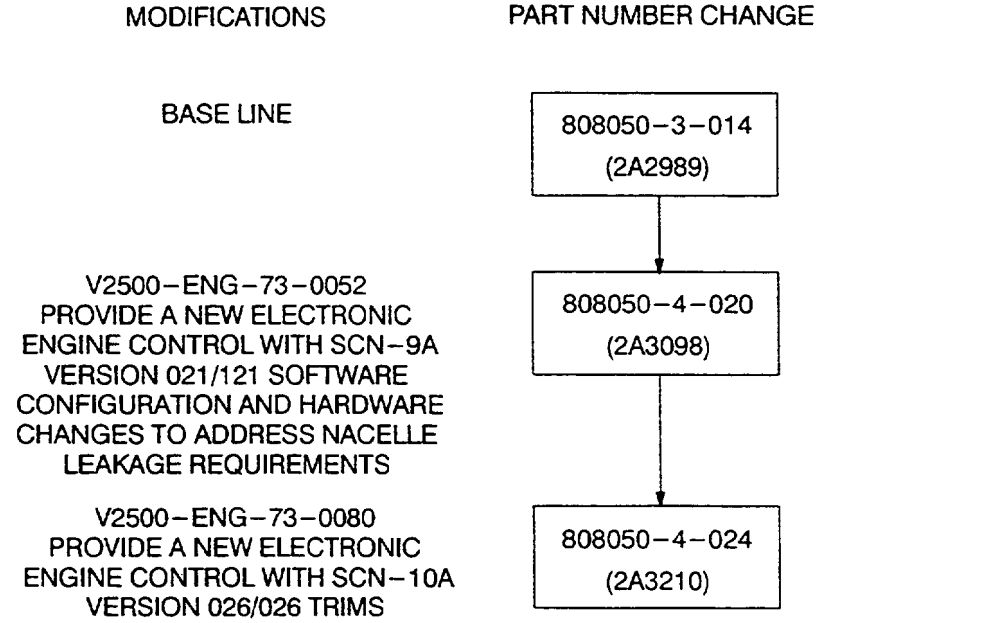
New Part No. (ATA No.)	Qty	Est'd Unit Price ($)	Keyword	Old Part No. (IPC No.)	Instructions Disposition
808050-4-024 2A3210 (73-22-34)	1		Control, Electronic Engine	808050-4-020 2A3098 (01-280)	(1D) (A)

C. Instructions/Disposition Code Statements:

(1D) The New part can be obtained through modification by the approved procedure in Reference (2). Purchase the New parts from or return the Old parts for modification to the approved vendor given in the Accomplishment Instructions.

(A) New part is currently available.

NOTE: The estimated 1995 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.



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

Printed in Great Britain

UNITED TECHNOLOGIES HAMILTON STANDARD

SERVICE BULLETIN

Engine Fuel and Control – EEC150–20 Electronic Engine Control – Incorporation of Airbus (A5) SCN10A Software Configuration

HSS FAA Repair Station License Number – SI3R842L
PWORCE FAA Repair Station License Number – CW5Y794M

1. Planning Information

A. Effectivity

Hamilton Standard EEC150–20 Electronic Engine Controls Part Number

808050–4–XXX

XXX – Identifies all available software configurations.

NOTE: Following incorporation of this service bulletin, the EEC150–20 can be installed on Airbus A320 and A321 that use the IAE V2500–A5 Series engines.

NOTE: Hamilton Standard Service Bulletin EEC150–20–73–8 must be incorporated prior to incorporation of this service bulletin.

B. Reason

The purpose of this Service Bulletin is to allow the Airbus A320 and A321 operators to install Airbus (A5) SCN10A software in the EEC150–20.

(1) Problem.

(a) N1 TOPPING LOOP ENHANCEMENTS: New A321 33K max takeoff rating at critical high altitude conditions has insufficient N1 redline margin to account for expected N1 transient overshoot characteristics. This could result in transient overshoot of the certified N1 redline limit on snap accels to max takeoff at these conditions on a deteriorated engine.

(b) N2 COCKPIT DISPLAY FOR BELOW IDLE: The N2 cockpit display can toggle between 3–9% N2 and "XX" when the engine is rotating below idle in this speed range.

(c) ERRONEOUS COCKPIT FUEL FLOW INDICATION AT FUEL ON: An erroneously high cockpit fuel flow indication can be displayed momentarily immediately after fuel pressurization.

(d) WEIGHT–ON– WHEELS (WOW) VALIDATION/ACCOMMODATION LOGIC: WOW from the A/C can be invalidated by the EEC if a GROUND status is received and the Mach Number (Mn) is above 0.43. This will result in inhibiting the use of Thrust Reverser (T/R) on landing and the generation of a nuisance maintenance fault.

(e) OFF IDLE EGT SPIKING: Short duration EGT spikes can result in EGT redline exceedance indications in the cockpit which have been observed during initial accels off–idle.

(f) STARTING EGT BIAS REVISION: EGT biasing currently implemented in A5 SCN9A results in a 645 C starting EGT limit for the A320 A/C instead of the 635 C limit.

(g) FLEX TEMPERATURE MODE CHANGES:

1 FLEX TEMPERATURE MODE SELECTION: Flex Temperature Mode engagement requires that the Flex Temperature input from the pilot be greater than the ambient temperature. Variations in the absolute and transient characteristics of the EEC selected T2, relative to the Flex Temperature input by the pilot as the A/C proceeds down the runway during takeoff, can result in unintended changes in the engagement of Flex T/O. This is most likely to occur for minor derated T/O's where the Flex Temperature is set purposely close to the actual ambient temperature obtained from the tower by the pilot.

2 FLEX TEMPERATURE ARINC LABEL 214: The value of Flex Temperature received by the EEC from the Flight Management computer is echoed back to the A/C on ARINC Label 214. The Flight Management Computer, however, sets its Flex Temperature SSM to No Computed Data (NCD) above 1500 feet, even if the EEC is still operating in Flex T/O Mode. This results in the loss of Flex Temperature indication in the cockpit during T/O.

(h) HEAT MANAGEMENT CHANGES:

1 AIR COOLED OIL COOLER (ACOC) SPRING VALVE NUISANCE FAULT: The air valve spring failed detection logic has been inappropriately flagging the spring failed "ACOC AIR MOD VLV/HC/EEC@".

2 HEAT MANAGEMENT FLIP MODE FAULT RECORDING: The nuisance Flip Mode fault, "HMS–IDG OVTMP W/RECIRC@" can be set after engine shutdown. This fault is recorded in EEROM and is a Class II fault which is intended to indicate a heat management system malfunction.

3 FUEL AND ENGINE OIL T/C FAILSAFE CLOSES AIR VALVE: The following discussion applies to both the engine oil and fuel thermocouples. If the fuel thermocouple is failed in both channels, the failsafe value for the input causes the logic to think the fuel is too cold. The logic responds by closing the air valve.

