CORE FLIGHT SOFTWARE SYSTEM (CFS)

HEALTH & SAFETY (HS) APPLICATION

BUILD: 2.3.0.0

FSW VERSION DESCRIPTION DOCUMENT

RELEASE DATE: 10/12/2016

1.0 FSW VERSION DESCRIPTION

1.1 PURPOSE AND SUMMARY

The purpose of this build is to continue to refine the cFS Health and Safety (HS) application product. This build provides various bug fixes and a few minor user's guide updates. This build also resolves capability issues with cFE build 6.5.0. This document serves as the notification of the Build 2.3.0.0 release of the cFS HS application.

HS version 2.3.0.0 is compatible with cFE builds 6.5.0.0 and above and OSAL 4.2.0.0 and above.

1.2 NEW/CHANGED FUNCTIONALITY IN THIS VERSION

Table 1.2-1 identifies new FSW functionality that has been implemented and is integrated into this FSW version Requirement references are included.

Table 1.2-1 – New Functionality in this Version

No.	FSB DCR # (or N/A)	Requirements	High Level Description of Functionality
N/A			None

Table 1.2-2 identifies changes to FSW functionality from a previously delivered FSW version and the DCRs and Trac Ticket numbers associated with these changes. See attachment 1 for a full listing of the DCRs and Trac Tickets included in this release.

Table 1.2-2 – Changes to Previously Delivered Functionality

No.	FSB DCR or Trac Ticket # (or N/A)	Requirements	Functionality or Change Description
1	#40	HS6010	HS Hogging configuration error. Health and Safety detects hogging by incrementing a counter within a non-blocking loop running at low priority, periodically extracting the number of increments, and rescaling that count to be within a fixed range. The system is hogging if the resulting scaled value is smaller than a threshold (actually, if a fixed value minus the rescaled value, representing busy time, is over a threshold). The rescaling is done by multiplying by a Mult1, dividing by Div, then multiplying by Mult2. Problem 1: The initialization of the parameters at task startup is done with this code: HS_CustomData.UtilMult1 = HS_UTIL_CONV_MULT1; HS_CustomData.UtilMult2 = HS_UTIL_CONV_DIV; HS_CustomData.UtilDiv = HS_UTIL_CONV_MULT2; Note the cross-up between DIV and MULT2. Problem 2: The default value of MULT1 in the stock configuration file is large enough that the first multiplication of the rescaling may overflow; a safer value (such as 1) should be used to avoid inconsistent behavior in untuned systems: better to have the system declare HOGGING consistently but, at the wrong threshold than to randomly bat it around, as happens on fast targets where count*2500 overflows.
2	4015	N/A	Fixed the following initialization typos in the custom initialization function defined in fsw/src/hs_custom.c: HS_CustomData.UtilMult2 = HS_UTIL_CONV_DIV; HS_CustomData.UtilDiv = HS_UTIL_CONV_MULT2;

No.	FSB DCR or Trac Ticket # (or N/A)	Requirements	Functionality or Change Description
3	4053	N/A	GPM-IVV-1280 - HS - Increments Command Error Counter for Internal Commands. In order to keep consistency between cFS applications it is recommend to remove all code to increment the command error counter for all internal commands. Removed code that incremented the command error counter for the HS_TEP_WAKEUP_MID internal command.
4	145570	N/A	Updated function HS_CustomGetUtil to protect against Divide-By-Zero

1.3 MISSING PLANNED FEATURES AND KNOWN PROBLEMS

Table 1.3-1 identifies the functions and known discrepancies that are absent from HS Build 2.3.0.0. Any workarounds that may apply are identified.

Information on currently open DCRs is available at http://tlserver3.gsfc.nasa.gov:7001/index.html. Information on currently open Trac tickets is available at https://babelfish.arc.nasa.gov/trac/cfs_apps/report/1. Note that these are restricted websites that requires a server account. Additional DCRs and/or Trac Tickets may have been submitted after preparation of this VDD. A cFS HS DCR/Ticket report containing a listing of open DCRs and Trac tickets is available on request for customers who do not have access to the restricted servers. Please contact Susanne Strege, susie.strege@nasa.gov.

