UNIVERSAL®AVIONICS
SYSTEMS CORPORATION

OPERATIONAL SOFTWARE DIFFERENCES

The software differences listed below are directed at the FMS operator and specifically cover changes that will be seen by the operator. A complete description of changes and improvements are available through the corresponding Universal Avionics Service Bulletins.

SCN 60X/70X

The 600/700 software control numbers (SCN) were developed to operate with the advent of the UNS-1C, UNS-1D generation Flight Management Systems. The UNS-1K was a later development which also uses the 600 series software. Upgrade improvements for the UNS-1B are also available allowing this system to use the 600 series software.

SCN 600.X was created to allowed the SCN 405.2/505.2 to operate on the new generation FMS. This software was short lived and there were only minor changes to this software from SCN 405. Major operational changes for the new generation FMS began with SCN 601/701.

The following are operational changes from the preceding software.

SCN 601/701

- A discrete GO-Around input signal from the aircraft TOGA (Take Off/Go Around) switch is recognized by the FMS to initiate missed approach procedures.

- A "Company Routes" database can be created offline and stored in the FMS.

- The Pilot Routes database is improved to allow storing of SIDs, STARs, and Approaches in addition to airways and waypoints.

- For the UNS-1C/1D a dual navigation database capability is added that allows loading of the next cycle database.

- The ability to load more than two database disks at a time is supported.

- ILS facilities (frequency, ident, LOC position, GS position, and inbound course) have been added to the database.

- The runway database is expanded to include length and magnetic course.

- The airport database is expanded to include variation and elevation.

- The TUNE page is modified such that the label "ACT" appears in green next to the active frequency display when the frequency has been received from the tuned radio.

- UTC time is now displayed in hh:mm:ss format on INITIALIZATION and DATA page. When the GPS is in NAV mode, UTC and date are automatically updated.

- The sensor's status on DATA 2/5 is changed to show (D) for deselected, instead of DESEL as in previous SCN's. Also, GPS status is now displayed for the off-side GPS, rather than blank status.

- Forecast winds can be associated with flight plan waypoints. Winds are interpolated at intermediate waypoints. ETE's and ETA's are calculated for each leg using wind and TAS, then summed for overall ETE and ETA at destination.

- A clearance language page is added to the FPS MENU.

- UTC overfly times are retained for waypoints that are behind the aircraft.

- When a DTO is performed, the UTC is captured and displayed next to PPOS on NAV page 1.

- Added OVRFLY line select key to overlay menu on FPL page

- Added SXTK line select key on MNVR page.

- A holding pattern may now be defined at any FPL waypoint, and then armed.

- A holding pattern may be directly activated by pressing DTO HOLDING on the holding pattern definition page or MNVR page.

- A parallel or teardrop entry will now recalculate the lateral guidance legs, when 15 seconds from the hold fix, in order to use the most current wind and groundspeed.

- Activation of a holding pattern will not cancel ARM APPR mode.

- For Collins Pro Line 4 4000, All ARINC 424 legs are now displayed on the EFIS map. Holding patterns are displayed on the EFIS map. Selected crosstrack is now displayed in magenta on the map. Annunciation of POS CORRECTING, POS UNCERTAIN, AND DEAD RECKONING are added to the MFD. A Progress Data Block is now available at the top of the Navigation Display.

- For cold weather operations, a Temperature Compensation (TCMP) mode is added.

- Flight Path Angle (FPA), in degrees, is displayed under Target V/S field on VNAV page 1.

- DTO or DTO HOLDING will no longer cancel VNAV mode for waypoints up to and including the Vertical TO waypoint.

- The VNAV mode logic for interface to the Honeywell Flight Guidance System allows recapture from above the flight path.

Refer to the applicable UASC service bulletin for a complete list of SCN 601 changes.

SCN 602/702

- Automatic approach arming occurs at 30nm from the End of Approach.

- Improved crossfill will push/pull crossfill options and triple FMS crossfill capabilities.

- Approaches using GPS are annotated with a "G" to indicate that GPS will remain selected during the approach.

- The holding function is improved to allow holding pattern at multiple waypoints in the flight plan. Procedural holding patterns are added to the database and eliminate the need to manually program holding patterns in SIDs, STARs, and Approaches.

- HOLD ARM will be displayed as submode on the NAV page when the next leg is a HOLD.

- Procedural heading leg data is displayed on the HSI. The HSI displays a centered needle when the aircraft is on the correct heading and the course pointer indicates the desired heading.

- The FUEL and FLT LOG pages are improved to allow the entry of total passenger weight.

