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(Signature on file) (Signature Page contained in Section 7)	AIR FORCE SPACE COMMAND (AFSPC), 50th SPACE WING (50 SW)	
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INTERFACE CONTROL DOCUMENT

UNLESS OTHERWISE SPECIFIED: NUMBERS ARE REPRESENTED IN DECIMAL FORM.

THIS DOCUMENT SPECIFIES TECHNICAL REQUIREMENTS AND NOTHING HEREIN CONTAINED SHALL BE DEEMED TO ALTER THE TERMS OF ANY CONTRACT OR PURCHASE ORDER BETWEEN ALL PARTIES AFFECTED

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ICD TITLE:
Navstar ~~Next Generation~~ GPS ~~Operational~~ Advanced Control Segment (OCX) to User Support Community Interfaces

SIZE A	CODE IDENT **4WNC1**	ICD NO. ICD-GPS-870
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NC	Initial Release	August 13, 2010	
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1 SCOPE

1.1 Scope

This Interface Control Document (ICD) defines the functional data transfer interface between the ~~Next Generation~~ Global Positioning System (GPS) ~~Operational~~ Advanced Control Segment (OCX) and the GPS ~~u~~User and ~~u~~User-support communities. This ICD describes the data files that are transferred in this interface and the means by which these data files are distributed.

The files that are distributed by the GPS OCX are: Almanacs (System Effectiveness Model (SEM), YUMA, and Extended Signals Health Status (ESHS)), Operational Advisories (OAs), Anti-Spoofing (A-S) ~~status~~Status, and Notice Advisory to Navstar Users (NANUs). The formats of these files are defined in the Appendices of this document. All data transferred as described in this ICD is unclassified.

The GPS OCX is operated by the 2d~~nd~~ ~~Satellite~~ Space Operations Squadron (2 SOPS), administratively organized under 50th Space Wing (50 SW). The GPS ~~u~~User and ~~u~~User-support communities are comprised of the Department of Homeland Security (DHS) United States Coast Guard (USCG); Department of Transportation (DOT), Federal Aviation Administration (FAA); other Civil ~~u~~Users; and various Military GPS ~~u~~Users. The interfaces between the GPS OCX and the USCG, FAA, other Civil ~~u~~Users, and the Military GPS ~~u~~User community are implemented using electronic mail (e-mail), Internet and SIPRNet. This ICD does not include detailed technical descriptions of the e-mail system, Internet or SIPRNet.

In this document, from here on, the term CS, which stands for Control Segment, will be used instead of OCX (where applicable). In the OCX era, the OCX System will be the GPS Control Segment; therefore, the CS will be performing the functions stated in this ICD.

1.2 Key Events

The major milestone for implementation of this interface is the initial operating capability of the GPS OCX system beginning with Effectivity 10 as defined in SS-CS-800.

1.3 Interface Control Document Approval and Changes

The Interface Control Contractor (ICC), designated by the government, is responsible for the basic preparation, approval, distribution, and retention of the ICD in accordance with the Interface Control Working Group (ICWG) charter GP-03-001.

The following signatories must approve this ICD to make it effective.

1. Air Force Space Command (AFSPC), GPS Directorate (GP) Space and Missile Systems Center (SMC)

2. Air Force Space Command (AFSPC), 50th Space Wing (50 SW)

3. Raytheon Company, OCX Contractor
~~4.~~ Department of Homeland Security (DHS), United States Coast Guard (USCG)
4.

5. ~~Air Force Space Command (AFSPC), 50th Space Wing (50 SW)~~

6. Department of Transportation (DOT), Federal Aviation Administration (FAA)

7. ~~Raytheon Company, OCX Contractor~~

Initial signature approval of this ICD can be contingent upon a letter of exception delineating those items by paragraph numbers that are not a part of the approval. Such letter of exception can be prepared by any of the signatories and must be furnished to the ICC for inclusion in the printed distribution of the officially released version of the ICD.

Changes to the approved version of this ICD can be initiated by any of the signatories and must be approved by all above signatories. The ICC is responsible for the preparation of the change pages, change coordination, and the change approval by all signatories. Designated signatories can approve proposed changes to this ICD without any increase in the scope of a specific contract by so specifying in a letter of exception. Such letters of exception must be furnished to the ICC for inclusion in the released version of the approved change and in the printed distribution of the approved ICD.

Whenever all of the issues addressed by a letter of exception are resolved, the respective signatory shall so advise the ICC in writing. When a portion of the exceptions taken by a signatory are resolved (but not all), the signatory shall provide the ICC with an updated letter of exception. Based on such notifications – without processing a proposed interface revision notice (PIRN) for approval – the ICC will omit the obsolete letter of exception from the next revision of the ICD and will substitute the new one (if required).

The typical review cycle for a PIRN is 45 days after receipt by individual addressees unless a written request for a waiver is submitted to the ICC.

2 APPLICABLE DOCUMENTS

2.1 Government Documents

The following documents of the issue specified contribute to the definition of the interfaces in this ICD and form a part of this ICD to the extent specified herein.

Specifications

Federal

None

Military

None

Other Government Activity

SS-CS-800 Current Version	GPS III Control Segment Specification Global Positioning Systems Wing (GPSW)

Standards

Federal

September 2008	Global Positioning System Standard Positioning Service Performance Standard
July 2010	DoD IPv6 Standard Profiles For IPv6 Capable Products Version 5.0

Military

MIL-HDBK-470 Current Version	Designing and Developing Maintainable Products and Systems
MIL-STD-810 Current Version	Department of Defense Test Method Standard for Environmental Engineering Considerations and Laboratory Tests

~~None~~

Other Publications

IS-GPS-200 Current Version	Navstar GPS Space Segment / Navigation User Interface
IS-GPS-705 Current Version	Navstar GPS Space Segment / User Segment L5 Interfaces
IS-GPS-800 Current Version	Navstar GPS Space Segment / User Segment L1C Interfaces
~~ICD-GPS-700 Current Version~~	~~Navstar GPS Military-Unique Space Segment / User Segment Interfaces~~

GP-03-001A 20 April 2006	GPS Interface Control Working Group (ICWG) Charter
MOA February 1992	Memorandum of Agreement Between the United States Coast Guard and the United States Space Command, "Distribution of Navstar Global Positioning System (GPS) Status Information" (Signatories: USCG/G-NRN and USSPACECOM/DO)
MOA February 1996	Support Agreement Between the United States Coast Guard and the United States Air Force Space Command, "Distribution of Navstar Global Positioning System (GPS) Status Information" (Signatories: Commanding Officer NAVCEN and AFSPC/DO)
MOA February 2010	Memorandum of Agreement between the Joint Functional Component Command for Space the U.S. Coast Guard Navigation Center and the FAA National Operations Control Center with respect to the Support of Users of the Navstar Global Positioning System
Fiscal Year 2008	Federal Radionavigation Plan

2.2 Non-Government Documents

The following documents of the issue specified contribute to the definition of the interfaces in this ICD and form a part of this ICD to the extent specified herein.

Specifications

None

Standards

None

Other Publications

None

3 REQUIREMENTS

3.1 Interface Identification

This ICD defines the interfaces between the ~~Next Generation~~ Global Positioning System (GPS) ~~Operational~~ Advanced Control Segment (OCX) and the GPS ~~u~~User and ~~u~~User-support communities during the OCX era. The files provided by the GPS ~~OCX~~ CS to these GPS Users are the Almanacs, Operational Advisories (OAs), Anti-Spoofing (A-S) ~~status~~Status, and the Notice Advisory to Navstar Users (NANUs) corresponding to all legacy signals and the new Civil signals L1C, L2C~~,~~ and L5~~, and M-Code~~. The primary means for distribution of the data that is generated by the GPS ~~OCX~~ CS is via electronic mail (e-mail), Internet and SIPRNet. Figure 1 captures the interfaces defined in this ICD.

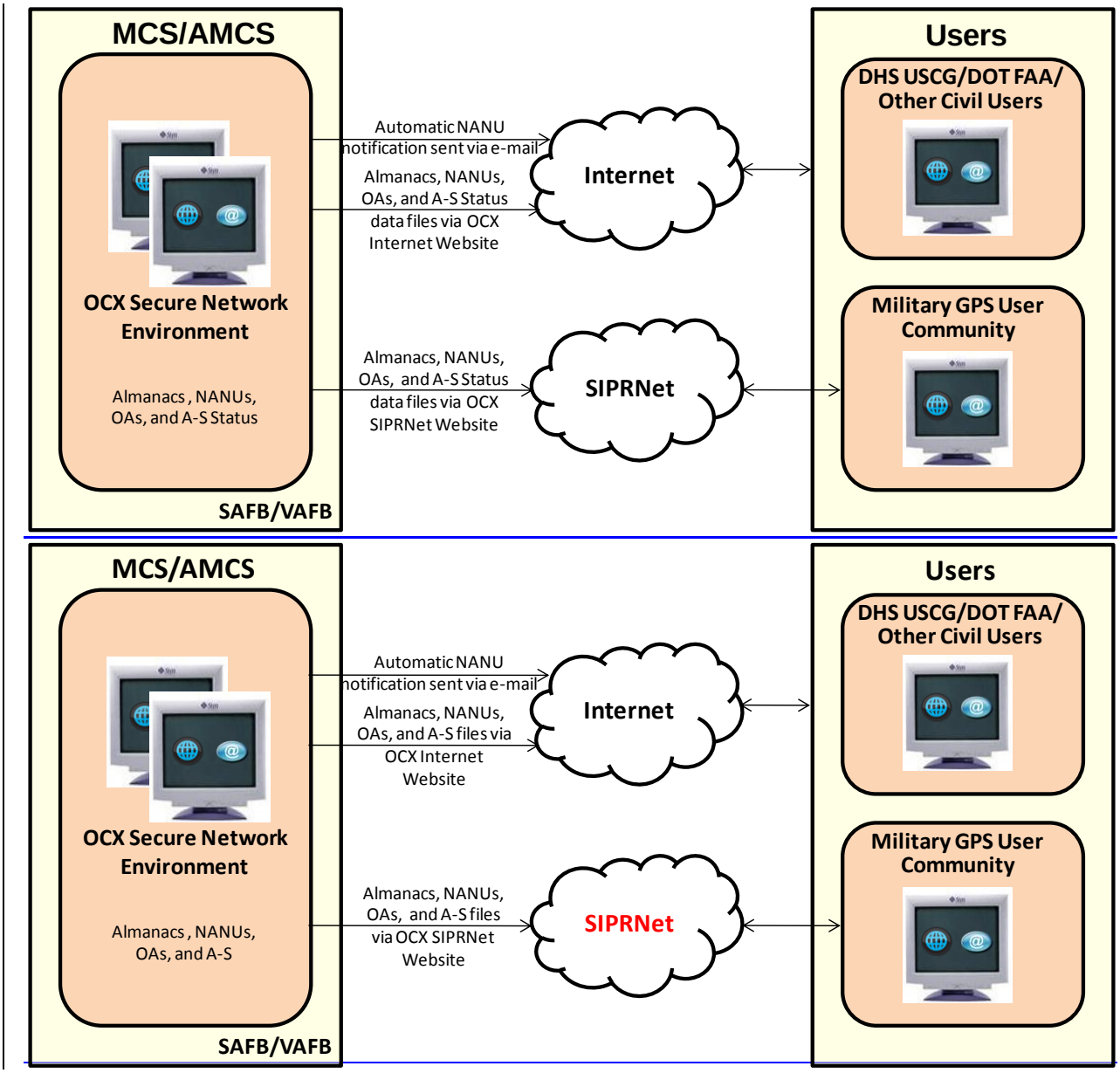

Figure 1 GPS ~~OCX~~ CS to the GPS User Community

The interfaces defined in this ICD are listed in Table I~~Table I~~, in the form of an information exchange matrix.