Table 1.3-1 – Functions absent from this Release

No.	FSB DCR # (or N/A)	Description	Reason for Absence	Affected Requirement or Component	Workaround	Planned Delivery
1	4150	Add HS CPU utilization driver for Linux. The HS app has an hs_custom.c file that implements an idle task and calculates the CPU utilization. When running the cFE on Linux this idle task causes the linux system to use 100% CPU, which is not good for a desktop system. Since Linux already maintains its own CPU utilization stats, a version of hs_custom.c that works for linux by eliminating the idle task and instead reporting the CPU utilization stats that linux maintains. This can be added to the project source and selected at compile time.	Implementation is dependent on customer needs.	HS6010	None	Not Determined
2	4116	HS - Add Trick Simulation Support (JSC Request)	Implementation is dependent on customer needs. Community input is needed.	N/A	Add required ifdef statements to header files	Not Determined

1.4 DEVELOPMENT TOOL VERSIONS ASSOCIATED WITH THIS FSW VERSION

Table 1.4-1 identifies the versions of development tools used to generate this FSW version:

Table 1.4-1 – Development Tool Versions Associated with this FSW Version

Tool Type.	Tool Name	Version Used
RTOS	BVTed with VxWorks 6.9, however, OSAL provides ability to use multiple OSes	6.9
Compiler	GNU	3.3.2
cFE	Core Flight Executive	6.5.0.0
cFE-PSP	cFE Platform Support Package	1.3.0.0
OSAL	Operating System Abstraction Layer	4.2.0

2.0 DELIVERED PRODUCTS

Table 2-1 identifies the locations of FSW products relevant to this FSW Build. The version or date of the Build and where the product can be located are provided. Changes from a previous VDD are identified.

Table 2-1 – Delivered Products and their Locations

Software Element	Changed with this Version?	New Version or Date	Location
Executable for this build	Yes	2.3.0.0	Not applicable. Executables must be created for the specific mission/platform
Installation Procedures & Special Instructions **(See Section 3.0)**	No	N/A	See Deployment Guide babelfish.arc.nasa.gov (in git system TOOLS master branchs) and http://sourceforge.net/projects/coreflightexec
Source Code of this FSW Build	Yes	2.3.0.0	Tlserver3.gsfc.nasa.gov. MKS label HS-ALL-Build2.3.0.0-OCT12-2016 babelfish.arc.nasa.gov (in git system hs_app_master branch) and http://sourceforge.net/projects/cfs_hs
FSW Build Plan	N/A	N/A	None
Annotated S/W Detailed Design Docs	No	N/A	fsb.gsfc.nasa.gov/cFS
Ground System T&C Database	No	N/A	Tlserver3.gsfc.nasa.gov babelfish.arc.nasa.gov (in git system hs_app_master branch) and http://sourceforge.net/projects/cfs_hs
Ground System Scripts developed by FSB	No	N/A	Tlserver3.gsfc.nasa.gov babelfish.arc.nasa.gov (in git system hs_app_master branch) and http://sourceforge.net/projects/cfs_hs
Simulator and Test Data Generator Software	No	N/A	None