- A STANDBY power down mode is added. After flight plan and fuel data are entered during preflight, the FMS can be powered down using STANDBY mode and FUEL and FPL page data will be retained for up to eight hours.

- Software Versions page is moved from DATA page 5 to a SW VERS line select key under MAINT on DATA page 1. Total DATA pages are now four.

- All waypoint latitude/longitudes from the nav database are now displayed to 0.01 minutes of resolution.

- References to JEPP are changed to NAV in regards to labeling the nav database.

- Support for UniLink is added.

- The DISPLAY Processor software in the UNS-1C, 1D, and 1B+ with 5" FPCDU is improved to support the display of weather graphics and other UniLink data.

- Floating waypoint terminators are displayed on a variety of EFIS map displays.

- All legs that terminate in floating waypoints are now displayed and referenced on the HSI.

- The display of holding pattern flight plan legs are available on the A429, Pro Line 4 800 and ASCB EFISs.

- The holding pattern flight plan legs are displayed on the Pro Line 4 4000 EFIS as Hold icons.

- Added EFIS interface for the Learjet 45 which includes altitude displays, interactive heading bug, LNAV, VNAV, overspeed, and Approach Modes.

- The Advanced Performance mode added sensed flap position, required field length, takeoff weight, and Static Air Temperature (SAT) limit computations.

- Runway gradient and length are now available from the navigation database and are used for runway length required calculations.

- VNAV Top of Descent (TOD) alerting message is changed from FPA CHANGE to TOP OF DESCENT ALERT.

- VNAV FPA CHANGE is changed to VERTICAL WPT ALERT.

- Removed the restriction for VNAV operations to waypoints in a Standard Instrument Departure (SID).

Refer to the applicable UASC service bulletin for a complete list of SCN 602 changes.

SCN 603/703

- LOC and Backcourse (BC) approaches, using the VHF NAV receiver for lateral steering, is available. A pseudo-glideslope is generated for three dimensional navigation.

- Added the message LOC STEERING ACTIVE for LOC and BC approaches to indicate when FMS is using raw localizer data for display and steering.

- Changed lateral scaling to be angular down to 350 feet full scale at the runway for use in GLS, LOC, and BC approaches.

- Added provisions for GPS Landing System (GLS) approaches.

- Improved the TUNE NAVAID message for ILS, LOC, and BC approaches. It now reads, for example, "TUNE NAV TO ITUS ON 111.70".

- Add an auxiliary power unit (APU) fuel flow configuration item.

- Added a configuration option to display either Q factor or the actual navigation performance (ANP) and required navigation performance (RNP). RNP can be manually set.

- Changed terminal scaling mode to activate when approach is armed, when the aircraft is within 30nm of the departure or destination, and when manually selected.

- Changed track to fix (TF) leg to use facility declination instead of applying great circle true heading magnetic calculation to TF leg.

- Changed the route ident to 10 characters to match the UniLink route ident.

- Changed the PERF Climb/Cruise page to display the ISA temperature corrections.

- Commands the FMS to automatically change from the PERF takeoff pages to the climb/cruise page after liftoff when Advanced Performance is configured.

- Changed the Initialization page to highlight the ACCEPT prompt when the position identification is GPS and the date and UTC are valid.

- Created new database status pages that provide the status of the database in the active and inactive data banks.

- Changed the FPL and DATA/NAV/APPR pages to display at or above, at or below, and window altitude constraints in small font.

- Added a VNAV menu page that allows entry of a default target vertical speed that is stored in non-volatile RAM.

- Changed the flight plan pages to allow entry of altitudes which will be used by the VNAV mode.

Refer to the applicable UASC service bulletin for a complete list of SCN 603 changes.

SCN 604/704

SCN 604 will support Universal Avionics new Terrain Awareness Warning System (TAWS), the Universal Cockpit Display (UCD), and remote tuning for the 8.33 Khz com radio spacing. It also includes the following operational changes.

- The holding definition page will retain pilot defined holding when leaving that page and later returning.

- The Company routes database will include the provision for Company defined waypoints.

- Cargo weight under fuel page 1 is expanded to six digits.

Refer to the applicable UASC service bulletin for a complete list of SCN 604 changes.

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SCN 80X/90X

The 80X/90X Software Control Numbers (SCN) was developed to operate with the advent of the UNS-1E, UNS-1Esp, UNS-1F and UNS-1L generation Flight Management Systems. Upgrade improvements for the UNS-1C, 1D, and 1K are also available, allowing these systems to use the 80X series software. Most of the software improvements allow these FMS's to work with new technology avionics and are transparent to the operator. The software differences listed below are directed at the FMS operator and specifically cover changes that will be seen by the operator. A complete description of changes and improvements are available through the corresponding Universal Avionics Service Bulletins. The Multi-Mission Management System (MMMS), 90X series software, provides the capability to automatically steer along one of six search patterns.