Table I Information Exchange Matrix

Producer	Consumer	Data Exchange Identification	Information Description	Nature of Transaction	Security
GPS ~~OCX~~CS	DHS USCG / DOT FAA/ Other Civil Users*	GPS Status Information	NANU	Transmit via E-Mail and Post to Internet Website	Unclassified
GPS ~~OCX~~CS	DHS USCG / DOT FAA/ Other Civil Users	GPS Constellation Status Summary	OA	Post to Internet Website	Unclassified
GPS ~~OCX~~CS	DHS USCG / DOT FAA/ Other Civil Users	GPS Constellation Anti-Spoofing Status ~~Summary~~	A-S Status	Post to Internet Website	Unclassified
GPS ~~OCX~~CS	DHS USCG / DOT FAA/ Other Civil Users	GPS Constellation Orbital and Performance Parameters, and SV Signal Health Status	Almanac	Post to Internet Website	Unclassified
GPS ~~OCX~~CS	Military User Community	GPS Status Information	NANU	Post to Internet and SIPRNet Websites	Unclassified
GPS ~~OCX~~CS	Military User Community	GPS Constellation Status Summary	OA	Post to Internet and SIPRNet Websites	Unclassified
GPS ~~OCX~~CS	Military User Community	GPS Constellation Anti-Spoofing Status ~~Summary~~	A-S Status	Post to Internet and SIPRNet Websites	Unclassified
GPS ~~OCX~~CS	Military User Community	GPS Constellation Orbital and Performance Parameters, and SV Signal Health Status	Almanac	Post to Internet and SIPRNet Websites	Unclassified
Note: * Automatic NANUs are also sent to other 2 SOPS approved GPS ~~.mil and .gov u~~Users via e-mail					

3.1.1 ~~Next Generation~~ GPS ~~Operational~~ Advanced Control Segment (OCX)

The GPS ~~OCX~~CS is operated by the 2d~~nd~~ ~~Satellite~~ Space Operations Squadron (2 SOPS), administratively organized under 50th Space Wing (50 SW). The GPS ~~OCX~~CS operations are performed primarily via the Master Control Station (MCS), Alternate Master Control Station (AMCS), Monitor Stations (MS), and Ground Antennas (GA).

The MCS, located at Schriever Air Force Base (SAFB), is the central control point for the GPS ~~OCX~~CS. For this interface, the MCS is responsible for generating the Almanacs, OAs, A-S ~~status~~Status and NANUs and providing these files to the GPS ~~u~~Users and ~~u~~User support community. The AMCS, located at Vandenberg AFB (VAFB), is functionally identical to the MCS; either MCS facility is capable of indefinite control of the GPS constellation. In case the MCS experiences downtime, the AMCS takes over this interface function. The term "MCS", as now used throughout this document, refers to either the MCS or the AMCS, whichever MCS facility actively controls the GPS constellation.

The MSs and GAs do not play a role in this interface.

3.1.2 GPS ~~u~~User and ~~u~~User-support communities

The GPS ~~user~~User and ~~user~~User-support communities involve the Civil and Military GPS users which are comprised of the Department of Homeland Security (DHS), United States Coast Guard (USCG); Department of Transportation (DOT), Federal Aviation Administration (FAA); other Civil Users; and various Military GPS Users. These GPS Users are the recipients of the Almanac data, OAs, A-S ~~status~~Status and NANUs.

3.2 Interface Definitions

The following subsections define the functional requirements and physical interface between the GPS ~~OCX~~CS and the DHS USCG, DOT FAA, other Civil Users, and the Military GPS User Community. For this interface, the GPS ~~OCX~~CS will communicate using Transmission Control Protocol/Internet Protocol (TCP/IP) communications protocol. This interface will also be IPv6 capable as defined by DoD IPv6 standard profile 5.0.

This ICD describes information exchanges between ~~OCX~~CS and the user support community at the functional (application) layer only, and does not describe the hardware and software configuration of the Internet or SIPRNet.

3.2.1 Generation of Almanac Data

The GPS ~~OCX~~CS generates the Almanac data for the GPS constellation, two current System Effectiveness Model (SEM) format Almanacs (current.al3 and current.bl3), two current YUMA format Almanacs (current.alm and current.blm), and one current Extended Signals Health Status (ESHS) format Almanac (current.ale). The satellite SEM and YUMA Almanac data contains orbital and performance parameters for operational GPS satellites. Detailed data formats of the SEM and YUMA Almanac data

are described in Appendix 3 of this ICD. The satellite ESHS Almanac data contains the health status of each of the modernized civil signals available for each SV – L1C, L2C and L5. Detailed data formats of the ESHS Almanac data are described in Appendix 4 of this ICD.

3.2.2 Generation of Operational Advisory Data

The GPS ~~OCX~~CS generates the Operational Advisory data (current.oa1) for the GPS constellation. The OA data are descriptive summaries of GPS constellation status. Detailed data formats of the OA data are described in Appendix 2 of this ICD.

3.2.3 Generation of NANU Data

The GPS ~~OCX~~CS generates the NANU data file (current.nnu) for the GPS constellation. The NANU data are messages that inform ~~users~~Users of satellite outages and other GPS issues. Detailed data formats of the NANU data are described in Appendix 1 of this ICD.

3.2.4 Generation of Anti-Spoofing Status

The GPS ~~OCX~~CS generates the Anti-Spoofing ~~status~~Status files (as.txt and as2.txt) for the GPS constellation. The A-S ~~status~~Status informs Users whether the Anti-Spoofing mode of each GPS SV is ON or OFF. Detailed data format of the A-S ~~status~~Status are described in Appendix 5 of this ICD.

3.2.5 Data Distribution

The GPS ~~OCX~~CS distributes the NANU, Operational Advisory, Anti-Spoofing ~~status~~Status, and Satellite Almanac files to the Military and Civil User Support Communities via electronic mail (e-mail), and Internet and SIPRNet websites. Sections 3.2.6 and 3.2.7 describe these interfaces.

3.2.6 GPS MCS to Civil GPS Users Interface (USCG/FAA)

The GPS ~~OCX~~CS provides the NANU data file via automatic electronic mail (e-mail) distribution to an e-mail address provided by the USCG and FAA. E-mail used for data transfer is generated and transmitted using resources of the OCX secure network environment. Other 2 SOPS approved/authorized GPS ~~u~~Users ~~with .mil or .gov e-mail accounts~~ also receive automatic NANUs. ~~Automatic e-mail distribution implies that OCX will maintain a distribution list of approved e-mail addresses.~~

The GPS ~~OCX~~CS uploads the NANU, Operational Advisory, Anti-Spoofing ~~status~~Status, and Satellite Almanac files to the Constellation Status page of the 2d~~nd~~ Space Operations Squadron (2 SOPS) Internet secured website, https://gps.afspc.af.mil/gps. NANU messages are transmitted whenever they are generated including weekends and holidays. The OA, A-S ~~status~~Status, and Almanac files are normally uploaded to the 2 SOPS Internet website once per day, 24/7, 365 days a year, prior to 1700 Zulu time (10 am MST, 11 am MDT). Internet website hosting, uploads, and downloads are also

accomplished using resources of the OCX secure network environment. The USCG, FAA and other GPS ~~users~~Users, including Military ~~users~~Users and the general public, with Internet connectivity can access the 2 SOPS website and download these data files using Hypertext Transfer Protocol Secure (HTTPS).

3.2.7 GPS MCS to Military GPS Users Interface

The Military GPS ~~users~~Users with Internet connectivity can access the 2 SOPS secured Internet website and download NANU, Operational Advisory, Anti-Spoofing S~~s~~tatus, and Satellite Almanac files as described in Section 3.2.6.

The GPS ~~OCX~~CS uploads the NANU, Operational Advisory, Anti-Spoofing ~~s~~Status, and Satellite Almanac files to the 2 SOPS SIPRNet website with the same frequency and timeline as for the Internet website as described in Section 3.2.6. SIPRNet website hosting, uploads, and downloads are accomplished using resources of the OCX secure network environment. Only authorized Military GPS ~~users~~Users with SIPRNet connectivity can download a NANU, OA, A-S Status, or Almanac data file using HTTPS.

3.2.8 GPS MCS to the United States Notice to Airman Office Interface

There is a data transfer interface between the CS and the United States NOTAM (Notice to Airmen) Office (USNOF) which is similar in content to the CS interface with the USCG and FAA. However, at this time, the CS to USNOF interface is defined and controlled by operational procedures and is not automated. Therefore, it is not included in this ICD. It is expected that a new automated interface between the CS and the USNOF will be added to this ICD in a future revision.

3.3 GPS MCS to GPS User Support Community ~~Information Assurance Requirements~~Data Integrity

Those consumers not interested in verifying the data integrity of messages (NANUs, OAs, A-S status files, Almanacs, and ESHSs) can simply just use the messages. The requirement is upon the GPS CS to provide data integrity and it is OPTIONAL for the consumer to take the steps needed to verify the integrity of the data. The following paragraphs describe what the GPS CS is required to do and optionally what the consumer would need to do to verify that a message is genuine and originates from the GPS CS.

The GPS CS shall use DoD Public Key Infrastructure (PKI) to digitally sign all messages (NANUs, OAs, A-S status files, Almanacs, and ESHSs) as per Department of Defense Public Key Infrastructure Functional Interface Specification 3.0. Digital signatures shall use the Rivest-Shamir-Adleman (RSA) public key algorithm with 2048 bit keys and Secure Hash Algorithm-256 (SHA-256) for signatures.

The GPS CS shall support modular addition or replacement of DoD PKI algorithms, key lengths, certificate authorities, certificates, and certificate structure with little or no code changes. Coordination in a public ICWG shall occur prior to any changes on the

unclassified interface.

The GPS CS unclassified certificate (and corresponding public key) shall be made available to all consumers for data integrity verification and source authentication. DoD PKI root certificates are available on the DoD Class 3 Public Key Infrastructure (PKI) website, http://dodpki.c3pki.chamb.disa.mil/, to verify the certificate chain.

3.3.1 GPS CS to GPS User Support Community data distribution via web site

As all the messages in this interface are unclassified and publicly releasable, the GPS CS shall make all the messages and associated digital signatures available to the public without requiring authentication of the consumer. A signature shall be persistent and on the message itself (i.e., not tied to a transport protocol or session). A message shall always have its corresponding signature available to the consumer to verify the message independent of the delivery protocol.

3.3.2 GPS CS to GPS User Support Community data distribution via automated interface

When first applying to receive data via automated interface, individuals may be required to provide some information prior to being added to receive automated distribution. For example, those who do not have an email address ending in .mil, might be referred to NAVCEN to get on their automated data distribution. After approval from the registration process, no further authentication activities are performed.