Software Element	Changed with this Version?	New Version or Date	Location
Executable - Ground Tools associated with FSW (tools to build stored command loads, etc.)	No	N/A	None
Source Code - Ground Tools associated with FSW (tools to build stored command loads, etc.)	No	N/A	Perl scripts to generate ground database and build verification procedures from templates (see cFS Deployment Guide)
Unit Test Procedures	No	N/A	Tlserver3.gsfc.nasa.gov
Unit Test Data	No	N/A	Tlserver3.gsfc.nasa.gov. MKS label HS-ALL-Build2.3.0.0-OCT12-2016 babelfish.arc.nasa.gov (in git system hs_app_master branch) and http://sourceforge.net/projects/cfs_hs
Unit Test Results	No	N/A	Tlserver3.gsfc.nasa.gov. MKS label HS-ALL-Build2.3.0.0-OCT12-2016 babelfish.arc.nasa.gov (in git system hs_app_master branch) and http://sourceforge.net/projects/cfs_hs
FSW Make Files	No	N/A	Tlserver3.gsfc.nasa.gov. MKS label HS-ALL-Build2.3.0.0-OCT12-2016 babelfish.arc.nasa.gov (in git system hs_app_master branch) and http://sourceforge.net/projects/cfs_hs
Linker & Compiler Configuration Files	No	N/A	Tlserver3.gsfc.nasa.gov
Requirements version (from MKS)	No	1.4	Tlserver3.gsfc.nasa.gov babelfish.arc.nasa.gov (in git system hs_app_master branch) and http://sourceforge.net/projects/cfs_hs

3.0 INSTALLATION PROCEDURES

Table 3-1 identifies the nominal FSW Installation Procedure(s) for this FSW Build onto the intended target system (including the commercial applications used and the configuration settings). The procedure version identifier, the date of the procedure and where it can be located are also provided.

Table 3-1 FSW Installation Procedure(s)

Destination (Target System)	Filename	Version and Date	Location
N/A	See cFS Deployment Guide	Version 3.0	Available with cFE open source release: http://sourceforge.net/projects/coreflightexec/ babelfish.arc.nasa.gov (in git system TOOLS master branch) and on Tlserver3.ndc.nasa.gov

4.0 CONFIGURATION SUMMARY AND VERSION IDENTIFICATION

HS Build 2.3.0.0 can be found on tlserver3.gsfc.nasa.gov and babelfish.arc.nasa.gov (in git system hs_app_master branch). Note that these are restricted websites that requires a server account. The open source release of HS Build 2.3.0.0 can be found on http://sourceforge.net/projects/cfs_hs. Verification of the version can be done by sending a HS Noop command which produces an event message containing the version. In addition, the initialization event message generated during the application startup provides the version.

5.0 SOFTWARE COPYRIGHT NOTICE

ACRONYMS

ACS ..... Attitude Control System

C&DH..... Command and Data Handling

cFE..... Core Flight Executive

cFS..... core Flight Software System

CM ..... Configuration Management

COTS ..... Commercial Off-The-Shelf

DCR ..... Discrepancy/Change Request

ETU..... Engineering Test Unit

FSB..... Flight Software Branch

FSW..... Flight Software

HS..... Health and Safety

I&T ..... Integration & Test

OSAL..... Operating System Abstraction Layer

RTOS..... Real-Time Operating System

T&C..... Telemetry and Command

URL..... Universal Resource Locator

VDD ..... Version Description Document

ATTACHMENT 1 – CFS HEALTH AND SAFTEY BUILD 2.3.0.0 DCRS

No.	DCR/Trac Ticket #	Description	Type	Priority	State	Date Reported	Build Target
1	#17	Update HS app for recent CFE update	defect	major	Test Complete	5/18/2015	2.3.0.0
2	#26	HS: Fix compiler errors/warnings with strict build settings	defect	minor	Test Complete	6/29/2015	2.3.0.0
3	#40	HS Hogging configuration error. Health and Safety detects hogging by incrementing a counter within a non-blocking loop running at low priority, periodically extracting the number of increments, and rescaling that count to be within a fixed range. The system is hogging if the resulting scaled value is smaller than a threshold (actually, if a fixed value minus the rescaled value, representing busy time, is over a threshold). The rescaling is done by multiplying by a Mult1, dividing by Div, then multiplying by Mult2. Problem 1: The initialization of the parameters at task startup is done with this code: HS_CustomData.UtilMult1 = HS_UTIL_CONV_MULT1; HS_CustomData.UtilMult2 = HS_UTIL_CONV_DIV; HS_CustomData.UtilDiv = HS_UTIL_CONV_MULT2; Note the cross-up between DIV and MULT2. Problem 2: The default value of MULT1 in the stock configuration file is large enough that the first multiplication of the rescaling may overflow; a safer value (such as 1) should be used to avoid inconsistent behavior in untuned systems: better to have the system declare HOGGING consistently but, at the wrong threshold than to randomly bat it around, as happens on fast targets where count*2500 overflows.	defect	minor	Test Complete	2/1/2016	2.3.0.0