SCN 800/900 was created to allow SCN 604/704 to operate in the new generation FMS. SCN 800/900 was short lived, as there were only minor changes to this software from SCN 604/704. (See Operators Training Manual, Report Number 3039sv60X/70X) Major operational changes for the new generation FMS begins with SCN 801/901.

The following are operational changes from the preceding software.

SCN 801/901

- The enroute VNAV format changed to 6 vertical waypoints to work in conjunction with vertical waypoints on flight plan pages.

- A better transition from Enroute VNAV to Approach VNAV allows VNAV to stay coupled during approach activation.

- Descent in holding patterns is now available.

- An OFFSET function on the flight plan pages allows for creation of offset VNAV waypoint through flight plan pages.

- NAV MENU options allows for calculating ABEAM POINT, Radial Crossing, and 4 LAT/LONG crossing points.

- For a pilot created waypoint, airport, or alignment point, the FMS retains and displays the defining parameters.

- The FMS will now notify the pilot when pilot defined routes and terminal area procedures are affected by a new navigation database.

- For lat/long waypoints the FMS allows for either 5 (ARINC) or 7 character format.

- Precision Arc (RF) leg for lateral support in flight plans.

- A new NAV page with ANP and RNP is added to the NAV display.

- Creation of new temporary Tactical Waypoints for use in flight plans are now available.

- Adds Top of Descent (TOD) to TAWS display.

Refer to the applicable UASC service bulletin for a complete list of SCN 801 changes.

SCN 802/902

- The COMPRESSED option is now on flight plan menu page 1, LSK 1L, with a new presentation. A new option, REF ALT, is on page 2, LSK 1L. REF ALT is a TAWS related function.

- On the flight plan menu arrival page under approach, RNAV (GPS) approaches are now separated from GPS approaches, with the designation of RNV.

- The FMS is now capable of flying RNAV (RNP) approaches with multiple legs between the FAF and MAP to include precision arc, track to fix, and course to fix legs with pseudo glideslope to less than RNP .3 on aircraft so certified.

- The NAV menu contains a new feature, MAP DISPLAY. This allows for the suppression of the missed approach transition on the map mode of the pilots flight display.

- The performance menu page contains a new option ETP/PNR, Equal Time Point and Point of No Return. Configuration allows for pilot inputs to determine engine failure and pressurization failure ETP/PNR.

- The tune function of the FMS now contains a communication frequency database.

- The method of construction of pilot created approaches has changed allowing for multiple fixes between the FAF and MAP.

- Modification of seven-character oceanic waypoint identifier format to "xxNxxxW"

Refer to the applicable UASC service bulletin for a complete list of SCN 802 changes.

- Added a new route clearance page, accessed from the Pilot Route menu page, which displays pilot-defined routes in clearance language format.

- Added configuration setting to display and specify the time of day the navigation database expires.

- Modified selected crosstrack mode to maintain the parallel offset for certain leg types through leg sequencing in order to comply with PRNAV and RNP RNAV.

- Modified selected crosstrack entry field on the NAV page to correctly interpret the entered selected crosstrack value when the commanded heading mode is active.

- Added a synchronized dual FMS feature. Pilot actions that affect LNAV, VNAV and FUEL are automatically and bidirectionally crossfilled.

- Added the use of runways for tactical operations such as DTO, PVOR, and HOLD.

- Added emergency divert feature to the DTO function. An emergency divert to a nearby airport was previously available through the use of the LIST function to access a list of nearby airports. This new feature will allow direct access to nearby airports from the DTO page and provide additional information such as range, bearing and maximum runway lengths.

- Added a Hold at Present Position (HOLD PPOS) option that enables pilot to enter a holding pattern at the current present position.

- Modified software to allow missed approach selection for advisory approaches.

- Modified software to restore the capability to do manual predicted RAIM for BC, LOC and ILS approach types.

- Modified software to display approach magnetic variance accurately in the unique case when a flight plan is entered where there is no origin and an extra waypoint after the destination.

- Removed the Quality (Q) factor as a display option for Estimated Position Uncertainty (EPU).

Refer to the applicable UASC service bulletin for a complete list of SCN 803 changes.

SCN 100X/110X

SCN 100X and the MMM version 110X, require a new FMS. The new FMS are the 1Ew, 1Espw, 1Fw, and 1Lw. This software is adapted to integrate the Space Base Augmentation System (SBAS) into the navigation sensor suite. Under SBAS is WAAS for North America, EGNOS for Europe, MSAS for Japan, and GAGAN for India.