As all the messages in this interface are unclassified and publicly releasable, after registration, the GPS CS shall automatically attempt to deliver messages and associated digital signatures the consumer has registered for without authenticating the consumer when delivery is attempted. If delivery is via email, the signature shall be on the message and not dependent on the email such that the extracted signature can be used to validate the extracted message without the whole email.
~~GPS OCX will sign all ICD-GPS-870 information with a DoD Public Key Infrastructure (PKI) provided certificate specific for this purpose. This will ensure that the information provided by this interface is genuine and originates from the GPS MCS.~~

~~The OCX certificate (and corresponding public key) will be made available to all users for data integrity verification and source authentication. DoD PKI root certificates are available on the DoD Class 3 Public Key Infrastructure (PKI) website, http://dodpki.c3pki.chamb.disa.mil/, to verify the certificate chain.~~

4 QUALITY ASSURANCE

Not Applicable

5 PREPARATION FOR DELIVERY

Not Applicable

6 NOTES

6.1 Acronyms and Abbreviations

2 SOPS	2dnd Space Operations Squadron
50 SW	50th Space Wing
A-S	Anti-Spoofing
AFB	Air Force Base
AFSPC	Air Force Space Command
AMCS	Alternate Master Control Station
ANOM	Anomaly
ASCII	American Standard Code for Information Interchange
CS	Control Segment, Cesium
DECOM	Decommission
DHS	Department of Homeland Security
DD	Calendar Day (2 digits)
DO	Director of Operations
DOD	Department of Defense
DOT	Department of Transportation
DSN	Defense Switched Network
DTG	Day Time Group
e-mail	Electronic mail
ESHS	Extended Signals Health Status
FAA	Federal Aviation Administration
FCSTCANC	Forecast Cancellation
FCSTDV	Forecast Delta-V
FCSTEXTD	Forecast Extension
FCSTMX	Forecast Maintenance
FCSTRESCD	Forecast rescheduled
FCSTSUMM	Forecast Summary
FCSTUUFN	Forecast Unusable Until Further Notice
G-NRN	Radio Navigation Division
GA	Ground Antenna
GP	Global Positioning System Directorate
GPS	Global Positioning System
GPSW	GPS Wing
GPSOC	GPS Operations Center
HDBK	Handbook
HH	Hour (2 digits)
HTTP	Hypertext Transfer Protocol

HTTPS	Hypertext Transfer Protocol Secure
ICC	Interface Control Contractor
ICD	Interface Control Document
ICWG	Interface Control Working Group
ID	Identification
IP	Internet Protocol
IERS	International Earth Rotation Service
IS	Interface Specification
JDAY	Julian Day of the Year
JJJ	Julian Date (3 digits)
LEAPSEC	Leap Second
LSB	Least Significant Bit
M	Meters
MDT	Mountain Daylight Time
MCS	Master Control Station
MIL	Military
MMM	Month (3 characters)
MM	Minutes (2 digits)
MOA	Memorandum of Agreement
MS	Monitor Station
MST	Mountain Standard Time
N/A	Not Applicable
NANU	Notice Advisory to Navstar Users
NAV	Navigation
NAVCEN	Navigation Center
NC	No Change
NNN	NANU Number (3 digits)
NOTAM	Notice to Airmen
OA	Operational Advisory
OCX	~~Next Generation GPS Operational~~ Advanced Control Segment
PIRN	Proposed Interface Revision Notice
PKI	Public Key Infrastructure
PRN	Pseudorandom Noise (Signal Number)
POC	Point Of Contact
RAD	Radians
RB	Rubidium
RFC	Request for Change
s	Seconds
SAFB	Schriever Air Force Base

SAIC	Science Applications International Corporation
SE&I	Systems Engineering and Integration
SEM	System Effectiveness Model
SIPRNet	Secret Internet Protocol Router Network
SMC	Space and Missile Systems Center
SPS	Standard Positioning Service
SQRT	Square Root
SUBJ	Subject
SS	System Specification
SSS	Seconds (3 digits)
STD	Standard
SV	Space Vehicle
SVID	Space Vehicle Identification
SVN	Space Vehicle Number
TBD	To Be Determined
TCP	Transmission Control Protocol
URA	User Range Accuracy
USABINIT	Initially usable
USCG	United States Coast Guard
USNOF	United States Notice to Airmen Office
UNUNOREF	Unusable with no reference
UNUSABLE	Unusable with reference NANU
UNUSUFN	Unusable Until Further Notice
USSPACECOM	United States Space Command
UTC	Coordinated Universal Time
VAFB	Vandenberg Air Force Base
WN	Week Number
YYYY	Year (4 digits)
Z	Zulu

7 APPROVAL

The signatories have approved this ICD with or without exception as their signature block implies and a copy of each approval sheet is included in this section.

8 VERIFICATION CROSS REFERENCE MATRIX

The verification cross reference matrix (VCRM), Table II, identifies the verification method planned for each requirement in this interface.

8.1 Verification Methods

Four standard verification methods are planned for this interface, as described in the SS-CS-800 Specification, Section 4. The descriptions of these methods are included below.

Inspection – Verifies conformance of physical characteristics to related requirements without the aid of special laboratory equipment, procedures, and services. This method most commonly uses an examination by the senses (sight, sound, smell, taste, or touch) to determine requirements compliance and may also rely on gauges or simple measures.

Analysis – Verifies conformance to requirements based on studies, calculations, and modeling, or is based on the certified usage of similar components under identical or similar operating conditions (similarity). This method may consist of the technical evaluation of data using logic or mathematics to determine compliance with requirements. It is typically used in verification when a given attribute is impossible or extremely difficult to test, thereby enabling expansion of the verification beyond the range of the test. Review of Software listings is considered to be Verification by Analysis. Software code review or inspection is also considered analysis verification.

Demonstration – Verifies the required operability of hardware and software by means that do not necessarily require the use of laboratory equipment, procedures, items or services. That is, compliance with requirements is verified by operation and function. More detail may be seen in MIL-HDBK-470 and MIL-STD-810. This method may be an un-instrumented test, with compliance determined by observation (e.g., maintenance task performance time).

Test – Verifies conformance to required performance/physical characteristics and design/construction features by instrumented functional operation and evaluation techniques through the use of laboratory equipment procedures, items, and services. This method generally uses procedures and test/measuring equipment to verify compliance with requirements.

Table II Verification Cross Reference Matrix

Section #	Requirement Title	Verification Method	Verification Level
3.2	Interface Definition	Demonstration	Segment
3.2.1	Generation of Almanac Data	Demonstration	Segment
3.2.2	Generation of Operational Advisory Data	Demonstration	Segment
3.2.3	Population of NANU Data	Demonstration	Segment

Section #	Requirement Title	Verification Method	Verification Level
3.2.4	Generation of Anti Spoofing Status	Demonstration	Segment
3.2.5	Data Distribution	Demonstration	Segment
3.2.6	GPS MCS to Civil GPS Users Interface (USCG/FAA)	Demonstration	Segment
3.2.7	GPS MCS to Military GPS Users Interface	Demonstration	Segment
3.2.8	GPS MCS to the United States Notice to Airman Office Interface	N/A*	N/A*
3.3	GPS MCS to GPS User Support Community Information Assurance Requirements	Demonstration	Segment
* No verifiable requirements in this section.			

10 APPENDIX 1: NANU DATA FORMATS

Appendix 1 describes the NANU types and the NANU message format.

10.1 Notice Advisory to Navstar Users

NANUs are used to notify ~~users~~Users of scheduled and unscheduled satellite outages and general GPS information. The paragraphs that follow describe the different types of NANUs. The NANU descriptions are arranged into four groups, as follows:

- Scheduled outages
- Unscheduled outages
- General text message
- Others

10.1.1 Scheduled Outages

NANU types in the scheduled outage group forecast outages that are planned to begin in the near future. Table 10-I~~Table 10-I~~ identifies NANU types in the scheduled outage group. The table describes the NANU acronym used in the message format, the name of the file and a description of the outages. NANU acronyms in this group all begin with "FCST" for "forecast."

Table 10-I Scheduled Outages

NANU ACRONYM	NAME	DESCRIPTION
FCSTDV	Forecast Delta-V	Scheduled outage times for Delta-V maneuvers.
FCSTMX	Forecast Maintenance	Scheduled outage times for non-Delta-V maintenance.
FCSTEXTD	Forecast Extension	Extends the scheduled outage time "Until Further Notice"; references the original forecast NANU.
FCSTSUMM	Forecast Summary	Exact outage times for the scheduled outage. This is sent after the maintenance is complete and the satellite is set healthy. It references the original forecast NANU. If a FCSTEXTD or a FCSTRESCD were required the FCSTSUMM will reference these.
FCSTCANC	Forecast Cancellation	Cancels a scheduled outage when a new maintenance time is not yet determined; it references the original forecast NANU message.
FCSTRESCD	Forecast rescheduled	Reschedules a scheduled outage referencing the original-FCST NANU message.
FCSTUUFN	Forecast Unusable Until Further Notice	Scheduled outage of indefinite duration not necessarily related to Delta-V or maintenance activities.

The message templates for the NANU types listed in Table 10-I are shown in Figures 10-1 through 10-7, respectively.

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) FORECAST OUTAGE JDAY JJJ/HHMM - JDAY JJJ/HHMM
1.     NANU TYPE: FCSTDV
       NANU NUMBER: YYYYSSS
       NANU DTG: DDHHMMZ MMM YYYY
       REFERENCE NANU: N/A
       REF NANU DTG: N/A
       SVN: XXX
       PRN: XX
       START JDAY: JJJ
       START TIME ZULU: HHMM
       START CALENDAR DATE: DD MMM YYYY
       STOP JDAY: JJJ
       STOP TIME ZULU: HHMM
       STOP CALENDAR DATE: DD MMM YYYY

2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WILL BE UNUSABLE ON JDAY JJJ
    (DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY) ENDING HHMM ZULU.

3.  POC: CIVILIAN - NAVCEN AT 703-313-5900, HTTP://WWW.NAVCEN.USCG.GOV
    CIVIL AVIATION - TBD
    MILITARY - GPS Support Center at HTTPS://GPS.AFSPC.AF.MIL/GPSOC, DSN 560-2541,
    COMM 719-567-2493, GPS_SUPPORT@SCHRIEVER.AF.MIL, HTTP://WWW.SCHRIEVER.AF.MIL/GPS
    MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-9994.
    COMM 805-606-9994, JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

Figure 10-1 FCSTDV NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) FORECAST OUTAGE JDAY JJJ/HHMM - JDAY JJJ/HHMM
1.     NANU TYPE: FCSTMX
       NANU NUMBER: YYYYSSS
       NANU DTG: DDHHMMZ MMM YYYY
       REFERENCE NANU: N/A
       REF NANU DTG: N/A
       SVN: XXX
       PRN: XX
       START JDAY: JJJ
       START TIME ZULU: HHMM
       START CALENDAR DATE: DD MMM YYYY
       STOP JDAY: JJJ
       STOP TIME ZULU: HHMM
       STOP CALENDAR DATE: DD MMM YYYY

2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WILL BE UNUSABLE ON JDAY JJJ
    (DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY)
    ENDING HHMM ZULU.