4 FUEL TEMPERATURE FAULT DETECTION: Engine vibration has produced numerous fuel thermocouple (T/C) intermittent faults which are being latched failed by the EEC in Revenue Service. This results in the setting of fuel temperature to the failsafed value and the recording and annunciation of a maintenance fault which is often difficult to confirm.

5 HEAT MANAGEMENT (HMT) RAISED IDLE LOGIC: Several events have been experienced in service where the engine idle has been raised to an undesirable level for on ground operations.

(i) MENU MODE FAULT DISPLAY: Logic was previously incorporated to indicate that T/R operation was inhibited due to an invalidated WOW from the A/C. This fault, "REVINH", generates a unique Clear Language Message (CLM), "EIU/LGCIU/WOW". When this fault is recorded in EEC fault memory, the fault acronym "REVINH" should appear on the troubleshooting data menu, but it does not.

(j) THRUST REVERSER CHANGES:

1 A/C PERMISSION SWITCH TEST: The Thrust Reverser A/C permission switch verification test is not performed in both channels on each flight.

2 REVERSER STOW & LOCK (S&L) AND ARMING VALVE CROSS CHECK FAULTS: Dispatch for 10 days is currently allowed with S&L and Arming Valve cross check faults. Thrust Reverser system status indication is degraded for subsequent Thrust Reverser system failures in this configuration.

3 REVERSER PRESSURIZED ECAM WARNING: Cross check failures of the Thrust Reverser S&L sensor input to the EEC can inhibit the setting of the "REVERSER PRESSURIZED" ECAM warning.

4 MONITORING OF T/R STOW TIME: No CLM is presently issued to direct the appropriate maintenance action for a T/R stow time exceedance.

(k) NUISANCE EEC SELF–TEST FAULTS: Intermittent aircraft power when the engine is not running or intermittent external resets can inappropriately set internal EEC faults.

(l) STARTING CHANGES:

1 AUTO–START LOCKED ROTOR DETECTION: Starts have occurred in production where the low rotor initially began to rotate but later bound–up prior to attaining idle. The software did not detect the locked rotor. The intent of the auto–start locked low rotor abort logic is to prevent engine starting to idle with the low rotor not turning.

2 GROUND STARTING ENHANCEMENTS: V2500–A5 engine ground autostarts at high altitudes and with low starter air supply pressures have not been 100% successful during the certification flight test campaign and in initial Revenue Service.

3 AUTO–START ENHANCEMENT FOR BOWED ROTOR: Field experience wtih the A1 engine has identified the potential for engine clearance degradation between rotating and static parts following the engine restart of a previously shut–down hot engine.

(m) ALTERNATOR CIRCUIT NUISANCE FAULT: Annunciations of "ALTERNATOR CIRCUIT FAILED" on ECAM have been seen during in–flight shutdowns on N2 synthesis. This fault is non–dispatchable.

(n) RATINGS:

1 New ratings are required for the A321 33K Growth engine.

2 An enhanced 27K (27E) rating is required for the A320 for TACA.

3 New ratings are required for the A319.

4 Temperature gradients at the High Pressure Turbine (HPT) 1st disk exist between idle and takeoff for the A321 installation (30K rating) which could impact HPT life.

(o) EPR INDICATION FAULTS DUE TO EEC P2 TO DADC P2 DISAGREEMENT: Flight test has demonstrated the potential to momentarily lose the EPR cockpit display during negative G load maneuvers.

(p) START ABORT DUE TO LOSS OF AIRCRAFT 28 VDC: Temporary failures of the aircraft 28 VDC input have resulted in auto–starts being aborted in revenue service without an accompanying ECAM message.

(q) WING ANTI–ICE (WAI) MINIMUM PB SCHEDULES: A/C ground handling characteristics with WAI selected has been criticized due to the resulting raised engine idle.

(r) SERVICE BLEED OVERRIDE: The EEC currently selects the source of High Pressure Compressor (HPC) customer service bleed (7th vs 10th stage) necessary to meet bleed demand for the lowest pressure source based on Pb. If the A1 Pb trip point is maintained for the A5, a TSFC penalty at low power cruise conditions could impact mission fuel burn for an A5 powered A320 or A319.

(s) MIN LIMITS FOR DADC TAT AND ALT INPUTS: The current minimum limits for both DADC T2 (–60 C) and Altitude (–1000 FT) do not cover the full range originally specified in the engine specification.

(t) MAINTENANCE LOGIC IMPROVEMENTS:

1 CLEAR LANGUAGE MESSAGE (CLM) CORRELATION TO ECAM WARNINGS: Determination of the required maintenance actions for faults identified in the Post Flight Report (PFR) can be less than straight forward.

2 EEC CONFIGURATION PAGE MENU REVISION: The Data Entry Plug (DEP) configuration is not presently available to the maintainer through Menu Mode.

3 "ENG 1(2) REVERSER UNLOCKED" MESSAGE IN MENU MODE: Spurious setting of the "ENG 1(2) REVERSER UNLOCKED" ECAM warning have been experienced during operation of the Thrust Reverser Menu Mode test with the latest Flight Warning Computer (FWC) Standard D1E.

4 PREMATURE TERMINATION OF MENU MODE: Premature terminations of Menu Mode, resulting in the EEC returning to Normal Mode, have been experienced while the system was configured for system bench testing.

5 MENU MODE TEST ENHANCEMENTS: The EEC self–test and P2/T2 heater test do not report current status of faults upon rerun of the test. This occurs when the test is rerun without leaving the menu.

(u) DISPATCH LOGIC: A number of faults which are approved at the engine level for Long Term Dispatch are currently conservatively treated as Short Term Dispatch items.

(v) DATA ENTRY PLUG (DEP) FAULT ACCOMODATION LOGIC: The Data Entry Modifier (DEM) cell contents have been modified to include new ratings and aircraft types which requires modification of the DEP fault accomodation logic.

(w) OVERSPEED TEST ENHANCEMENTS:

1 OVERSPEED NUISANCE FAULTS: Overspeed nuisance faults have been experienced in the field with A1/A5 engines.

2 NUISANCE FMU OVERSPEED SYSTEM FAULTS: Presently the EEC will record a nuisance FMU overspeed system fault following a real overspeed system activation event.

(x) OVERSPEED EVENT REPORTING: None.

(y) PARAMETER SYNTHESIS: New takeoff ratings for the A321 and A319 aircraft installations require EGT biasing for cockpit display to ensure that desired EGT redline limits are compatible with the ECAM displays.

(z) EPR/N1 REFERENCE – PIP (Performance Improvement Package) MODIFIER A319: A Specific EPR modifier is required for the A319.

(aa) ARINC MAINTENANCE WORD 1: Flight Warning Computer (FWC) logic does not presently consider EEC interface faults for TRA, Fuel Temperature T/C, and Engine Oil Temperature T/C faults – Warnings: "ENG ONE TLA FAULT", "ENG THR LEVER FAULT", and "ENG FUEL HEAT SYSTEM".

(ab) ENGINE T2 PROBE VS DADC T2 DISAGREEMENT: Disagreement between engine T2 and DADC T2 does not presently result in any fault recording within the EEC or associated A/C annunciation.