The following are operational changes from the preceding software.

SCN 1000/1100

- Added a "+" sign to indicate a positive value in the VDEV field on the VNAV Path Page.

- Improved position accuracy calculations by refining inputs to the multi-sensor Kalman filter used to determine actual navigation performance (ANP).

- Removed waypoint overfly as the default to the precision arc (RF) procedural leg type and added an "overfly" (OVFLY) option to the SID, STAR and Approach RF Leg Definition Pages.

- Improved software to ensure temperature compensation is <u>not</u> applied to manually entered altitudes at final approach course fixes (FACF).

- Improved synchronization functionality to ensure SYNC mode is retained when two independent FMS with Selected Crosstrack (SXTK) active are synchronized.

- Incorporated routine update to the magnetic variation model.

- Modified software to prevent erroneous NO INTERCEPT message during large course changes.

- Now shows multiple approaches of the same type to a same runway by adding an identifier suffix to uniquely identify each approach.

- Added the capability for deviation steered autopilots to fly advanced approaches. An Advanced Approach Deviation Steering configuration option was implemented to enable this functionality.

- Updated the missed approach functionality to maintain approach scaling and alerting until the missed approach waypoint is sequenced.

- Modified software to maintain approach scaling on the first missed approach leg when that leg is a TF leg type.

- Added to the crossfill functionality GPS required and approved information to ensure GPS required and GPS allowed approaches are crossfilled, and to prevent the deselection of the offside FMS's GPS when the approach is armed.

- Improved flight plan auto-link functionality to select the first instance of a waypoint when multiple waypoints exist in a terminal procedure, i.e. when a course reversal (HF leg) exists in the flight plan.

- Modified approach logic to allow approach arm/activation when the flight plan is unlinked.

- Modified software to use published required navigation performance (RNP) values from the navigation database (when an RNP value exists) for full scale lateral deviation output.

- Removed automatic approach Predictive RAIM feature as it is no longer required per TSO-146b.

- Added Space Based Augmentation System (SBAS); charted as RNAV (GPS or GNSS) approaches, to the navigation database.

- Added GPS/WAAS sensor configuration options (antenna offsets, approved SBAS providers, analog deviation hi/lo level voltages) to configuration pages.

- Added GPS/WAAS provisions to power-up, self test, configuration and initialization functions, including test and status of the WAAS/ARINC board.

- Added select and deselect logic for the GPS/WAAS sensor. New WAAS sensor pages provide sensor status, integrity status, sensor and satellite selection/ deselection. Data Pages 2 and 4 have been updated to reflect GPS/WAAS sensor status.

- Added SBAS approach provisions to the flight plan function. This includes the ability to select a SBAS approach by entering its Channel ID and displaying SBAS approaches with a "W" prefix on approach lists to indicate LPV Level of Service (LOS) availability.

- Added an RNAV Approach LOS page from which the SBAS approach LOS may be viewed or selected. The Navigation and Navigation Approach pages have been modified to provide access to this page. Level of service includes LNAV, LNAV/VNAV and LPV.

- Improved the approach interface to support the selection of SBAS (RNAV (GPS)) approaches and approach guidance function.

- Revised FMS default RNP values for oceanic, enroute and approach flight phases to reflect greater accuracy requirements. Oceanic operations have been revised from 6.0 nm to 4.0 nm; enroute from 2.8 nm to 2.0 nm; and approach from 0.5 to 0.3 nm.

- Added a SBAS Approach LOS annunciation to the Navigation Approach Page.

- Adjusted inputs to the multi-sensor position filter to incorporate the GPS/WAAS sensor. Modified Navigation Approach pages to display the SBAS approach Horizontal and Vertical Protection Levels (HPL/VPL) and corresponding Horizontal and Vertical Alert Level (HAL/VAL) as a measure of position accuracy.

- Modified ANP calculation to comply with FAA guidance AC 90-101, Approval Guidance for RNP Procedures with Special Aircraft and Aircrew Authorization Required (SAAAR), Design Assurance Level C.

- Modified estimate of position accuracy logic for LNAV approaches to employ the most precise RNP value for HAL calculation, regardless if it is manually entered or derived from the navigation database.

- Modified the navigation function to disable the position correcting function when a high integrity GPS / WAAS position is available.

- Updated synchronization function to accommodate SBAS approach capabilities.

- Improved crossfill functionality in dual FMS installations to ensure all applicable vertical waypoints are consistently crossfilled to the VNAV flight plan.