3.  POC: CIVILIAN - NAVCEN AT 703-313-5900, HTTP://WWW.NAVCEN.USCG.GOV
    CIVIL AVIATION - TBD
    MILITARY - GPS Support Center at HTTPS://GPS.AFSPC.AF.MIL/GPSOC, DSN 560-2541,
    COMM 719-567-2493, GPS_SUPPORT@SCHRIEVER.AF.MIL, HTTP://WWW.SCHRIEVER.AF.MIL/GPS
    MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-9994.
    COMM 805-606-9994, JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

Figure 10-2 FCSTMX NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) FORECAST OUTAGE EXTENDED UNTIL FURTHER NOTICE
1.      NANU TYPE: FCSTEXTD
        NANU NUMBER: YYYYSSS
        NANU DTG: DDHHMMZ MMM YYYY
        REFERENCE NANU: YYYYNNN
        REF NANU DTG: DDHHMMZ MMM YYYY
        SVN: XXX
        PRN: XX
        START JDAY: JJJ
        START TIME ZULU: HHMM
        START CALENDAR DATE: DD MMM YYYY
        STOP JDAY: UFN
        STOP TIME ZULU: N/A
        STOP CALENDAR DATE: N/A

2.  CONDITION: THE FORECAST OUTAGE FOR GPS SATELLITE SVNXXX (PRNXX) IS EXTENDED UNTIL
    FURTHER NOTICE.

3.  POC: CIVILIAN - NAVCEN AT 703-313-5900, HTTP://WWW.NAVCEN.USCG.GOV
    CIVIL AVIATION - TBD
    MILITARY - GPS Support Center at HTTPS://GPS.AFSPC.AF.MIL/GPSOC, DSN 560-2541,
    COMM 719-567-2493, GPS_SUPPORT@SCHRIEVER.AF.MIL, HTTP://WWW.SCHRIEVER.AF.MIL/GPS
    MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-9994.
    COMM 805-606-9994, JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

Figure 10-3 FCSTEXTD NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) FORECAST OUTAGE SUMMARY JDAY JJJ/HHMM - JDAY JJJ/HHMM
1.      NANU TYPE: FCSTSUMM
        NANU NUMBER: YYYYSSS
        NANU DTG: DDHHMMZ MMM YYYY
        REFERENCE NANU: YYYYNNN
        REF NANU DTG: DDHHMMZ MMM YYYY
        SVN: XXX
        PRN: XX
        START JDAY: JJJ
        START TIME ZULU: HHMM
        START CALENDAR DATE: DD MMM YYYY
        STOP JDAY: JJJ
        STOP TIME ZULU: HHMM
        STOP CALENDAR DATE: DD MMM YYYY

2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WAS UNUSABLE ON JDAY JJJ
    (DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY)
    ENDING HHMM ZULU.

3.  POC: CIVILIAN - NAVCEN AT 703-313-5900, HTTP://WWW.NAVCEN.USCG.GOV
    CIVIL AVIATION - TBD
    MILITARY - GPS Support Center at HTTPS://GPS.AFSPC.AF.MIL/GPSOC, DSN 560-2541,
    COMM 719-567-2493, GPS_SUPPORT@SCHRIEVER.AF.MIL, HTTP://WWW.SCHRIEVER.AF.MIL/GPS
    MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-9994.
    COMM 805-606-9994, JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

Figure 10-4 FCSTSUMM NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) FORECAST OUTAGE CANCELLED
1.      NANU TYPE: FCSTCANC
        NANU NUMBER: YYYYSSS
        NANU DTG: DDHHMMZ MMM YYYY
        REFERENCE NANU: YYYYNNN
        REF NANU DTG: DDHHMMZ MMM YYYY
        SVN: XXX
        PRN: XX
        START JDAY: JJJ
        START TIME ZULU: HHMM
        START CALENDAR DATE: DD MMM YYYY
        STOP JDAY: CANCELLED
        STOP TIME ZULU: N/A
        STOP CALENDAR DATE: N/A

2.  CONDITION: THE FORECAST OUTAGE FOR GPS SATELLITE SVNXXX (PRNXX) SCHEDULED FOR
    JDAY JJJ (DD MMM YYYY) BEGINNING HHMM ZULU HAS BEEN CANCELLED.

3.  POC: CIVILIAN - NAVCEN AT 703-313-5900, HTTP://WWW.NAVCEN.USCG.GOV
    CIVIL AVIATION - TBD
    MILITARY - GPS Support Center at HTTPS://GPS.AFSPC.AF.MIL/GPSOC, DSN 560-2541,
    COMM 719-567-2493, GPS_SUPPORT@SCHRIEVER.AF.MIL, HTTP://WWW.SCHRIEVER.AF.MIL/GPS
    MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-9994.
    COMM 805-606-9994, JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

Figure 10-5 FCSTCANC NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) FORECAST OUTAGE RESCHEDULED
1.      NANU TYPE: FCSTRESCD
        NANU NUMBER: YYYYSSS
        NANU DTG: DDHHMMZ MMM YYYY
        REFERENCE NANU: YYYYNNN
        REF NANU DTG: DDHHMMZ MMM YYYY
        SVN: XXX
        PRN: XX
        START JDAY: JJJ
        START TIME ZULU: HHMM
        START CALENDAR DATE: DD MMM YYYY
        STOP JDAY: JJJ
        STOP TIME ZULU: HHMM
        STOP CALENDAR DATE: DD MMM YYYY

2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WILL BE UNUSABLE ON JDAY JJJ
    (DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY)
    ENDING HHMM ZULU. PLEASE REFERENCE NANU NUMBER YYYYNNN
    DTG DDHHMMZ MMM YYYY FOR THE ORIGINAL OUTAGE TIME.

3.  POC: CIVILIAN - NAVCEN AT 703-313-5900, HTTP://WWW.NAVCEN.USCG.GOV
    CIVIL AVIATION - TBD
    MILITARY - GPS Support Center at HTTPS://GPS.AFSPC.AF.MIL/GPSOC, DSN 560-2541,
    COMM 719-567-2493, GPS_SUPPORT@SCHRIEVER.AF.MIL, HTTP://WWW.SCHRIEVER.AF.MIL/GPS
    MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-9994.
    COMM 805-606-9994, JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

Figure 10-6 FCSTRESC NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYJJJ
SUBJ: SVNXXX (PRNXX) FORECAST OUTAGE SUMMARY JDAY JJJ/HHHH - UFN
1.     NANU TYPE: FCSTUUFN
       NANU NUMBER: YYYYSSS
       NANU DTG: HHHHDDZ MMM YYYY
       SVN: XXX
       PRN: XX
       START JDAY: JJJ
       START TIME ZULU: HHHH
       START CALENDAR DATE: DD MMM YYYY

2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WAS UNUSABLE ON JDAY 211
    (30 JUL 2009) BEGINNING 0915 ZULU UNTIL FURTHER NOTICE.

3.  POC: CIVILIAN - NAVCEN AT 703-313-5900, HTTP://WWW.NAVCEN.USCG.GOV
    CIVIL AVIATION - TBD
    MILITARY - GPS Support Center at HTTPS://GPS.AFSPC.AF.MIL/GPSOC, DSN 560-2541,
    COMM 719-567-2493, GPS_SUPPORT@SCHRIEVER.AF.MIL, HTTP://WWW.SCHRIEVER.AF.MIL/GPS
    MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-9994.
    COMM 805-606-9994. JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

Figure 10-7 FCSTUUFN NANU Message Template

10.1.2 Unscheduled Outages

NANU types in the unscheduled outage group describe unplanned outages that are ongoing or have occurred in the recent past. Table 10-IITable 10-II identifies NANU types in the unscheduled outage group. The table describes the NANU acronym used in the message format, the name of the file and a description of the outages. NANU acronyms in this group all begin with “UNU” or “UNUS” for “unusable.”

Table 10-II Unscheduled Outages

NANU ACRONYM	NAME	DESCRIPTION
UNUSUFN	Unusable Until Further Notice	Notifies ~~users~~Users that a satellite will be unusable to all ~~users~~Users until further notice.
UNUSABLE	Unusable with reference NANU	Closes out an UNUSUFN NANU and gives the exact outage times; references the UNUSUFN NANU
UNUNOREF	Unusable with no reference	Gives times for outages that were resolved before an UNUSUFN NANU could be sent.

The message templates for the NANU types listed in Table 10-II are shown in Figures 10-8 through 10-10, respectively.

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) UNUSABLE JDAY JJJ/HHMM - UNTIL FURTHER NOTICE
1.      NANU TYPE: UNUSUFN
        NANU NUMBER: YYYYSSS
        NANU DTG: DDHHMMZ MMM YYYY
        REFERENCE NANU: N/A
        REF NANU DTG: N/A
        SVN: XXX
        PRN: XX
        START JDAY: JJJ
        START TIME ZULU: HHMM
        START CALENDAR DATE: DD MMM YYYY
        STOP JDAY: UFN
        STOP TIME ZULU: N/A
        STOP CALENDAR DATE: N/A

2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WILL BE UNUSABLE ON JDAY JJJ
    (DD MMM YYYY) BEGINNING HHMM ZULU UNTIL FURTHER NOTICE.

3.  POC: CIVILIAN - NAVCEN AT 703-313-5900, HTTP://WWW.NAVCEN.USCG.GOV
    CIVIL AVIATION - TBD
    MILITARY - GPS Support Center at HTTPS://GPS.AFSPC.AF.MIL/GPSOC, DSN 560-2541,
    COMM 719-567-2493, GPS_SUPPORT@SCHRIEVER.AF.MIL, HTTP://WWW.SCHRIEVER.AF.MIL/GPS
    MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-9994.
    COMM 805-606-9994, JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

Figure 10-8 UNUSUFN NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) UNUSABLE JDAY JJJ/HHMM - JDAY JJJ/HHMM
1.      NANU TYPE: UNUSABLE
        NANU NUMBER: YYYYSSS
        NANU DTG: DDHHMMZ MMM YYYY
        REFERENCE NANU: YYYYNNN
        REF NANU DTG: DDHHMMZ MMM YYYY
        SVN: XXX
        PRN: XX
        START JDAY: JJJ
        START TIME ZULU: HHMM
        START CALENDAR DATE: DD MMM YYYY
        STOP JDAY: JJJ
        STOP TIME ZULU: HHMM
        STOP CALENDAR DATE: DD MMM YYYY

2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WAS UNUSABLE ON JDAY JJJ
    (DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY)
    ENDING HHMM ZULU.

3.  POC: CIVILIAN - NAVCEN AT 703-313-5900, HTTP://WWW.NAVCEN.USCG.GOV
    CIVIL AVIATION - TBD
    MILITARY - GPS Support Center at HTTPS://GPS.AFSPC.AF.MIL/GPSOC, DSN 560-2541,
    COMM 719-567-2493, GPS_SUPPORT@SCHRIEVER.AF.MIL, HTTP://WWW.SCHRIEVER.AF.MIL/GPS
    MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-9994.
    COMM 805-606-9994, JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

Figure 10-9 UNUSABLE NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) UNUSABLE JDAY JJJ/HHMM - JDAY JJJ/HHMM
1.      NANU TYPE: UNUNOREF
        NANU NUMBER: YYYYSSS
        NANU DTG: DDHHMMZ MMM YYYY
        REFERENCE NANU: N/A
        REF NANU DTG: N/A
        SVN: XXX
        PRN: XX
        START JDAY: JJJ
        START TIME ZULU: HHMM
        START CALENDAR DATE: DD MMM YYYY
        STOP JDAY: JJJ
        STOP TIME ZULU: HHMM
        STOP CALENDAR DATE: DD MMM YYYY

2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WAS UNUSABLE ON JDAY JJJ
    (DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY)
    ENDING HHMM ZULU.

3.  POC: CIVILIAN - NAVCEN AT 703-313-5900, HTTP://WWW.NAVCEN.USCG.GOV
    CIVIL AVIATION - TBD
    MILITARY - GPS Support Center at HTTPS://GPS.AFSPC.AF.MIL/GPSOC, DSN 560-2541,
    COMM 719-567-2493, GPS_SUPPORT@SCHRIEVER.AF.MIL, HTTP://WWW.SCHRIEVER.AF.MIL/GPS
    MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-9994.
    COMM 805-606-9994, JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

Figure 10-10 UNUNOREF NANU Message Template

10.1.3 General NANU Messages

General NANU messages describe a GPS issue, problem, or event deemed noteworthy to the GPS user community. General NANU topics may include but are not limited to failures in meeting SPS Performance Standard requirements, space segment problems that cannot be conveyed through other NANU formats, and space vehicle (SV) disposal announcements. NANU messages of this type are all identified with the "GENERAL" NANU acronym.

General NANU messages may be generically worded and may direct further detailed questions to the appropriate authorities. Recommendations or notes may be included, depending on the circumstances.