4	145764	Fixed the following format warnings from calls to CFE_EVS_SendEvent: fsw/src/hs_app.c:435: warning: format '%08X' expects type 'unsigned int', but argument 4 has type 'int32' fsw/src/hs_monitors.c:570: warning: format '%d' expects type 'int', but argument 4 has type 'uint32' fsw/src/hs_custom.c:415: warning: format '%i' expects type 'int', but argument 12 has type 'uint32' fsw/src/hs_custom.c:472: warning: format '%d' expects type 'int', but argument 6 has type 'int32'	defect	minor	Test Complete	9/6/2016	2.3.0.0
5	4015	Fixed the following initialization typos in the custom initialization function defined in fsw/src/hs_custom.c: HS_CustomData.UtilMult2 = HS_UTIL_CONV_DIV; HS_CustomData.UtilDiv = HS_UTIL_CONV_MULT2;	defect	minor	Test Complete	5/21/2012	2.3.0.0
6	4053	GPM-IVV-1280 - HS - Increments Command Error Counter for Internal Commands. In order to keep consistency between cFS applications it is recommend to remove all code to increment the command error counter for all internal commands. Removed code that incremented the command error counter for the HS_TEP_WAKEUP_MID internal command.	defect	minor	Test Complete	7/30/2012	2.3.0.0
7	4109	Removed use of the term "Critical" when referencing application and event monitoring. Use of the term "critical", when referring to application and event monitoring, is unnecessary. In theory, all applications are somewhat "critical" or we shouldn't be running them. All applications in the system will need some action taken if they stop running. Of course, some applications are less important than others, but the Application Monitor allows less important applications to have less drastic responses when they fail to check in. Since the monitor can be used for the less critical applications, to avoid any confusion, the term Critical was removed from the source code comments, doxygen users guide, and users guide when referring to Application and Event Monitoring.	Change Request	minor	Test Complete	5/8/2013	2.3.0.0
8	4133	Corrected HS_MAT_LD_ERR_EID Doxygen Information to 'Error Loading MsgActs Table,RC=0x%08X'	defect	minor	Test Complete	9/25/2013	2.3.0.0
9	145570	Updated function HS_CustomGetUtil to protect against Divide-By-Zero	defect	major	Test Complete	5/13/2016	2.3.0.0

10	145575	Moved the following function prototypes from hs_app.c to hs_app.h: int32 HS_AppInit (void); int32 HS_SbInit (void); int32 HS_TblInit (void); int32 HS_ProcessMain (void); int32 HS_ProcessCommands (void);	Change Request	minor	Test Complete	5/16/2016	2.3.0.0
11	145738	HS_AppInit sets variable that is never used. In hs_app.c, the variable "Status" is set to CFE_SUCCESS, immediately after which the code path will always set "Status" to a different value without using the previously-set value. In hs_app.c:HS_AppInit , removed assignment Status to CFE_SUCCESS at declaration.	defect	minor	Test Complete	8/5/2016	2.3.0.0
12	3284	Default HS Idle task priority was set to the same prioritoy as the VxWorks UTILITY_TASK. The default priority has been changed to 252. The Idle task priority should be the lowest priority task on a system.	Change Request	minor	Test Complete	8/3/2011	2.3.0.0