- Improved VNAV data output to ensure seamless coupling to autopilot and flight director systems interfaced with the FMS.

- Improved software to display vertical target speed (VTGT) on the Landing Performance Page.

- Improved the suggested COM frequencies list by providing arrival COM frequencies such as ATIS, Tower, and Ground Control, when approaching the destination airport.

- Added functionality to download FMS configuration settings onto a disk via the Data Transfer Unit (DTU).

- Added on the last NAV page distance and bearing to ✳EOA✳ when within 99nm of ✳EOA✳.

- Added a REFRESH option to the Level of Service (LOS) page to require the SBAS LOS to be review for a change in the Level of Service. SCN 1000.5 and subsequent

Refer to the applicable UASC service bulletin for a complete list of SCN 1000/1100 changes.

SCN 1001/1101

The following operational improvements have been implemented in SCN 1001/1101 as it evolved from SCN 1000.5/1100.5 and includes changes and improvements made through SCN 1000.8/1100.8:

- Added the capability to output and display an Active Speed Limit using procedural speed limits, airport speed restriction, and maximum holding speeds.

- Modified software allowing an FMS operator to initiate a request for updated flight level winds through UniLink and, upon reception of those winds, have them automatically applied to the flight plan predictions. UniLink required

- Added a new advanced display bus that supports UASC display products.

- Improved software allowing the FMS operator to have access to all related annunciations on the Message page (MSG).

- Updated software so CDU page references are changed from WAAS to SBAS where appropriate.

- Added the capability for the pilot to plan and direct the FMS to perform a DTO in a specified direction after sequencing a waypoint.

- Created a new SBAS DIAG page to display GPS altitude and ground speed.

- Corrected software so that when GO AROUND activates, the FMS deletes the *EOA* gap, regardless of where the EOA gap is in the Guidance Leg Set.

- Updated software to ensure that when the TEMP COMP page is accessed, after the airport has changed since the last time the page was accessed, the temperature correction is referenced to the proper airport.

- This software update erases the mark-on-target waypoint database when the FPL ERASE discrete is activated for more than 3 seconds. SCN 1101

- Modified software to display the correct bearing on the FPL pages for course and heading legs when magnetic variation is invalid when manual variation is entered and will display the Mag/True reference consistently based on the Mag/True State of the FMS. The FMS will use Airport Magvar when System Magvar is not defined at the airport reference location.

- Updated software by retaining speed limit, altitude constraint, and RNP when the inserted procedure is linked to the adjacent segments.

- Modified software so that the message "TOD ALERT" is activated when the 2-minute alert window is reentered.

- Updated software to prevent VDEV output error when a new target VS is entered.

- Modified software so that temperature compensation remains engaged when an LPV or LNAV/VNAV approach is active.

- Added FlexPerf Trip Performance function in the FMS to provide for crew planning of the performance climb, cruise and descent phases of flight, and to compute the resulting vertical trajectory of the airplane and fuel consumption. This feature is only applicable to FMS/MMMS with FlexPerf hardware installed indicated by the part number; refer to the Equipment Specifications section of the applicable FMS Installation Manual. FlexPerf requires an aircraft specific FlexPerf database. Contact Universal Avionics for a list of currently supported aircraft.

- Added a new critical guidance bus for an LP/LPV capability that emulates an ILS approach output from a VOR/ILS receiver to the flight guidance system.

- Modified software to enable the FMS to meet new requirements for handling terminal area procedures that have a mix of RNP and non-RNP legs.

    - Procedural RNP no longer propagates to subsequent legs.

    - Adherence to procedural RNP has been rendered stricter in cases of manual leg change.

    - Lateral full-scale deflection is now sensitive to crew-entered RNP.

    - Analog lateral deviation output outside of approach is now sensitive to procedural and crew-entered RNP.

    - Automatic changes to the lateral full-scale deflection is now annunciated on the NAV page.

    - Automatic changes in the lateral full-scale deflection will now occur gradually over 30 seconds.

    - Capability to manually select Lateral scaling modes has been removed.

    - Increase manual RNP limit from 5nm to 25nm.

    - Leg RNP value is propagated into the first approach waypoint when appropriate.

- Updated software to inhibit inserting manual holding (HOLD) into the approach common segment. Instead, when the approach waypoint is selected, the hold pattern is defined for off flight plan only.

- Modified software to compute a Flight Path Angle (FPA) to the first approach waypoint.

- Modified software to compute hold entry type based on bearing from present position to the hold fix when the hold is on the flight plan and there is no prior leg that provides an inbound course.

Refer to the applicable UASC service bulletin for a complete list of SCN 1001/1101 changes.