The GENERAL message structure is a text paragraph format, such as, the generic example shown in Figure 10-11~~Figure 10-11~~. The format consists of two sections. Section one contains a header indicating the type of message. Section two is the body of the message.

```
1.     NANU TYPE: GENERAL
*** GENERAL MESSAGE TO ALL GPS USERS ***

MESSAGE WRITTEN IN PARAGRAPH FORM

*** GENERAL MESSAGE TO ALL GPS USERS ***
```

Figure 10-11 General Message Format

10.1.4 Other Messages

NANU types in the "other" group describe events that occur infrequently. Table 10-III~~Table 10-III~~ identifies NANU types in the "other" outage group. The table describes the NANU acronym used in the message format, the name of the file and a description of the message.

Table 10-III Other Types of NANU Messages

NANU ACRONYM	NAME	DESCRIPTION
USABINIT	Initially usable	Notifies ~~users~~Users that an SV is set healthy for the first time.
LEAPSEC	Leap second	Notifies ~~users~~Users of an impending leap second.
LAUNCH	Launch	Notifies ~~users~~Users after the launch of a satellite.
DECOM	Decommission	Notifies ~~users~~Users that an SV has been removed from the current constellation identified within the broadcast Almanac, but does not necessarily signify permanent disposal.

The message templates for the NANU types listed in Table 10-III are shown in Figures 10-12 through 10-15, respectively.

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXXX (PRNXX) USABLE JDAY JJJ/HHMM
1.     NANU TYPE: USABINIT
       NANU NUMBER: YYYYSSS
       NANU DTG: DDHHMMZ MMM YYYY
       REFERENCE NANU: N/A
       REF NANU DTG: N/A
       SVN: XXX
       PRN: XX
       START JDAY: JJJ
       START TIME ZULU: HHMM
       START CALENDAR DATE: DD MMM YYYY
       STOP JDAY: N/A
       STOP TIME ZULU: N/A
       STOP CALENDAR DATE: N/A

2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WAS USABLE AS OF JDAY JJJ
    (DD MMM YYYY) BEGINNING HHMM ZULU.

3.  POC: CIVILIAN - NAVCEN AT 703-313-5900, HTTP://WWW.NAVCEN.USCG.GOV
    CIVIL AVIATION - TBD
    MILITARY - GPS Support Center at HTTPS://GPS.AFSPC.AF.MIL/GPSOC, DSN 560-2541,
    COMM 719-567-2493, GPS_SUPPORT@SCHRIEVER.AF.MIL, HTTP://WWW.SCHRIEVER.AF.MIL/GPS
    MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-9994.
    COMM 805-606-9994, JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

Figure 10-12 USABINIT NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: LEAP SECOND
1.  CONDITION: THE INTERNATIONAL EARTH ROTATION SERVICE (IERS) HAS ANNOUNCED THE
    INTRODUCTION OF A LEAP SECOND TO OCCUR AT THE END OF MMM YYYY

2.  COORDINATED UNIVERSAL TIME (UTC) WILL SEQUENCE AS FOLLOWS:
              DD MMM YYYY  HH HOURS MM MINUTES SS SECONDS
              DD MMM YYYY  HH HOURS MM MINUTES SS SECONDS
              DD MMM YYYY  HH HOURS MM MINUTES SS SECONDS

3.  FOR GPS, AS WITH PREVIOUS LEAP SECOND UPDATES, THE UTC DATA IN SUBFRAME 4, PAGE 18 OF
    THE NAVIGATION MESSAGE WILL CHANGE IN ACCORDANCE WITH IS-GPS-200.

    FOR GPS, IF/AS AVAILABLE, THE UTC DATA IN MESSAGE TYPE 33 OF THE CNAV DATA FOR L2C
    WILL CHANGE IN ACCORDANCE WITH IS-GPS-200.

    FOR GPS, IF/AS AVAILABLE, THE UTC DATA IN SUBFRAME 3, PAGE 1 OF THE CNAV-2 DATA FOR
    L1C WILL CHANGE IN ACCORDANCE WITH IS-GPS-800.

    FOR GPS, IF/AS AVAILABLE, THE UTC DATA IN MESSAGE TYPE 33 OF THE CNAV DATA FOR L5
    WILL CHANGE IN ACCORDANCE WITH IS-GPS-705.

    BEFORE THE LEAP SECOND
    GPS-UTC IS XX (GPS IS AHEAD OF UTC BY XX SECONDS)

    AFTER THE LEAP SECOND
    GPS-UTC WILL BE XX (GPS WILL BE AHEAD OF UTC BY XX SECONDS)

4.  POC: CIVILIAN - NAVCEN AT 703-313-5900, HTTP://WWW.NAVCEN.USCG.GOV
    CIVIL AVIATION - TBD
    MILITARY - GPS Support Center at HTTPS://GPS.AFSPC.AF.MIL/GPSOC, DSN 560-2541,
    COMM 719-567-2493, GPS_SUPPORT@SCHRIEVER.AF.MIL, HTTP://WWW.SCHRIEVER.AF.MIL/GPS
    MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-9994.
    COMM 805-606-9994, JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

Figure 10-13 LEAPSEC NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVN-XXX (PRN-XX) LAUNCH JDAY JJJ
1.      NANU TYPE: LAUNCH
        NANU NUMBER: YYYYSSS
        NANU DTG: HHHHDDZ MMM 2007
        SVN: XXX
        PRN: XX
        LAUNCH JDAY: JJJ
        LAUNCH TIME ZULU: HHHH

2.  GPS SATELLITE SVN XXX (PRN XX) WAS LAUNCHED ON JDAY JJJ A USABINIT NANU WILL BE SENT
    WHEN THE SATELITTE IS SET ACTIVE TO SERVICE.

3.  POC: CIVILIAN - NAVCEN AT 703-313-5900, HTTP://WWW.NAVCEN.USCG.GOV
    CIVIL AVIATION - TBD
    MILITARY - GPS Support Center at HTTPS://GPS.AFSPC.AF.MIL/GPSOC, DSN 560-2541,
    COMM 719-567-2493, GPS_SUPPORT@SCHRIEVER.AF.MIL, HTTP://WWW.SCHRIEVER.AF.MIL/GPS
    MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-9994.
    COMM 805-606-9994, JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

Figure 10-14 LAUNCH NANU Message Template

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYJJJ
SUBJ: SVNXXX (PRNXX) DECOMMISSIONING JDAY JJJ/HHHH
1.      NANU TYPE: DECOMM
        NANU NUMBER: YYYYSSS
        NANU DTG: HHHHDDZ MMM YYYY
        REFERENCE NANU: YYYYSSS
        REF NANU DTG: HHHHDDZ MMM YYYY
        SVN: XXX
        PRN: XX
        UNUSABLE START JDAY: JJJ
        UNUSABLE START TIME ZULU: HHHH
        UNUSABLE START CALENDAR DATE: DD MMM YYYY
        DECOMMISSIONING START JDAY: JJJ
        DECOMMISSIONING START TIME ZULU: HHHH
        DECOMMISSIONING START CALENDAR DATE: DD MMM YYYY


2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WAS UNUSABLE AS OF JDAY JJJ (DD MMM YYYY) AND
    REMOVED FROM THE GPS CONSTELLATION ON JDAY JJJ (DD MMM YYYY) AT HHHH ZULU.

3.  POC: CIVILIAN - NAVCEN AT 703-313-5900, HTTP://WWW.NAVCEN.USCG.GOV
    CIVIL AVIATION - TBD
    MILITARY - GPS Support Center at HTTPS://GPS.AFSPC.AF.MIL/GPSOC, DSN 560-2541,
    COMM 719-567-2493, GPS_SUPPORT@SCHRIEVER.AF.MIL, HTTP://WWW.SCHRIEVER.AF.MIL/GPS
    MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-9994.
    COMM 805-606-9994, JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

Figure 10-15 DECOM NANU Message Template

10.2 NANU Notification Times

NANU messages announcing scheduled events are normally distributed to the user community prior to the event. NANU messages announcing unscheduled events are normally distributed to the user community as soon as practical after the event. However, mission critical problems have priority over user notification and therefore may delay normal NANU distribution. NANU notification times typically vary by NANU group. Nominal and objective NANU notification times for the four NANU groups are summarized in Table 10-IV~~Table 10-IV~~.

Table 10-IV NANU Notification Times

NANU Group	Nominal Notification Times	Objective
Scheduled	48 hrs prior to outage start	96 hrs prior to outage start
Unscheduled	Less than 1 hr after outage start	15 minutes after outage start
General	No Nominal – Timing determined on a case-by-case basis	
Other	No Nominal – Timing determined on a case-by-case basis	

The length of the outage time specified in scheduled NANU messages is typically longer than the expected maintenance time to allow for minor variations in the time required to accomplish a particular maintenance activity.

10.3 NANU Message Format

The NANU message structure for all messages, except the General, LAUNCH, DECOM, and LEAPSEC messages, is based on a tabular format that simplifies the readability of data. A template for these messages is illustrated in Figure 10-16~~Figure 10-16~~. These messages are arranged into a header and three sections. The following paragraphs explain this message format in more detail.

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYNNN
SUBJ: SVNXXX (PRNXX) FORECAST OUTAGE JDAY JJJ/HHMM - JDAY JJJ/HHMM
1.  NANU TYPE: FCSTDV
     NANU NUMBER: YYYYNNN
     NANU DTG: DDHHMMZ MMM YYYY
     REFERENCE NANU: YYYYNNN
     REF NANU DTG: DDHHMMZ MMM YYYY
     SVN: XXX
     PRN: XX
     START JDAY: JJJ
     START TIME ZULU: HHMM
     START CALENDAR DATE: DD MMM YYYY
     STOP JDAY: JJJ
     STOP TIME ZULU: HHMM
     STOP CALENDAR DATE: DD MMM YYYY

2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WILL BE UNUSABLE ON JDAY JJJ
     (DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY) ENDING HHMM ZULU.

3.  POC: CIVILIAN - NAVCEN AT (703)313-5900, HTTP://WWW.NAVCEN.USCG.GOV
    CIVIL AVIATION - TBD
     MILITARY - GPS Operations Center at HTTPS://GPS.AFSPC.AF.MIL/GPSOC, DSN 560-2541,
     COMM 719-567-2541, GPS_SUPPORT@SCHRIEVER.AF.MIL, HTTPS://GPS.AFSPC.AF.MIL
     MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-9994,
     COMM 805-606-9994. JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

Figure 10-16 NANU Message Template

10.3.1 NANU Header

The first line of the header includes the title “NOTICE ADVISORY TO NAVSTAR USERS (NANU)” and the assigned identification (ID) number for that NANU message. The ID number consists of the four-digit year followed by a sequentially assigned three-digit number which begins at 001 for the first NANU on the first day of a new year. The ID number is incremented for each new NANU up to a maximum of 999 in any given calendar year, after which the ID number rolls over and begins numbering subsequent NANUs beginning with 001. The second line identifies the subject of the message including the Space Vehicle Number (SVN), SV Pseudo Random Noise (PRN) number, type of message, and effective dates for the event. The date is in Julian day-of-year format (JDAY), numbered from 001 to 366, and the time is Zulu referenced in a 24-hour, two digit hour (HH) and two digit minute (MM) format. The NANU header is illustrated in Figure 10-17~~Figure 10-17~~.