(ac) FUEL ON/OFF DISCRETE CROSSCHECK ENHANCEMENT: Fuel On/Off discrete crosscheck faults can lead to a Class I ECAM Warning "ENG 1/2: FUEL VALVE FAULT". Crosscheck faults are classified as Schedule Maintenance Report (SMR) faults which are approved for long term dispatch.

(ad) AUTOTHRUST INSTINCTIVE DISCONNECT (ID) LOGIC: Though no known problems have been experienced on the V2500 engine installation, sensitivity of the ID signal acquisition in the EEC could be too high.

(2) Cause.

(a) N1 TOPPING LOOP ENHANCEMENTS: The new 33K rating max takeoff steady state N1 is too close to the N1 redline limit for the present N1 topping loop capability to prevent transient exceedence of the redline limit at high conditions.

(b) N2 COCKPIT DISPLAY FOR BELOW IDLE: The EEC Channel B N2 input is derived from one phase of the dedicated alternator's output. The noisy characteristic of this input at low speed can result in inaccurate N2 calculations which can be displayed in the cockpit once the dedicated speed winding input from Channel A has gone out of range low.

(c) ERRONEOUS COCKPIT FUEL FLOW INDICATION AT FUEL ON: The transient effects of fuel flow initiation on the mass fuel flowmeter signal to the EEC can result in an indicated fuel flow in the cockpit that is higher than actual metered flow.

(d) WEIGHT–ON–WHEEELS (WOW) VALIDATION/ACCOMODATION LOGIC: WOW from the A/C can be invalidated by the EEC if a Ground status is received and the Mach Number is above 0.43. This will result in inhibiting the use of Thrust Reverser (T/R) on landing and the generation of a nuisance maintenance fault.

(e) OFF IDLE EGT SPIKING: EGT spikes are caused by initial fuel addition to accelerate the engine off–idle, where the LPT initially extracts little to no work, this results in a momentarily high gas temperature spike passing the EGT sensors. This is not harmful to engine hardware based on service experience.

(f) STARTING EGT BIAS REVISION: Previous requirements to bias EGT at takeoff for the A320 did not specifically disable this bias for starting.

(g) FLEX TEMPERATURE MODE CHANGES:

1 FLEX TEMPERATURE MODE SELECTION: The selection of Flex T/O Mode is currently not frozen until Mn is greater than 0.15.

2 FLEX TEMPERATURE ARINC LABEL 214: The EEC echoes back the Flex Temperature it receives from the A/C with the "as–received" SSM.

(h) HEAT MANAGEMENT CHANGES:

1 AIR COOLED OIL COOLER (ACOC) SPRING VALVE NUISANCE FAULT: The current design does not properly distinguish between normal and failed operation effectively.

2 HEAT MANAGEMENT FLIP MODE FAULT RECORDING: On engine shutdown during soakback, it may be possible for the IDG oil temperature to rise over and stay above the maintenance limit long enough to set the fault flag. At shutdown, there is no fuel flow to use as a cooling medium for the IDG oil.

3 FUEL AND ENGINE OIL T/C FAILSAFE CLOSES AIR VALVE: The current heat management design does not completely accommodate failures of the fuel and engine oil thermocouples.

4 FUEL TEMPERATURE FAULT DETECTION: The present EEC fuel T/C input fault detection logic does not accomodate intermittent faults satisfactorily.

5 HEAT MANAGEMENT (HMT) RAISED IDLE LOGIC: Present HMT logic defaults the fuel temperature used in the raised idle logic, in the event of a dual channel T/C failure, to a value which results in an elevated ground idle.

(i) MENU MODE FAULT DISPLAY: The implementation of the REVINH fault omitted the display of its acronym on the MENU MODE troubleshooting display menu.

(j) THRUST REVERSER CHANGES:

1 A/C PERMISSION SWITCH TEST: The verification that the switch is not stuck closed is incorporated as part of the normal Thrust Reverser command logic. This results in the verification of the switch integrity at the end of the flight during normal reverser operation and only in the channel "In Control."

2 REVERSER STOW & LOCK (S&L) AND ARMING VALVE CROSS CHECK FAULTS: S&L and Arming Valve cross check faults currently set only Class II faults.

3 REVERSER PRESSURIZED ECAM WARNING: The EEC failsafes the ARINC output of the S&L sensor to "UNLOCKED" if the S&L feedback differs between channels. However, the logic in the Flight Warning Computer (FWC) requires the S&L feedback to indicate "LOCKED" before providing a "REVERSER PRESSURIZED" indication on ECAM.

4 MONITORING OF T/R STOW TIME: Flight Warning Computer (FWC) logic currently sets an ECAM Warning "ENG REV UNLOCKED" if it detects a stow time exceedance.

(k) NUISANCE EEC SELF–TEST FAULTS: Externally induced POR's (Power–on–Reset) can interrupt internal EEC self–tests resulting in artificial test failures.

(l) STARTING CHANGES:

1 AUTO–START LOCKED ROTOR DETECTION: The present logic design only considered the case where the low rotor never turns at all from the beginning of the auto–start sequence. The possibility of binding–up later in the start sequence was not anticipated.

2 GROUND STARTING ENHANCEMENTS: Non–optimized ground start fuel scheduling results in light–up stall and insufficient engine starting acceleration torque under these conditions.

3 AUTO–START ENHANCEMENT FOR BOWED ROTOR: Thermal differentials developing after shut–down of a hot engine can produce significant "bowing" of the rotor spool which, coupled with resulting amplification of the natural spool whirl on the subsequent engine start, can result in rubbing leading to clearance degradation and a corresponding loss in engine performance.

(m) ALTERNATOR CIRCUIT NUISANCE FAULT: The fault logic associated with the alternator circuit is enabled using N2 synthesis which is intentionally biased for starting and thus is inaccurate during engine windmilling. This results in the logic determining that the high rotor is turning fast enough for the alternator to meet its minimum output requirement, when it is not.

(n) RATINGS:

1 New requirements.

2 New requirements.

3 New requirements.

4 The higher takeoff rating for the A321 30K rating relative to the A320 27K rating results in greater temperature gradients between idle and takeoff if the existing A320 min idle N2 is maintained for the A321.

(o) EPR INDICATION FAULTS DUE TO EEC P2 TO DADC P2 DISAGREEMENT: Local air turbulence at the EEC P2/T2 probe causes the check between EEC P2 and DADC P2 to fail the present tolerance.

(p) START ABORT DUE TO LOSS OF AIRCRAFT 28 VDC: The current design does not adequately address temporary losses of aircraft 28 VDC.

(q) WING ANTI–ICE (WAI) MINIMUM PB SCHEDULES: Pilot selection of WAI causes the EEC to raise the minimum PB schedule to meet the increased bleed requirements.

(r) SERVICE BLEED OVERRIDE: The corresponding level of bleed sense point pressure is significantly greater for the A5 than for the A1 engine.