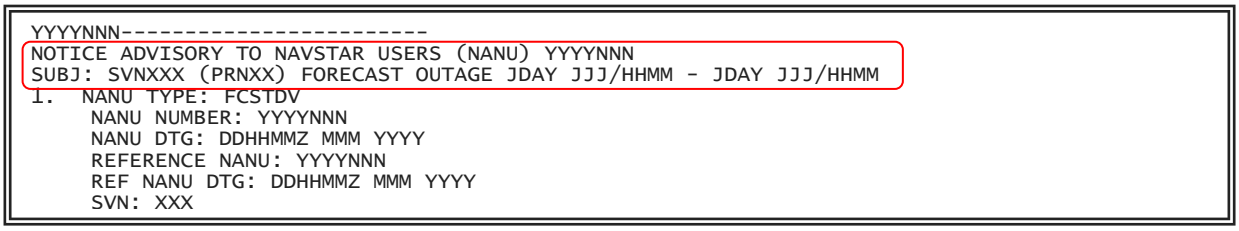

Figure 10-17 NANU Header

10.3.2 NANU Section 1

Section 1 provides the message description, reference information, satellite identification and outage time in a tabular format.

10.3.2.1 NANU Message Description

The message description includes the NANU type acronym, NANU number, and Day Time Group (DTG). The NANU type acronym is as previously described in paragraphs 10.1.1, 10.1.2, and 10.1.4. The NANU number is as previously described in paragraph 10.3.1. The DTG provides the date the NANU was created. The DTG format is represented as DDHHMM "Z" MMM YYYY. The first two digits identify the calendar day (DD) followed by the hour (HH) and minutes (MM). The letter Z indicates that the time is given in Zulu reference. This is followed by the first three letters of the month (MMM) and the four-digit year (YYYY). This portion of the message is illustrated in Figure 10-18~~Figure 10-18~~.

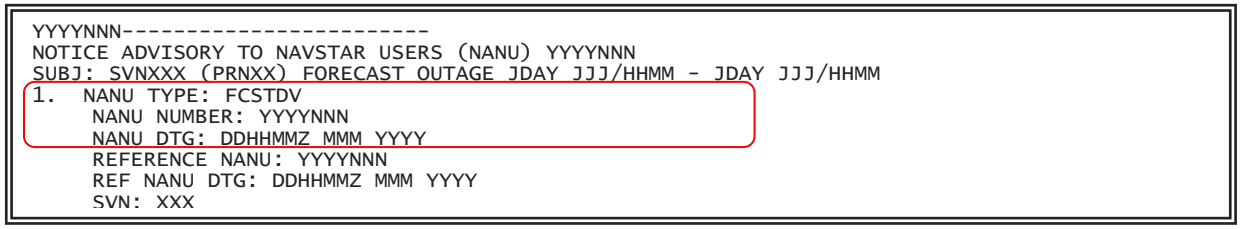

Figure 10-18 Message Description

10.3.2.2 NANU Reference Information

As shown in Figure 10-19~~Figure 10-19~~, the reference information serves to close, extend, cancel, or reschedule previously broadcast messages. The data conveyed in this section includes the message ID number (YYYYNNN) and DTG (REF NANU DTG) of a previously broadcast message. Both of these items will be noted as N/A if the current message is not a follow up message.

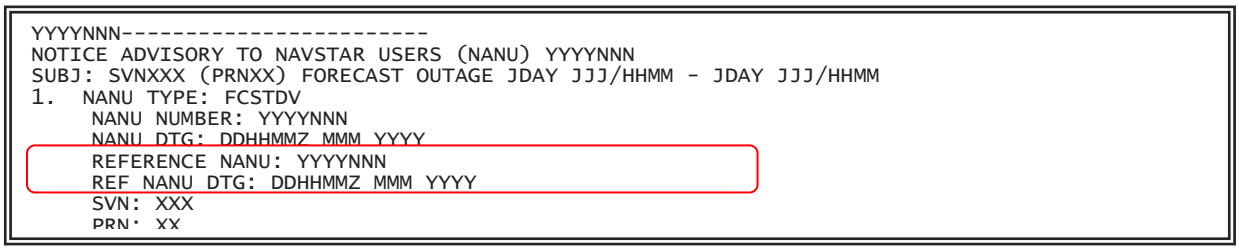

Figure 10-19 Reference Information

10.3.2.3 Satellite Identification

As shown in Figure 10-20~~Figure 10-20~~, the satellite identification information specifies the satellite that is the subject of the NANU. The identification information includes the satellite three-digit SVN and two-digit PRN number.

```
YYYYNNN------------------------
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYNNN
SUBJ: SVNXXX (PRNXX) FORECAST OUTAGE JDAY JJJ/HHMM - JDAY JJJ/HHMM
1.  NANU TYPE: FCSTDV
     NANU NUMBER: YYYYNNN
     NANU DTG: DDHHMMZ MMM YYYY
     REFERENCE NANU: YYYYNNN
     REF NANU DTG: DDHHMMZ MMM YYYY
     SVN: XXX
     PRN: XX
     START JDAY: JJJ
     START TIME ZULU: HHMM
     START CALENDAR DATE: DD MMM YYYY
     STOP JDAY: JJJ
```

Figure 10-20 Satellite Identification Information

10.3.2.4 Outage Time

As shown in Figure 10-21~~Figure 10-21~~, the outage time variables include start and stop dates and times. The start day is provided in three-digit Julian Day-of-Year format (JJJ = 001 to 366) as well as calendar day-month-year format. The calendar day is represented as two digits (DD), followed by the first three letters of the month (MMM) followed by the four-digit year (YYYY). The start time is given in Zulu time in a 24-hour, two-digit hour (HH), and two-digit minute (MM) format. The stop dates and time follow the same formats as the start dates and time.

```
YYYYNNN------------------------
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYNNN
SUBJ: SVNXXX (PRNXX) FORECAST OUTAGE JDAY JJJ/HHMM - JDAY JJJ/HHMM
1.  NANU TYPE: FCSTDV
     NANU NUMBER: YYYYNNN
     NANU DTG: DDHHMMZ MMM YYYY
     REFERENCE NANU: YYYYNNN
     REF NANU DTG: DDHHMMZ MMM YYYY
     SVN: XXX
     PRN: XX
     START JDAY: JJJ
     START TIME ZULU: HHMM
     START CALENDAR DATE: DD MMM YYYY
     STOP JDAY: JJJ
     STOP TIME ZULU: HHMM
     STOP CALENDAR DATE: DD MMM YYYY
```

Figure 10-21 Outage Time

10.3.3 NANU Section 2

As shown in Figure 10-22~~Figure 10-22~~, Section 2 is a summary of the NANU in paragraph format including the satellite three-digit SVN and two-digit PRN number, text description of the event, start and stop date(s) in Julian and calendar date formats, and start and stop time(s) in Zulu hours and minutes.

```
2.  CONDITION: GPS SATELLITE SVNXXX (PRNXX) WILL BE UNUSABLE ON JDAY JJJ
    (DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY) ENDING HHMM ZULU.
```

Figure 10-22 NANU Section 2

10.3.4 NANU Section 3

Section 3 of the NANU identifies points of contact for additional technical and support information. An example of this section is illustrated in Figure 10-23~~Figure 10-23~~.

```
3.  POC: CIVILIAN - NAVCEN AT (703)313-5900, HTTP://WWW.NAVCEN.USCG.GOV
    CIVIL AVIATION - TBD
    MILITARY - GPS Operations Center at HTTPS://GPS.AFSPC.AF.MIL/GPSOC, DSN 560-2541,
    COMM 719-567-2541, GPS_SUPPORT@SCHRIEVER.AF.MIL, HTTPS://GPS.AFSPC.AF.MIL
    MILITARY ALTERNATE - JOINT SPACE OPERATIONS CENTER, DSN 276-9994,
    COMM 805-606-9994, JSPOCCOMBATOPS@VANDENBERG.AF.MIL
```

Figure 10-23 Contact Information

20 APPENDIX 2: OPERATIONAL ADVISORY DATA FILE

Appendix 2 describes the Operational Advisory message format.

20.1 Operational Advisory

The Operational Advisory (OA) message provides a summary of the satellite constellation status. An example is shown in Figure 20-1. The OA is arranged in three sections. The following paragraphs describe each section and subsection of the OA.

```
UNCLASSIFIED
GPS OPERATIONAL ADVISORY        086.OA1
SUBJ: GPS STATUS      27 MAR 2009

1. SATELLITES, PLANES, AND CLOCKS (CS=CESIUM RB=RUBIDIUM):
A. BLOCK I  : NONE
B. BLOCK II : PRNS  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14
   PLANE    : SLOT B2, D1, C2, D4, B6, C5, A6, A3, A1, E3, D2, B4, F3, F1
   CLOCK    :      RB, RB, CS, RB, RB, RB, RB, CS, CS, CS, RB, RB, RB, RB
   BLOCK II : PRNS 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28
   PLANE    : SLOT F2, B1, C4, E4, C3, E1, D3, E2, F4, D5, A5, F5, A4, B3
   CLOCK    :      RB, RB, RB, RB, RB, RB, RB, RB, RB, CS, RB, RB, CS, RB
   BLOCK II : PRNS 29, 30, 31, 32
   PLANE    : SLOT C1, B5, A2, E5
   CLOCK    :      RB, CS, RB, RB
C*.BLOCK III: PRNS 33, 34, 35
   PLANE    : SLOT A2, C3, F4
   CLOCK    :      RB, RB, RB
2. CURRENT ADVISORIES AND FORECASTS:
A. FORECASTS:           FOR SEVEN DAYS AFTER EVENT CONCLUDES.
NANU          MSG DATE/TIME       PRN  TYPE         SUMMARY (JDAY/ZULU TIME START - STOP)

2009022       261836Z MAR 2009    18   FCSTDV       092/1600-093/0630
B. ADVISORIES:
NANU          MSG DATE/TIME       PRN  TYPE         SUMMARY (JDAY/ZULU TIME START - STOP)

C. GENERAL:
NANU          MSG DATE/TIME       PRN  TYPE         SUMMARY (JDAY/ZULU TIME START - STOP)

2009020       202158Z MAR 2009         GENERAL      /-/
2009021       241836Z MAR 2009    01   LAUNCH       /-/
2009023       262212Z MAR 2009         GENERAL      /-/
3. REMARKS:
A. THE POINT OF CONTACT FOR GPS MILITARY OPERATIONAL SUPPORT IS THE GPS
OPERATIONS CENTER AT (719)567-2541 OR DSN 560-2541.
B. CIVILIAN:  FOR INFORMATION, CONTACT US COAST GUARD NAVCEN AT
COMMERCIAL (703)313-5900 24 HOURS DAILY AND INTERNET
HTTP://WWW.NAVCEN.USCG.GOV
C. MILITARY SUPPORT WEBPAGES CAN BE FOUND AT THE FOLLOWING
HTTPS://GPS.AFSPC.AF.MIL/GPS OR HTTPS://GPS.AFSPC.AF.MIL/GPSOC
```

*Note: Section 1.C of the example OA message shown above contains example data for the GPS III SVs to show the type of data that will go in this section in the OCX era. This example is not meant to represent the actual GPS constellation configuration.

Figure 20-1 Sample Operational Advisory

20.2 OA Header.

The header includes the title “GPS OPERATIONAL ADVISORY,” the subject “SUBJ: GPS STATUS” and the date. The date is represented in a format that includes two-digit day (DD), the first three characters of the month (MMM), and four-digit year (YYYY). The OA header is illustrated in Figure 20-2.

```
UNCLASSIFIED
GPS OPERATIONAL ADVISORY        086.OA1
SUBJ: GPS STATUS      27 MAR 2009
```

Figure 20-2 OA Header

20.3 OA Section 1

Section 1 lists operational satellites by PRN number, assigned plane, and clock in current use. Subsection 1.A previously identified operational satellites in Block I. However, these satellites are no longer operational, so this subsection includes the word “NONE”. Subsection 1.B identifies satellites within Block II that are currently in use. Subsection 1.C identifies satellites within Block III that are currently in use. The example data shown for Section 1 is not meant to represent the actual GPS constellation configuration. The abbreviations CS and RB are used to indicate Cesium and Rubidium clocks, respectively. An example of section 1 of the OA is illustrated in Figure 20-3.

```
1. SATELLITES, PLANES, AND CLOCKS (CS=CESIUM RB=RUBIDIUM):
A. BLOCK I  : NONE
B. BLOCK II : PRNS  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14
   PLANE    : SLOT B2, D1, C2, D4, B6, C5, A6, A3, A1, E3, D2, B4, F3, F1
   CLOCK    :      RB, RB, CS, RB, RB, RB, RB, CS, CS, CS, RB, RB, RB, RB
   BLOCK II : PRNS 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28
   PLANE    : SLOT F2, B1, C4, E4, C3, E1, D3, E2, F4, D5, A5, F5, A4, B3
   CLOCK    :      RB, RB, RB, RB, RB, RB, RB, RB, RB, CS, RB, RB, CS, RB
   BLOCK II : PRNS 29, 30, 31, 32
   PLANE    : SLOT C1, B5, A2, E5
   CLOCK    :      RB, CS, RB, RB
C. BLOCK III: PRNS 33, 34, 35
   PLANE    : SLOT A2, C3, F4
   CLOCK    :      RB, RB, RB
```

Figure 20-3 OA Section 1

20.4 OA Section 2

Section 2 contains a summary of current and recent advisories, forecasts, and general text messages. It is organized into three subsections. Subsection 2A summarizes scheduled NANU messages. Subsection 2B summarizes advisory messages (messages with prefix UNU). Section 2C summarizes general text messages. An example of section 2 of the OA is illustrated in Figure 20-4.

```
2. CURRENT ADVISORIES AND FORECASTS:
A. FORECASTS:            FOR SEVEN DAYS AFTER EVENT CONCLUDES.
NANU          MSG DATE/TIME       PRN  TYPE         SUMMARY (JDAY/ZULU TIME START - STOP)

2009022       261836Z MAR 2009    18   FCSTDV       092/1600-093/0630
B. ADVISORIES:
NANU          MSG DATE/TIME       PRN  TYPE         SUMMARY (JDAY/ZULU TIME START - STOP)

C. GENERAL:
NANU          MSG DATE/TIME       PRN  TYPE         SUMMARY (JDAY/ZULU TIME START - STOP)

2009020       202158Z MAR 2009         GENERAL      /-/
2009021       241836Z MAR 2009    01   LAUNCH       /-/
2009023       262212Z MAR 2009         GENERAL      /-/
```

Figure 20-4 OA Section 2

20.5 OA Section 3

Section 3 identifies points of contact for additional technical and support information. It is organized into three subsections, each in text format. An example of section 3 of the OA is illustrated in Figure 20-5.

```
3. REMARKS:
A. THE POINT OF CONTACT FOR GPS MILITARY OPERATIONAL SUPPORT IS THE GPS
OPERATIONS CENTER AT (719)567-2541 OR DSN 560-2541.
B. CIVILIAN:  FOR INFORMATION, CONTACT US COAST GUARD NAVCEN AT
COMMERCIAL (703)313-5900 24 HOURS DAILY AND INTERNET
HTTP://WWW.NAVCEN.USCG.GOV
C. MILITARY SUPPORT WEBPAGES CAN BE FOUND AT THE FOLLOWING
HTTPS://GPS.AFSPC.AF.MIL/GPS OR HTTPS://GPS.AFSPC.AF.MIL/GPSOC
```

Figure 20-5 OA Section 3

30 APPENDIX 3: ALMANAC DATA FILES

Appendix 3 describes the SEM and YUMA Almanac message formats.

30.1 Almanac Description

The Almanac is a subset of GPS satellite clock and ephemeris data, with reduced precision. The CS provides the GPS Almanac in two formats, YUMA and System Effectiveness Model (SEM). Each Almanac format is broken into two files. YUMA files are named current.alm (PRNs 1-32) and current.blm (PRNs 33-63). SEM files are named current.al3 (PRNs 1-32) and current.bl3 (PRNs 33-63). The YUMA Almanac is an easy-to-read format of the Almanac data, while the SEM format is intended as input for software tools.

30.2 SEM Almanac Parameters Definition

The SEM Almanac parameters are defined in paragraph 20.3.3.5.1.2 of IS-GPS-200. The number of bits, scale factor for the least significant bit (LSB), range, and units of the Almanac parameters are specified in Table 20-VI of IS-GPS-200.

30.3 SV Health Word

While the orbital description data is generally usable for months, the satellite health may change at any time. The SEM and YUMA Almanac data formats also include an SV health word. The SV health word is defined in paragraph 20.3.3.5.1.3 and Table 20-VIII of IS-GPS-200. Table 30-I ~~Table 30-I~~ shows the 3 MCS health categories for satellites commonly used by 2 SOPS (ACTIVE, BAD & DEAD). The “OTHER” MCS health category is a generalized term for the remaining states/conditions defined by IS-GPS-200 which may be used by 2 SOPS in the future. Table 30-I also specifies the binary health words used in SV navigation (NAV) messages and the equivalent decimal representations used by both the SEM and YUMA Almanacs. The SV health word is found in cell R-7 of each record in the SEM Almanac. It is found on the third line of each record in the YUMA Almanac. Users of the SEM and YUMA Almanacs should be prepared for any potential future 2 SOPS use of other MCS health categories, as defined by codes in IS-GPS-200, Table 20-VIII.

Table 30-I Six-Bit SV Health Word in Almanac

SV Health Category	Six Bit SV Health Word in NAV message	Numerical Representation of Six-Bit Health Word in SEM & YUMA Almanac
ACTIVE	000000	0
OTHER	000001	1
OTHER	000010	2
OTHER	000011	3
OTHER	000100	4
OTHER	000101	5
OTHER	000110	6
OTHER	000111	7

SV Health Category	Six Bit SV Health Word in NAV message	Numerical Representation of Six-Bit Health Word in SEM & YUMA Almanac
OTHER	001000	8
OTHER	001001	9
OTHER	001010	10
OTHER	001011	11
OTHER	001100	12
OTHER	001101	13
OTHER	001110	14
OTHER	001111	15
OTHER	010000	16
OTHER	010001	17
OTHER	010010	18
OTHER	010011	19
OTHER	010100	20
OTHER	010101	21
OTHER	010110	22
OTHER	010111	23
OTHER	011000	24
OTHER	011001	25
OTHER	011010	26
OTHER	011011	27
OTHER	011100	28
OTHER	011101	29
OTHER	011110	30
OTHER	011111	31
OTHER	100000	32
OTHER	100001	33
OTHER	100010	34
OTHER	100011	35
OTHER	100100	36
OTHER	100101	36
OTHER	100110	38
OTHER	100111	39
OTHER	101000	40
OTHER	101001	41
OTHER	101010	42
OTHER	101011	43
OTHER	101100	44
OTHER	101101	45
OTHER	101110	46
OTHER	101111	47
OTHER	110000	48
OTHER	110001	49
OTHER	110010	50
OTHER	110011	51

SV Health Category	Six Bit SV Health Word in NAV message	Numerical Representation of Six-Bit Health Word in SEM & YUMA Almanac
OTHER	110100	52
OTHER	110101	53
OTHER	110110	54
OTHER	110111	55
OTHER	111000	56
OTHER	111001	57
OTHER	111010	58
OTHER	111011	59
BAD	111100	60
OTHER	111101	61
OTHER	111110	62
DEAD	111111	63

30.4 SEM Almanac Format

The SEM format file example in Figure 30-1 is arranged with a header that identifies the number of records (number of satellites) and file name (current.al3). The SEM Almanac sample illustrated below is a data sample of one record out of 28 in this sample file and its parameter definition, as stated in the note of Figure 30-1, is in Table 30-II. There is an additional SEM file with a file name extension of .bl3 that is identical to .al3, except for the parameters listed in Table 30-III.

```
LINE
1     28  CURRENT.AL3
2     175 589824
3
R-1   1
R-2   032
R-3   1
R-4   0.54044723510742E-0002 b  0.95157623291016E-0002 c -0.25247572921216E-0008
R-5   0.51537275390625E+0004 d -0.12954437732697E+0000 e -0.54729294776917E+0000
R-6   0.21287477016449E+0000 f  0.26512145996094E-0003 g  0.00000000000000E+0000
R-7   0
R-8   9
R-9
1
2
.
.
```

Figure 30-1 SEM Data Sample for Current.al3

Note: The **bold** letters and numbers in the rectangles are not part of the SEM format; they are used for identification purposes in Table 30-II. Table 30-II identifies the characteristics of each parameter in the SEM Almanac.

Table 30-II SEM Almanac Description for Current.al3

(Sheet 1 of 2)

Line No.	Almanac Name	Description	Units	Range	Accuracy	Precision
1	Number of records	The number of satellite Almanac records contained in the file	Records	0 to 32	1	2 significant digits
	Name of Almanac	Descriptive name for the Almanac in the file	N/A	Any combination of valid ASCII characters	N/A	24 significant characters
2	GPS Week Number	The Almanac reference week number (WNa) for all Almanac data in the file	Weeks	0 to 1023 *	1	4 significant digits
	GPS Time of Applicability	The number of seconds since the beginning of the Almanac reference week. The Almanac reference time (t_{oa}) for all Almanac data in the file	Second	0 to 602,112	1	6 significant digits
3	Blank line for format spacing					
Record Format						
R-1	PRN Number	The satellite PRN number. This is a required data item as it is the GPS user's primary means of identifying GPS satellites. It is equivalent to the space vehicle identification (SVID) number of the SV	None	1 to 32	None	2 significant digits
R-2	SVN	The SV reference number. Unique sequential number associated with each satellite. For any SV with a one- or two-digit SVN, the preceding 0 will not be shown	None	0 to ~~999~~255 (zero denotes that this field is empty)	None	3 significant digits
R-3	Average URA Number	The satellite "average" URA** number. This is not an item in the raw Almanac file but is based on the average URA value transmitted by this satellite in subframe 1. The URA is taken in the range of 730 hours	None	0 to 15	1	2 significant digits
R-4	Eccentricity	This defines the amount of the orbit deviation from a circular orbit (e)**	Unitless	0 to 3.125 E-2	4.77 E-7	7 significant digits

Table 30-II~~Table 30-IIII~~ SEM Almanac Description for Current.al3

(Sheet 2 of 2)

Line No	Almanac Name	Description	Units	Range	Accuracy	Precision
b	Inclination Offset	Satellite Almanac orbital "inclination angle offset" (δ_i)** This does not include the 0.30 semicircle reference value (i_0)**	Semi circles	-6.25 E-2 to +6.25 E-2	1.91 E-6	7 significant digits
c	Rate of Right Ascension	Rate of change in the measurement of the angle of right ascension (Ω-DOT)**	Semi circles/ second	-1.1921 E-7*** to +1.1921 E-7***	3.64 E-12	7 significant digits
R-5	Square Root of Semi-Major Axis	Measurement from the center of the orbit to either the point of apogee or the point of perigee ($A^{1/2}$)**	$Meters^{1/2}$	0 to 8,192	4.88 E-04	9 significant digits
d	Geographic Longitude of Orbital Plane	Geographic longitude of the orbital plane at the weekly epoch" (Ω_0)**	Semi circles	-1.0 to +1.0	1.19 E-07	9 significant digits
e	Argument of Perigee	The angle from the equator to perigee (ω)**	Semi circles	-1.0 to +1.0	1.19 E-07	9 significant digits
R-6	Mean Anomaly	The angle which describes the position of the satellite in its orbit, relative to perigee. (M_0)**	Semi circle	-1.0 to +1.0	1.19 E-07	9 significant digits
f	Zeroth Order Clock Correction	The satellite Almanac zeroth order clock correction term (a_{f0})**	Seconds	-9.7657 E-4*** to +9.7657 E-4***	9.54 E-07	5 significant digits
g	First Order Clock Correction	The satellite Almanac first order clock correction term (a_{f1})**	Seconds/ second	-3.7253 E-9*** to +3.7253 E-9***	3.64 E-12	5 significant digits
R-7	Satellite Health	The satellite subframe 4 and 5, page 25 six-bit health code **	None	0 to 63	None	2 significant digits
R-8	Satellite Configuration	The satellite subframe 4, page 25 four-bit configuration code **	None	0 to 15	None	2 significant digits
R-9	Blank line for format spacing					

*GPS Week Number as distributed by the CS is a modulo 1024 (0-1023) decimal number representing the modulo 1024 binary week number broadcast from an SV (see IS-GPS-200). Some user applications (such as the SEM program) may require the user to replace the modulo 1024 week number in this format with the full decimal week number (e.g., 0-65,535) in order to determine the correct calendar date of the Almanac.
**As defined in IS-GPS-200.
***Rounded up from max range of IS-GPS-200 binary format.