(s) MIN LIMITS FOR DADC TAT AND ALT INPUTS: The software was designed to the ICD requirements, but the ICD was not in compliance with the original requirements in the engine specification.

(t) MAINTENANCE LOGIC IMPROVEMENTS:

1 CLEAR LANGUAGE MESSAGE (CLM) CORRELATION TO ECAM WARNINGS: Troubleshooting faults is complicated by the lack of correlation between ECAM warnings and CLM's transmitted from the EEC as summarized in the PFR.

2 EEC CONFIGURATION PAGE MENU REVISION: New requirement.

3 "ENG 1(2) REVERSER UNLOCKED" MESSAGE IN MENU MODE: FWC Standard D1E no longer inhibits the setting of this ECAM warning in Phase 1 and Phase 10 when the TRA is not in the reverser area. Since the EEC does not presently transmit TRA to the A/C during Menu Mode operation, execution of the T/R Menu Mode test can now set this warning.

4 PREMATURE TERMINATION OF MENU MODE: Several non–revenue service configurations associated with system bench testing, including the use of digital pressure inputs to the EEC, use of UART monitoring routines, and externally corrupted fault codes, have been shown to have the potential to interrrupt the proper operation of Menu Mode.

5 MENU MODE TEST ENHANCEMENTS: The logic does not clear out all the previously recorded faults before each run.

(u) DISPATCH LOGIC: Revenue Service experience was desired before downgrading these faults from Short Term to Long Term Dispatch.

(v) DATA ENTRY PLUG (DEP) FAULT ACCOMODATION LOGIC: New requirements.

(w) OVERSPEED TEST ENHANCEMENTS:

1 OVERSPEED NUISANCE FAULTS: The specific cause ot the test failures has not been determined.

2 NUISANCE FMU OVERSPEED SYSTEM FAULTS: Current EEC logic does not recognize that the overspeed valve in the FMU is hydraulically latched in the overspeed position following system activation. Once the engine spools down, in response to the resulting fuel flow reduction, the EEC stops commanding the overspeed valve. Since the valve does not return to the normal position, as commanded by the EEC, the EEC sets the nuisance FMU overspeed system fault.

(x) OVERSPEED EVENT REPORTING: New requirement.

(y) PARAMETER SYNTHESIS: New requirements.

(z) EPR/N1 REFERENCE – PIP (Performance Improvement Package) MODIFIER A319: New requirement.

(aa) ARINC MAINTENANCE WORD 1: The ARINC bits used by the FWC logic do not include internal faults.

(ab) ENGINE T2 PROBE VS DADC T2 DISAGREEMENT: Present EEC logic uses engine probe T2 to validate the T2 received from the A/C DADC's. If the two sources disagree, the EEC uses engine probe T2 to preclude the potential of a bad DADC T2 effecting more than one engine.

(ac) FUEL ON/OFF DISCRETE CROSSCHECK ENHANCEMENT: Present EEC logic failsafes the Fuel On/Off discrete to "ON" in the event the two channel's fuel valve feedback discretes disagree. This produces an ECAM warning message when the pilot shuts the engine down due to the disagreement between the command and the feedback indication.

(ad) AUTOTHRUST INSTINCTIVE DISCONNECT (ID) LOGIC: Analysis and test have demonstrated that the V2500 logic susceptibility to spurious short duation signals on the ID line can be improved.

(3) Solution.

(a) N1 TOPPING LOOP ENHANCEMENTS: (1) Incorporate improved N1 loop compensation for all ratings, (2) incorporate a transient N1 topping loop based on the existing N2 topping loop (for the 33K rating only) which will provide earlier intervention by the N1 topping loop to minimize N1 overshoots and (3) raise the steady state N1 topping limit (for all ratings other than 33K) from its present value of 98.7% to 99.5% based on the benefits of item (1). The 33K rating steady state topping limit will be set at the redline value of 100% N1.

(b) N2 COCKPIT DISPLAY FOR BELOW IDLE: Modify the channel B N2 processing logic to preclude the display of the potentially noisy channel B's N2 during shutdown by using the crosstalked value from channel A. The channel A logic was also enhanced to preclude toggling as the signal goes out of range low.

(c) ERRONEOUS COCKPIT FUEL FLOW INDICATION AT FUEL ON: Modify the mass fuel flowmeter processing logic to limit the value of fuel flow sent to the cockpit by the commanded fuel flow for 2.5 seconds following fuel on detection. The mass flowmeter data averaging is also increased form 4 to 8 cycles to improve noise immunity.

(d) WEIGHT–ON–WHEELS (WOW) VALIDATION/ACCOMMODATION LOGIC: Increase the GROUND/FLIGHT threshold for validating a GROUND WOW indication from the A/C to 0.5 Mn and apply a 20 second confirmation before inhibiting reverser operation and recording a maintenance fault.

(e) OFF IDLE EGT SPIKING: New logic has been implemented to: (1) override the Engine 7A Bleed closed and reset the SVA closed 5 degrees during on ground operations and (2) bias cockpit EGT for low power operation as appropriate to effect a true EGT redline equivalent to the engine certified limit of 650 C to provide additional EGT Redline margin.

(f) STARTING EGT BIAS REVISION: Modify the logic to disable the EGT biasing during starting such that EGT limits for both ground and in–flight starting are consistent for all aircraft installations (A321, A320, A319) as originally intended.

(g) FLEX TEMPERATURE MODE CHANGES:

1 FLEX TEMPERATURE MODE SELECTION: Modify the logic to freeze the Flex Mode selection when TLA is greater than Max Climb (MCL).

2 FLEX TEMPERATURE ARINC LABEL 214: Modify the logic to output on Label 214 the Flex Temperature used and frozen in the power management and not the one received from the A/C.

(h) HEAT MANAGEMENT CHANGES:

1 AIR COOLED OIL COOLER (ACOC) SPRING VALVE NUISANCE FAULT: Remove the air valve spring failed detection logic. The logic has been a source of nuisance faults without providing much benefit and is redundant to the test of the ACOC valve done during engine spool–up.

2 HEAT MANAGEMENT FLIP MODE FAULT RECORDING: Modify the logic such that the Flip Mode nuisance fault will not set after the engine is shutdown.

3 FUEL AND ENGINE OIL T/C FAILSAFE CLOSES AIR VALVE: Modify the design to failsafe the fuel temperature to the proper failsafe value so that the fuel will not be inappropriately cold and the air valve inappropriately closed.

4 FUEL TEMPERATURE FAULT DETECTION: Increase the latch time associated with the fuel temperature crosscheck, rate, and range failures from 5 to 30 seconds to provide improved accomodation for T/C intermittent faults. A fuel sensor design modification is also being implemented to address the vibration environment from a hardware point of view.

5 HEAT MANAGEMENT (HMT) RAISED IDLE LOGIC: Modify the logic to inhibit the raised idle logic on the ground in the event of a dual channel fuel T/C failure.

(i) MENU MODE FAULT DISPLAY: Revise the logic to correctly display the fault acronym with the troubleshooting data on the associated menu.