Table 30-III SEM Almanac Description for Current.bl3

Line No.	Almanac Name	Description	Units	Range	Accuracy	Precision
1	Number of records	The number of satellite Almanac records contained in the file	Records	0 to 31	1	2 significant digits
Record Format						
R-1	PRN Number	The satellite PRN number. This is a required data item as it is the GPS user's primary means of identifying GPS satellites. It is equivalent to the space vehicle identification (SVID) number of the SV	None	33 to 63	None	2 significant digits
Note: The parameters of the current.bl3 file are identical to the current.al3 file (Table 30-II), except for the parameters listed in this table.						

30.5 YUMA Almanac Format

Parameters used in the YUMA format are not the same as used in the SEM format. The YUMA angular units are in radians whereas the SEM angular units are in semicircles. In addition, the YUMA Orbital Inclination is a direct measure of inclination angle (approximately 55 degrees), whereas the SEM Inclination Offset is relative to 0.30 semicircles (54 degrees). The parameters of the YUMA Almanac are identified within the message structure. Entries for ID, Health, and Week are represented in decimal format.

Figure 30-
~~Figure 30-~~2 illustrates one record in a current.alm YUMA Almanac file sample. The maximum number of records in a current.alm file is 32 and this file addresses PRNs 1-32. Line one of each record identifies the week in which the file was generated as well as the PRN number of the subject SV. There is an additional YUMA file with a file name extension of .blm that is identical to .alm, except that it addresses PRNs 33-63 and the maximum number of records in a current.blm file is 31.

```
******** Week 175 almanac for PRN-01 ********
ID:                         01
Health:                     000
Eccentricity:               0.5404472351E-002
Time of Applicability(s):   589824.0000
Orbital Inclination(rad):   0.9723724451
Rate of Right Ascen(r/s):  -0.7931758961E-008
SQRT(A)  (m 1/2):           5153.727539
Right Ascen at Week(rad):  -0.4069756641E+000
Argument of Perigee(rad):  -1.719371504
Mean Anom(rad):             0.6687658141E+000
Af0(s):                     0.2651214600E-003
Af1(s/s):                   0.0000000000E+000
Week:                        175
                          .
```

Figure 30-2 YUMA Almanac Data Sample For Current.alm

40 APPENDIX 4: EXTENDED SIGNALS HEALTH STATUS FILES

Appendix 4 describes the Extended Signals Health Status (ESHS) message format.

40.1 Extended Signals Health Status

The Extended Signals Health Status (ESHS) data message provides the health status of each of the modernized civil signals (L1C, L2C, and L5) for each SV, as defined in Table 40-I.

Table 40-I Modernized Civil Signals

Modernized Civil Signal	L1C	L2C	L5
Reference Document	IS-GPS-800	IS-GPS-200	IS-GPS-705
Applicable SV Block/Iteration	III	IIR-M, IIF, III	IIF, III

IS-GPS-200, Section 30.3.3.1.1.2, defines the signal health of L1, L2 and L5 as follows: "the three, one-bit, health indication in bits 52 through 54 of message type 10 refers to the L1, L2, and L5 signals of the transmitting SV. The health of each signal is indicated by:

0 = Signal OK,
1 = Signal bad or unavailable

The ESHS format, as shown in Figure 40-1, contains a header that identifies the number of records (number of satellites), filename (extension .ale), and the health of each signal as described above. The ESHS sample shown in Figure 40-1, depicts one data record out of 28 in this sample file.

LINE	Parameter Name	
1	# of Records/File Name	28 CURRENT.ALE
2	GPS Week #/GPS TOA	175 589824
3	Blank	
R-1	PRN	18
R-2	SVN	054
R-3	L1/L2/L5 Health Status	0-7 in binary format (000, 001, 010, 011, 100, 101, 110, 111)
R-4	Blank	

Note: The left columns are for information only and not part of the CURRENT.ALE file. The extended health Almanac sample (CURRENT.ALE) illustrated above is a data sample of one record out of 28 in this sample file.

Figure 40-1 Extended Signals Health Status Data Sample

Table 40-II identifies the characteristics of each parameter in the ESHS message.

Table 40-II ESHS Description

Line No.	Parameter Name	Description	Units	Range	Accuracy	Resolution
1	Number of records	The number of satellite ESHS records contained in the file	Records	0 to 63	1	2 significant digits
	Name of ESHS file	Descriptive name for the ESHS file	N/A	Any combination of valid ASCII characters	N/A	24 significant characters
2	GPS Week Number	The Almanac reference week number (WNa) for all data in the file	Weeks	0 to 1023*	1	4 significant characters
	GPS Time of Applicability	The number of seconds since the beginning of the Almanac reference week for all data in the file.	Seconds	0 to 602,112	1	6 significant characters
3	Blank Line for Format Spacing					
Record Format						
R-1	PRN Number	The satellite PRN number. This is a required data item as it is the GPS user's primary means of identifying GPS satellites. It is equivalent to the Space Vehicle identification (SVID) number of the SV.	None	1-63	N/A	2 significant digits
R-2	SVN	The SV reference number. Unique sequential number associated with each satellite.	None	0-999 (0 denotes this field is empty)	N/A	3 significant digits
R-3	L1C/L2C/L5 Health Status	The health status of the L1C/L2C/L5 signals, defined as follows: 0 = Signal OK 1 = Signal bad or unavailable	None	0-7 in binary format (000, 001, 010, 011, 100, 101, 110, 111)	N/A	3 significant characters
R-4	Blank Line for Format Spacing					

*GPS Week Number as distributed by the CS is a modulo 1024 (0-1023) decimal number representing the modulo 1024 binary week number broadcast from an SV (see IS-GPS-200). Some user applications (such as the SEM program) may require the user to replace the modulo 1024 week number in this format with the full decimal week number (e.g., 0-65,535) in order to determine the correct calendar date of the Almanac.

50 APPENDIX 5: ANTI-SPOOFING STATUS FILE

Appendix 5 describes the Anti-Spoofing ~~status~~Status message format.

50.1 Anti-Spoofing Status

The Anti-Spoofing (A-S) S~~s~~tatus informs Users whether the Anti-Spoofing mode of each GPS SV is ON or OFF. There are two A-S ~~status~~Status files named as.txt and as2.txt. The message files are simple text files that identify each satellite in the GPS constellation by a two digit PRN number and a three digit SVN number and it shows the SV's A-S ~~status~~Status (ON/OFF). The difference between the two A-S ~~status~~Status files is the PRN Numbers. As.txt addresses PRNs 1-32 and as2.txt addresses PRNs 33-63. An example of the A-S ~~status~~Status (as.txt) is shown in Figure 50-1.

```
            Anti Spoofing (A-S) Status

                 PRN   SVN    A-S
                  1    049    ON
                  2    061    ON
                  3    033    ON
                  4    034    ON
                  5    050    ON
                  6    036    ON
                  7    048    ON
                  8    038    ON
                  9    039    ON
                 10    040    ON
                 11    046    ON
                 12    058    ON
                 13    043    ON
                 14    041    ON
                 15    055    ON
                 16    056    ON
                 17    053    ON
                 18    054    ON
                 19    059    ON
                 20    051    ON
                 21    045    ON
                 22    047    ON
                 23    060    ON
                 24    024    ON
                 25    025    ON
                 26    026    ON
                 27    027    ON
                 28    044    ON
                 29    057    ON
                 30    030    ON
                 31    052    ON
                 32    023    ON
```

Figure 50-1 Sample of the Anti-Spoofing S~~s~~tatus file (as.txt)

60 APPENDIX 6: LETTERS OF EXCEPTION

60.1 Scope

As indicated in paragraph 1.3, initial signature approval of this document, as well as approval of subsequent changes to the document, can be contingent upon a "letter of exception". This appendix depicts such "letters of exception" when utilized by any signatory of this document in the initial approval cycle and/or in the change approval process. The ICC will omit such letters of exception from subsequent revisions of this document based on written authorization by the respective signatory (without processing a proposed interface revision notice (PIRN) for approval). When some (but not all) of the exceptions taken by a signatory are resolved, the signatory shall provide the ICC with an updated letter of exception for inclusion in the next ICD revision (without processing a PIRN for approval.

60.2 Applicable Documents

The documents listed in Section 2.1 shall be applicable to this appendix.

60.3 Letters of Exception

If signature approval of this document -- as affixed to the cover page -- is marked by an asterisk, it indicates that the approval is contingent upon the exceptions taken by that signatory in a letter of exception. Any letter of exception, which is in force for the revision of the ICD is depicted in Figure 60-1. Signatories for whom no letter of exception is shown have approved this version of the document without exception.

Raytheon

Customer Success Is Our Mission

Raytheon Company
16800 E. CentreTech Parkway
Aurora, Colorado
80011-9046 USA
303.344.6000

1 July 2010

In Reply, Please Refer to: GPS-10DSB049

Department of the Air Force
HQ Space and Missile Systems Center (AFSPC)
Global Positioning System Wing (GPSW)
483 N. Aviation Blvd.
El Segundo, CA 90245-2808

Attention: Ms. Sara Lawlyes, CO

Subject: LETTER OF EXCEPTION FOR ICD-GPS-870

Reference: (a) Raytheon letter reference GPS-10DSB048 dated 1 July 2010; Subject: Impact Assessment, Rough Order of Magnitude (ROM) for ICD-GPS-870
(b) Global Positioning System (GPS) Advanced Control Segment (OCX), Contract No. FA8807-10-C-0001

Dear Ms. Lawlyes

Raytheon Company has reviewed the subject version of ICD-GPS-870, dated 3 June 2010.

Raytheon Company cost impact, as presented under our 1 July 2010 ROM, is based on the following limitations:

1. Paragraph 3.2.5 – OCX will support a maximum of 1000 simultaneous internet transactions.
2. Paragraph 3.2.6 – OCX will support a maximum of 1000 simultaneous SIPRNET internet transactions.

Should you have any questions, please contact John Crooks at 720-858-5181 for technical concerns, or the undersigned at (720) 858-5172, email dsblea@raytheon.com.

Sincerely,
RAYTHEON COMPANY

Darline S. Blea
Manager, Program Contracts

Figure 60-1 Letter of Exception