(j) THRUST REVERSER CHANGES:

1 A/C PERMISSION SWITCH TEST: Modify the logic to incorporate the A/C permission switch test into the existing engine spool–up test so that the verification is performed on each flight in both channels of the EEC.

2 REVERSER STOW & LOCK (S&L) AND ARMING VALVE CROSS CHECK FAULTS: Upgrade cross check faults of the S&L or Arming Valve from Class II to Class I by modifying the logic to set the Class I (NO DISPATCH) "REVERSER SYSTEM FAULT" (270/19) for cross check faults of the S&L or Arming Valve.

3 REVERSER PRESSURIZED ECAM WARNING: Modify the logic to output on ARINC the local S&L feedback, instead of the failsafe value, to prevent inhibiting of the "REVERSER PRESSURIZED" ECAM warning in the presence of S&L cross check faults.

4 MONITORING OF T/R STOW TIME: Modify the logic to monitor the T/R stow time and generate a CLM (TR TUBES/HCU/TR ACT@) to direct the appropriate maintenance action.

(k) NUISANCE EEC SELF–TEST FAULTS: Modify the logic to verify that the EEC self–test failure did not result from an externally induced POR before recording the associated fault so that nuisance faults do not occur.

(l) STARTING CHANGES:

1 AUTO–START LOCKED ROTOR DETECTION: Change the auto–start locked low rotor logic to abort any start where the low rotor does not rotate, or stops rotating during the start sequence prior to attaining idle.

2 GROUND STARTING ENHANCEMENTS: Optimize ground start fuel scheduling by making minimum fuelflow a function of altitude to reduce it to 240 PPH at high altitudes, provisioning for an optimized ground autostart fuel and ignition on speed schedule as a function of altitude, adjusting the autostart ground ignition speed timer to 35 seconds and introducing a raised N2dot acceleration schedule for ground starting to ensure light up at lower altitudes occurs on the WF/PB starting schedule. These changes are applied to ground starts only based on the current Ground/Flight starting logic, thus assuring no impact to the air starting characteristics or certification.

3 AUTO–START ENHANCEMENT FOR BOWED ROTOR: Modify the logic to provide the provisions for incorporating by TRIM an additional 30 seconds of dry motoring of the engine on the starter before initiating fuel pressurization for all Auto–starts on the ground. This additional motoring will reduce thermals on the rotor spool and provide priming of the Number 3 bearing which is designed to control rotor spool whirl, thus minimizing the potential for rotor rub. The TRIMS for A5 SCN10 will be initialized to the current A5 values, thus affecting no change to the current starting logic. A separate trim is also added to the starter cut–out (SCO) speed to reduce the SCO for ground starting from 42.6% to 40.1% N2 to enhance starter life.

(m) ALTERNATOR CIRCUIT NUISANCE FAULT: Modify the logic to enable the fault detection on the alternator circuit only when the required sensor input signals are available so that nuisance faults will not be inappropriately set.

(n) RATINGS:

1 Implement new T/O, MCT, MCL, and Breakpoint Ratings for the A321 33K engine which is selectable via the DEP.

2 Implement new T/O, MCT, MCL, and Breakpoint Ratings for the A320 27K engine which is selectable via the DEP.

3 Implement new T/O, MCT, MCL, Breakpoint, Min PB, N1 Reverse, N1 Idle, N1 Topping, and N2 Idles Ratings for the A319 which is selectable via the DEP.

4 Implement the provision for providing a separately trimable min idle N2 schedule for the A321 should an HPT life concern arise on the A5. The A5 SCN10 min idle N2 TRIMS will be initialized to the current A320 idle levels.

(o) EPR INDICATION FAULTS DUE TO EEC P2 TO DADC P2 DISAGREEMENT: Incorporate a percent of point tolerance between EEC &DADC P2 to accomodate the potential error observed during negative G load maneuvers.

(p) START ABORT DUE TO LOSS OF AIRCRAFT 28 VDC: Change the logic so that a temporary loss of aircraft 28 VDC will not permanently inhibit the starting logic.

(q) WING ANTI–ICE (WAI) MINIMUM PB SCHEDULES: WAI selection on ground causes the A/C Bleed Zone Controller to command the WAI valve open for 30 seconds to verify operation of the valve. Therefore, the logic in the EEC is modified to invoke the higher PB schedule for only 40 seconds following WAI selection on the ground.

(r) SERVICE BLEED OVERRIDE: Reduce the PB service bleed trip point for the A5 engine to optimize its fuel burn benefit while maintaining the required service bleed pressure capability for low power cruise operation.

(s) MIN LIMITS FOR DADC TAT AND ALT INPUTS: Modify the input processing logic to account for the originally intended required input range for T2 (–80C) and Altitude (–2000 FT).

(t) MAINTENANCE LOGIC IMPROVEMENTS:

1 CLEAR LANGUAGE MESSAGE (CLM) CORRELATION TO ECAM WARNINGS: A number of CLM's have been added to cover ECAM warnings which are listed in the PFR which currently do not have associated CLM's from the EEC. The new CLM's are as follows:

VSV MECH/BLD VLV/STRT@
FAN INSP/HC/EEC@
STRT DUCT/BLD VLV/STRT@
VSV MECH/BLD VLV/LPC@
ENG INSP/CNA/LPC@
VSV MECH/HP BLD/HP INSP@
CHK AIR SUP/STRT/VSV@
VSV MCH/HP VLV/ENG INSP@
HC/HCU/NLKACTS@
TUBES/LKACTS/NLKACTS@
IGN1/115VAC/EEC@
IGN2/115VAC/EEC@
TR TUBES/HCU/TR ACT@
HC/PROX SW/T/R UP ACT@
HCU/T/R UP ACT/PROX SW@

2 EEC CONFIGURATION PAGE MENU REVISION: The DEP configuration, as it is marked on the plug itself, has been added to the existing EEC Configuration page menu screen to aid in maintenance.

3 "ENG 1(2) REVERSER UNLOCKED" MESSAGE IN MENU MODE: Modify the logic so that the EEC will transmit the TRA position to the A/C during the T/R Menu Mode test to prevent spurious setting of the "ENG 1(2) REVERSER UNLOCKED" ECAM warning.

4 PREMATURE TERMINATION OF MENU MODE: Modify the associated code to preclude premature interruptions to Menu Mode while configured for system bench testing.

5 MENU MODE TEST ENHANCEMENTS: Clear all faults from the previous run before a rerun of the EEC self–test or P2/T2 heater test is done so that current status of the faults will be reported.

(u) DISPATCH LOGIC: Modify the logic to downgrade the following faults to Long Term Dispatch: (1) Cross check faults between channels for the following signals . . . Pb, P5, Pamb, P2; Starter Air Valve & Fuel On/Off discrete feedbacks, and Air Cooled Oil Cooler and Spill Valve LVDT feedbacks; (2) wraparound faults for Tenth Stage Makeup solenoid and Pb Heater relay discrete outputs and Air Cooled Oil Cooler and Spill Valve torque motor outputs; and (3) track checks on the Air Cooled Oil Cooler and Spill Valve torque motor loops. Additionally, a "Scheduled Maintenance Report" was created and the number of fault cells allocated to this fault class was established at 60. The Class III (unlimited) fault recording design was also modified to record the last occurrence of a fault, rather than the first occurrence, to aid in the confirmation of the performed maintenance actions.

(v) DATA ENTRY PLUG (DEP) FAULT ACCOMODATION LOGIC: Modify the DEP fault logic to default to the A321 if the plug is invalid.

(w) OVERSPEED TEST ENHANCEMENTS:

1 OVERSPEED NUISANCE FAULTS: Continuing review of the overspeed test criteria has identified the following changes aimed at addressing the field events: (1) Modify the logic to eliminate the potential for single pass failures setting an overspeed fault; (2) delete the overspeed test done on engine spool–up as it is redundant to the test done on engine spool–down and (3) record additional fault information associated with a detected overspeed fault to aid in identifying the specific test that is setting the overspeed fault.

2 NUISANCE FMU OVERSPEED SYSTEM FAULTS: Modify the EEC logic to account for the hydraulic latching of the overspeed valve following a real overspeed event to avoid the setting of the nuisance FMU overspeed system fault.

(x) OVERSPEED EVENT REPORTING: Provide a CLM, "71–00–00 PROPULSION SYSTEM@", and add the capability to record appropriate parametric data in EEROM at the time of an overspeed event to aid in the troubleshooting of such an event.

(y) PARAMETER SYNTHESIS: Incorporate EGT biasing for cockpit display to max continuous and takeoff operation which is appropriate for each particular thrust rating and aircraft installation.

(z) EPR/N1 REFERENCE – PIP (Performance Improvement Package) MODIFIER A319: Implement a specific A319 PIP EPR modifier table.

(aa) ARINC MAINTENANCE WORD 1: Modify the definition of the associated EEC ARINC bits to include EEC interface faults.

(ab) ENGINE T2 PROBE VS DADC T2 DISAGREEMENT: Modify the EEC fault logic to record a Scheduled Maintenance Fault in the EEC fault memory if the engine probe and DADC T2's disagree by more than the allowed tolerance for more than a specified time above a certain Mn.

(ac) FUEL ON/OFF DISCRETE CROSSCHECK ENHANCEMENT: Modify the fuel valve crosscheck fault accomodation logic to synthesize the fuel valve feedback from the fuel valve command for all cases where the position of the valve can not be determined. Continue to failsafe the fuel valve position to Fuel ON, if other engine parameters do not confirm that the engine has been shut down following command of Fuel OFF.

(ad) AUTOTHRUST INSTINCTIVE DISCONNECT (ID) LOGIC: Modify the EEC ID logic to require a 2 pass confirmation of the ID discrete input to the EEC before allowing disconnection of the Autothrust System to reduce the susceptibility to spurious signals on the ID line.

C. Description

You do not open the EEC150–20 to install the revised software. The EEC150–20 is reprogrammed with Airbus (A5) SCN10A software and re–identified with the new part number. A functional test of the EEC150–20 is not required.

D. Compliance

Category 8 – Accomplish based upon experience with the prior configuration.

E. Approval

The part number changes and/or part modifications given in Paragraphs 2 and 3 of this service bulletin have been shown to comply with the applicable Federal Aviation Regulations and are FAA–approved for the EEC150–20 Electronic Engine Control.

F. Manpower

Approximately 1 man–hour is necessary to do these Service Bulletin procedures.

G. Material – Cost and Availability

(1) IAE funds this program. The hard copy, no–charge purchase order to perform this service bulletin must refer to the HS service bulletin number EEC150–20–73–10 and the IAE Service Bulletin Number V2500–ENG–73–0080.

This service bulletin will be done at no charge to the operator if the EEC150–20 is sent to one of these addresses:

(a) United Technologies Corporation
Hamilton Standard Division
Attention: Hamilton Support Systems
Electronics Service Center
97 Newberrry Road
East Windsor, CT 06088
U.S.A. (FAA Repair License No: SI3R842L)

(b) Pratt & Whitney
Overhaul and Repair Center – Europe (PWORCE)
Maastricht Airport
P.O. Box 269
6190 AG BEEK
Maastricht Airport
The Netherlands (FAA Repair License No: CW5Y749M)

(2) You can do these Service Bulletin procedures at your own location at your own cost and expense using the "Alternate Reprogramming Method" described in the accomplishment instructions. If you do these Service Bulletin procedures with the "Alternate Reprogramming Method", you need to obtain the software diskette used to reprogram the EEC. Refer to Material Information to order the Reprogramming Diskette.

(3) One Reprogramming Diskette can be used to modify approximately 40 EEC150–20 units. The Software Loader Utility used to reprogram the EEC creates a log file on the Reprogramming Diskette. When the log file is filled or when your fleet of EEC's is modified, return the Reprogramming Diskette to Hamilton Standard. Contact your local Hamilton Standard Field Support Representative if you need assistance to return the Reprogramming Diskette.

(4) The new parts required to accomplish this Service Bulletin are listed in Section 3, Material Information.

H. Tooling

NOTE: The following tools and equipment are necessary to perform the "Alternate Reprogramming Method" procedures:

(1) IBM compatible computer, with the following minimum requirements:

(a) 80286 processor

(b) 512 Kbytes RAM

(c) 1.44Mbyte, 3.5" floppy disk drive

(d) Dual channel RS–422 aysnchronous communication board (HS recommends Model DS202 by Qua Tech Incorporated) with the following setup:
Channel A EEC – COM3 (Base address 2E8, IRQ level 5)
Channel B EEC – COM4 (Base address 3E8, IRQ level 5)

(e) MSDOS operating system (version 3.0 or higher)

NOTE: THE IBM COMPUTER DATE/TIME MUST BE CURRENT PRIOR TO PERFORMING THIS PROCEDURE.

(2) Hamilton Standard diskette called out in the Service Bulletin which is being incorporated. This diskette contains the EEC150–20: application code, trims, memory clear utilities, and software loader.

(3) EEC150–20 commuication cables as defined in Table 1.

(4) 28VDC, 5.0 +/– 0.5A power supply and associated power cables as defined in Table 2.

I. Weight and Balance

None

J. Electrical Load Data

Not Affected

K. References

E9137 Standard Electronic Practices Manual
Components Maintenance Manual CMM 73–28–01
IAE Service Bulletin Number V2500–ENG–73–0080
Hamilton Standard Service Bulletin EEC150–20–73–10
Hamilton Standard Service Bulletin EEC150–20–73–8

L. Other Publications Affected

Illustrated Parts Catalog 73–28–01

2. Accomplishment Instructions

NOTE: Refer to the E9137 Standard Practices Manual to do the procedures unless otherwise noted.

NOTE: The "Alternate Reprogramming Method" procedures may be used whenever the EEC electrical connectors are disconnected from the aircraft. If the EEC is reprogrammed using 28VDC power from the aircraft, refer to the engine/aircraft procedures.

A. If you use the "Alternate Reprogramming Method" skip to step 2.B. Otherwise refer to CMM 73–28–01, section 200 (ATLAS) to reprogram the EEC150–20. Use the program, version number, and engine trims shown below.

	Channel A	Channel B
Application Program:	Y811183	Y811184
Application Version Number:	026	026
Engine Trim Program:	Y811185	Y811185
Engine Trim Version Number:	026	026

If you do not use the "Alternate Reprogramming Method" of programming, skip to step 2.AM

B. If you use the "Alternate Reprogramming Method", verify that the model number on the identification plate of the unit is "EEC150–20".

C. Record the current unit part number and the unit serial number from the nameplate. This information will be input into the computer.

D. Plug–in all necessary equipment, but do not turn the equipment on.

E. Connect the programming harness connector marked P1 to the EEC connector marked J1. Ensure that the red engagement stripe on the EEC connector J1 is fully covered.

F. Connect the programming harness connector marked P7 to the EEC connector marked J7. Ensure that the red engagement stripe on the EEC connector J7 is fully covered. If the computer and power supply connections to the cables are permanent, skip to step 2.J.

G. Connect the programming harness connector marked "ch. a uart" to the IBM compatible computer UART board connectors for the channel A RS–422 Port (COM3). Ensure that these connectors are properly mated.

H. Connect the programming harness connector marked "ch. b uart" to the IBM compatible computer UART board connectors for the channel B RS–422 Port (COM4). Ensure that these connectors are properly mated.

NOTE: UART CONNECTIONS CAN DIFFER FOR DIFFERENT IBM COMPATIBLE COMPUTERS.

NOTE: It is important to verify that the connectors are correctly installed for correct loader operation. HS recommends labeling the RS–422 COM3 port as "ch. a uart" and COM4 port as "ch. b uart" on the computer to reduce errors.

I. Connect the opposite end of P3 and P9 cables to the 28VDC supply.

J. Connect the power supply harness connector marked P3 to the EEC connector marked J3. Ensure that the red engagement stripes on EEC connector J3 are fully covered.

K. Connect the power supply harness connector marked P9 to the EEC connector marked J9. Ensure that the red engagement stripes on EEC connector J9 are fully covered.

L. Locate the BOOT/BITE switches for channel A and channel B. Set the BOOT/BITE switches to the ON (closed) position.

M. Turn on the 28 VDC power supply to the EEC .

N. Turn on the power to the IBM compatible computer.

O. Wait for the MSDOS prompt "C:\>" to appear on the IBM compatible computer.

NOTE: The procedure uses disk drive "A" to identify the location of the floppy drive in the computer system. If your computer is configured with the 3.5 inch floppy drive at a different designation, substitute that designation into the procedure.

P. Obtain the Hamilton Standard reprogramming diskette P/N 819191–3. Ensure that the write protection tab of the diskette is covering the "hole". Insert the diskette into the floppy drive designated as "A" on the IBM compatible computer.

Q. The display will show the "**C:\>**". Type **a:** then press the **RETURN** key (note: some computers have the **RETURN** key designated as **ENTER**).

R. The display will show the "**A:\>**" prompt. Type **LDR150** then press the **RETURN** key. This starts the UART programming utility. Several messages will appear including the program identification, version number, time and the UTC/P&W document property rights notice. If there is a configuration error on the diskette, the program will display the appropriate error message and abort the programming process. See Table 3 for a summary of error code description and troubleshooting suggestions.

S. The UART programming utility **LDR150**, will display the following message: "**Enter operator's name performing download : [ ] >**". The field between the brackets will always be empty the first time the program is executed on the diskette. Subsequent execution of the program will display the last name entered. If the operator is the same, press the **RETURN** key to continue. If a different name is present than the operator's or no name is present, the operator should enter his/her name and press the **RETURN** key.

T. The LDR150 program will display the following message:

WARNING – EEC Fault Memory Will Be Cleared By This Program.
If an EEC Fault Dump Is Required Prior to Programming,
enter Q to Quit or C to Continue [Q/C] :

If a fault dump has already been accomplished or is not required, type **C**, then press the **RETURN** key.

If a fault dump is required, or the operator wishes to terminate the programming procedure, type **Q**, then press the **RETURN** key. If the operator selects the quit option, turn off the 28VDC power to the EEC and go to step 2.AI.

U. The LDR150 program will now prompt with the following message: "**Enter the 9 character EEC Serial Number : [XXXX–XXXX] >** ". From the Hamilton Standard nameplate, enter the nine character EEC serial number and press the **RETURN** key.

NOTE: For steps 2.V and 2.W, if the EEC150–20 part number on the nameplate between the dashes is a single digit, enter a zero immediately preceeding this digit.
Example: P/N 808050–4–025 would be entered as 808050–04–025.

V. The LDR150 program will now prompt with the following message: "**Enter the 13 character Current EEC HW Part No. : [XXXXXX–XX–XXX] >** ". From the Hamilton Standard nameplate, enter the 13 character EEC Hardware Part Number and press the **RETURN** key.

W. The LDR150 program will now prompt with the following message: "**Enter the 13 character SB EEC HW Part No. : [XXXXXX–XX–XXX] >** ". From the Service Bulletin, enter the new 13 character EEC Hardware Part Number and press the **RETURN** key.

X. The LDR150 program will now prompt with the following message: "**Enter Trim Checksum Value for "xxxxxx.xxx" : >** ". The xxxxxx.xxx designation is the name of the Trim File being loaded to the EEC. Enter the trim checksum value **5479** and press the **RETURN** key.

Y. The LDR150 program will now prompt with the following message: "**Do you wish to reenter the above entries [Y/N/Q] :** ".

(1) To proceed with programming process, type **N**, then press the **RETURN** key. Continue with step 2.Z.

(2) To correct any errors in the data entered, type **Y,** then press **RETURN**. Continue with step 2.S.

(3) To quit the programming process, type **Q**, then press **RETURN**. Turn off the 28VDC power to the EEC and continue with step 2.AJ.

Z. At this point the screen will be initialized to display the activity of the programming process. Status messages will scroll across the screen. If an error occurs, see Table 3 for a summary of error code description and troubleshooting suggestions.

AA. The LDR150 program will prompt with the following message:

Turn Off the BITE and BOOT switches to the EEC
then
Turn Off POWER to the EEC and wait at least 5 seconds
then
Turn On POWER to the EEC

Press the RETURN Key When Ready to Continue

Locate the BOOT/BITE switches on your test equipment, and set the BOOT/BITE switches to the OFF (open) position.

AB. Switch off the 28 VDC power supply to the EEC, wait 5 seconds, then switch on the 28 VDC power supply to the EEC.

AC. On the IBM compatible computer, press the **RETURN** key.

AD. Wait until the LDR150 program prompts with the following message:_

Turn ON the BITE and BOOT switches to the EEC
then
Turn Off POWER to the EEC and wait at least 5 seconds
then
Turn On POWER to the EEC

...Press the RETURN Key When Ready to Continue

Locate the BOOT/BITE switches on your test equipment, and set the BOOT/BITE switches to the ON (closed) position.

AE. Switch off the 28 VDC power supply to the EEC, wait 5 seconds, then switch on the 28 VDC power supply to the EEC.

AF. On the IBM compatible computer, press the **RETURN** key.

AG. Wait until the LDR150 program prompts with the following message:

Turn Off POWER to the EEC

...Press the RETURN Key When Ready to Continue

Switch off the 28 VDC power supply to the EEC .

AH. On the IBM compatible computer, press the **RETURN** key.

AI. The LDR150 program will now display the status of the programming process. Record the name of the log file for hard copy report of the process.

(1) If successful programming occurred, the following message will be displayed:

****** EEC REPROGRAMMING SUCCESSFULLY COMPLETED *****

Record the log file name "VLXXXX.LOG" for later printout.

If desired, record the log file name "VLXXXX.LOG" for later printout."

(2) If the programming was unsuccessful, the following message will be displayed:

****** DOWNLOAD PROCESS ABORTED – ERROR CODE "X" ******

Record the log file name "VLXXXX.LOG" for later printout.

If desired, record the log file name "VLXXXX.LOG" for later printout."

The "X" refers to the type of error that caused the process to abort. Table 1 describes the error codes and action to be taken.

AJ. Press the **RETURN** key to terminate the program and return to the MSDOS prompt "**A:\>**".

AK. If a printer is available, a paper copy of the log file can be generated by the IBM compatible computer. To do this, at the MSDOS prompt, type **PRINT VLXXXX.LOG**, then press the **RETURN** key. Wait until the printer is finished before proceeding with the next step. If the printer is not available remove the diskette and move it to a system that has a printer and type the preceeding command for a paper copy.

AL. Disconnect the EEC electrical connectors from the J1, J3, J7 and J9 connectors.

AM. Change the Hamilton Standard Part Number to show that this Service Bulletin is included into the end–assembly configuration. Put the information shown below on a new unit identification plate. EEC150–20 units reprogrammed at one of the addresses shown in paragraph 1.G.1 will be sent back with their assemblies re–identified as shown.

(a) Put the new end–assembly part number in the "PART NO." area of the new identification plate:

PART NUMBER BEFORE THIS SERVICE BULLETIN	PART NUMBER AFTER THIS SERVICE BULLETIN
808050–4–XXX	808050–4–024

(b) Put the new IAE part number in the "CI NO." area of the new identification plate.

EEC150–20 END–ASSEMBLY	NEW IAE PART NUMBER
808050–4–024	2A3210

SERVICE BULLETIN

Table 1. COMMUNICATION CONNECTIONS

EEC SIGNAL NAME	EEC CONNECTOR	QUA–TECH CONNECOR	QUA–TECH SIGNAL NAME
UART IN LINE B CHA	P1–b	PA–2	TXD+
UART IN LINE A CHA	P1–H	PA–7	TXD–
UART OUT LINE A CHA	P1–c	PA–4	RXD+
UART OUT LINE B CHA	P1–J	PA–8	RXD–
BOOT DISC CHA	P1–D	N/A	N/A
BITE DISC CHA	P1–Z	N/A	N/A
BOOT/BITE RTN CHA	P1–m	N/A	N/A
UART IN LINE B CHB	P7–b	PB–2	TXD+
UART IN LINE A CHB	P7–H	PB–7	TXD–
UART OUT LINE A CHB	P7–c	PB–4	RXD+
UART OUT LINE B CHB	P7–J	PB–8	RXD–
BOOT DISC CHB	P7–D	N/A	N/A
BITE DISC CHB	P7–Z	N/A	N/A
BOOT/BITE RTN CHB	P7–m	N/A	N/A

Table 2. POWER SUPPLY CONNECTIONS

EEC SIGNAL NAME	EEC CONNECTOR	POWER SUPPLY
GTP CHA	P3–m	+28VDC
GTP RTN CHA	P3–r	+28VDC RTN
GTP CHB	P9–m	+28VDC
GTP RTN CHB	P9–r	+28VDC RTN

Table 3. ERROR CODE DEFINITIONS

ERROR CODE	ERROR TYPE	ACTION
E1	EEC VERIFY ERROR – Data verify error in EEC – Compare failed or location could not be programmed	Try procedure 3 times, if still bad return EEC unit
E2	COMMUNICATION ERROR– Communication problem between EEC and IBM compatible computer	Check BITE, cables, power supply, UART board, and EEC. Retry 3 times.
E3	CONFIGURATION ERROR – Configuration data comparison failed. (Possible Hardware P/N mismatch, EEC compatability mismatch, Trim Checksum mismatch)	Operator data entered incorrect or incorrect data on existing nameplate. Check data – retry with the correct information.
E4	SYSTEM PROBLEM – Poor operating environment, bad disk, or program aborted by operator.	If the process was not terminated by the operator, check that the disk is not write protected, or replace disk and retry.

3. Material Information

A. This Service Bulletin change will use the parts in the list for each EEC150–20 that incorporates this service bulletin.

B. Any parts that usually are discarded when you disassemble the EEC150–20 are not in the list.

C. In the list of parts for this change, MSQ is the "Minimum Sales Quantity". The parts that have an entry in this area of the list are supplied only in this quantity, or a multiplication of this quantity.

D. In the list of parts for this change, the "Key Word" is a one–word name for the part.

E. In the list of parts for this change, the "Instruction Codes" tell you what to do with the parts. A short list under the list of parts tells you about the instruction codes that are used in the list.

F. The prices that are shown are estimates for one part. When you buy the parts, the prices may be different. Send requests for parts to:

Mail: Hamilton Standard Customer Support Service Center
Attention: Spare Parts Sales
471 Lakeshore Parkway
Rock Hill, SC 29730
Attn: Spare Parts Sales

Facsimile: 803–325–2849

Purchase orders for parts must refer to the HS Service Bulletin Number EEC150–20–73–10, the IAE Service Bulletin Number V2500–ENG–73–0080.

G. New Parts Required

New PN	Qty	MSQ	Estimated Price	Key Word	PN Before this SB	Instruction Code
751333–1	1	20	1.80	Plate	–	A
819191–2	1	1	$ 0.00	Diskette	–	B,C

Instruction Code A. The "New PN" is the same as the "PN before this SB".

Instruction Code B. One Reprogramming Diskette can modify approximately 40 EEC150–20 units. You should order the proper quantity of diskettes to modify your fleet of EEC150–20 units.

Instruction Code C. The Reprogramming Diskette is provided to you at No Charge.

Hamilton Standard Service Bulletin EEC150–20–73–8
Hamilton Standard Service Bulletin EEC150–20–73–10
Hamilton Standard Internal Reference Number EC238024, EC239550
IAE Service Bulletin Number V2500–ENG–73–0080
IAE Internal Reference Number 95VZ013