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### INTERFACE CONTROL DOCUMENT

UNLESS OTHERWISE SPECIFIED: NUMBERS ARE REPRESENTED IN DECIMAL FORM.

**Interface Control Contractor:**

Engility (GPS SE&I)  
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ICD TITLE:

**NAVSTAR GPS Control Segment to User Support  
Community Interfaces**

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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	IRN-ICD-240A-002 – RFC 308 – Update ICD-GPS-870 and ICD-GPS-240 to align with new OCX to external agency interfaces	21 Sep 2016	13 Mar 2017
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# 1 SCOPE

## 1.1 Scope

This Interface Control Document (ICD) defines the following Global Positioning System (GPS) automated interfaces that serve the GPS user and user-support communities during the Operational Control System (OCS)/Architecture Evolution Plan (AEP) systems era:

The functional data transfer interface between the GPS Control Segment (CS) and the GPS User Support Software (GUSS) offline tool.

The physical data transfer interface between the GPS CS and the Schriever Air Force Base (AFB) local area network (LAN) on which the GUSS offline tool resides.

The functional data transfer interfaces between the CS and the United States Coast Guard (USCG) Navigation Center (NAVCEN). These interfaces support the Memorandum of Agreement (MOA) between the Department of Defense (DoD) Joint Functional Component Command for Space (JFCC SPACE); the Department of Homeland Security (DHS) U.S. Coast Guard Navigation Center (NAVCEN); and the Department of Transportation (DOT) Federal Aviation Administration (FAA) National Operations Control Center (NOCC), “Interagency Memorandum of Agreement with Respect to Support of Users of the Navstar Global Positioning System (GPS).”

The functional data transfer interfaces between the CS and the military user community.

This ICD identifies the data transfer requirements for these interfaces. The GUSS software tool is functionally a part of the CS, but resides on hardware that is physically outside the CS. Therefore the functional and physical interfaces between the CS and the GUSS tool are described in this ICD at the physical boundary of the CS. The interfaces between the GPS CS and the NAVCEN and the GPS CS and the military user community are implemented using electronic mail (e-mail), internet and SIPRNET. These interfaces are described only at the functional (application) level in this ICD. This ICD does not include detailed technical descriptions of the e-mail system, internet or SIPRNET.

## 1.2 Key Dates

None

### 1.3 ICD 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.

United States Air Force (USAF), Space Command (AFSPC), GPS Wing (GPSW) Space and Missile Systems Center (SMC)

USAF, AFSPC, 50<sup>th</sup> Space Wing (50 SW)

United States Coast Guard (USCG), Navigation Center (NAVCEN)

The Boeing Company

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*

None

#### Standards

##### *Federal*

None

##### *Military*

None

Other Publications

IS-GPS-200 Current Version	Navstar GPS Space Segment/Navigation User Interface
GP-03-001 14 November 2003	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 USSPC/DOO)
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/DOO)
MOA February 2010	Memorandum of Agreement between the Joint Functional Component Command for Space; the US Coast Guard Navigation Center and the FAA National Operations Control Center with respect to the Support of Users of the Navstar Global Positioning System
MOA June 2014	Interagency Memorandum of Agreement with Respect to Support of Users of the Navstar Global Positioning System (GPS)

## 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

The interfaces defined in this ICD are listed in 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 CS	GUSS Offline Software Tool	GPS Constellation Orbital and Performance Parameters	Almanac	Transfer via diskette	Unclassified
GPS CS	USCG NAVCEN	GPS Status Information	NANU	Transmit via E-Mail	Unclassified
GPS CS	USCG NAVCEN	GPS Constellation Status Summary	OA	Post to Internet Website	Unclassified
GPS CS	USCG NAVCEN	GPS Constellation Orbital and Performance Parameters	Almanac	Post to Internet Website	Unclassified
GPS CS	USCG NAVCEN	GPS Status Information	Satellite Outage File	Post to Internet Website	Unclassified
GPS CS	Military User Community	GPS Status Information	NANU	Post to Internet and SIPRNET Websites	Unclassified
GPS CS	Military User Community	GPS Constellation Status Summary	OA	Post to Internet and SIPRNET Websites	Unclassified
GPS CS	Military User Community	GPS Constellation Orbital and Performance Parameters	Almanac	Post to Internet and SIPRNET Websites	Unclassified
GPS CS	Military User Community	GPS Status Information	Satellite Outage File	Post to Internet and SIPRNET Websites	Unclassified

The information distributed by the CS includes Notice Advisory to Navstar Users (NANU), Operational Advisory (OA), Satellite Outage File (SOF) and satellite almanac. The NANU is a message that informs users of satellite outages and other GPS issues. The OA is a descriptive summary of GPS constellation status. The SOF is a machine readable format of GPS satellite outage information. The satellite almanac contains orbital and performance parameters for operational GPS satellites. The primary means of data distribution include electronic mail (e-mail) and Internet and SIPRNET websites. All data transfer described in this ICD is unclassified.

## 3.2 Interface Definitions

The following paragraphs define the physical interface between the CS and the Schriever AFB LAN on which the GUSS offline software tool resides. The following paragraphs also describe the functional interfaces between the CS and the GUSS tool, USCG NAVCEN, and the military user community.

Unless otherwise specified in the paragraphs below, e-mail used for data transfer is generated and transmitted using resources of the Schriever AFB LAN. Internet website hosting, uploads, and downloads are also accomplished using resources of the Schriever AFB LAN. SIPRNET website hosting, uploads, and downloads are accomplished using resources of the Peterson AFB LAN. The hardware and software interfaces of the internet and these LAN's are not controlled by this ICD. Therefore, these interfaces are described at the functional (application) level only in this ICD.

The address of the 2 SOPS internet website, Constellation Status Page, referenced in the subsequent subsections is <https://gps.afspc.af.mil/gps/>. The address of the GPS Operations Center (GPSOC) internet website referenced in the subsequent subsections is <http://gps.afspc.af.mil/gpsoc/>. The address of the GPS Operations Center SIPRNET website referenced in the subsequent subsections is distributed separately to authorized military users and, therefore, not listed in this ICD.

Detailed data formats of the NANU, OA, SOF and almanac data that are referenced in the paragraphs below are described in Appendices 1, 2, 3 and 4 of this ICD, respectively.

### 3.2.1 Almanac Interface between the GPS CS and the GUSS Offline Tool

Almanac data from the legacy CS are transferred to the GUSS via a 3.5-inch, high-density, 1.44 megabyte, International Business Machines Corporation (IBM) personal computer (PC) format diskette. The diskette contains one current System Effectiveness Model (SEM) format almanac and one current YUMA format almanac downloaded from the CS Almanac computer. The files are downloaded in the Windows® PC file format. (Windows is a registered trademark of the Microsoft Corporation.) The filename assigned to the SEM almanac is current.al3. The filename assigned to the YUMA almanac is current.alm. The files are downloaded to the diskette using a secure copy program to assure no classified data is transferred to the diskette. The files are uploaded to the GUSS software tool using a Windows®-compatible computer connected to the Schriever AFB LAN. The files are normally transferred from the CS to the GUSS once per day, prior to 1700 Zulu time (10 am Mountain Standard Time (MST), 11 am Mountain Daylight Time (MDT)).

The interface between the GPS CS and the GUSS Offline Tool is shown in Figure 1.

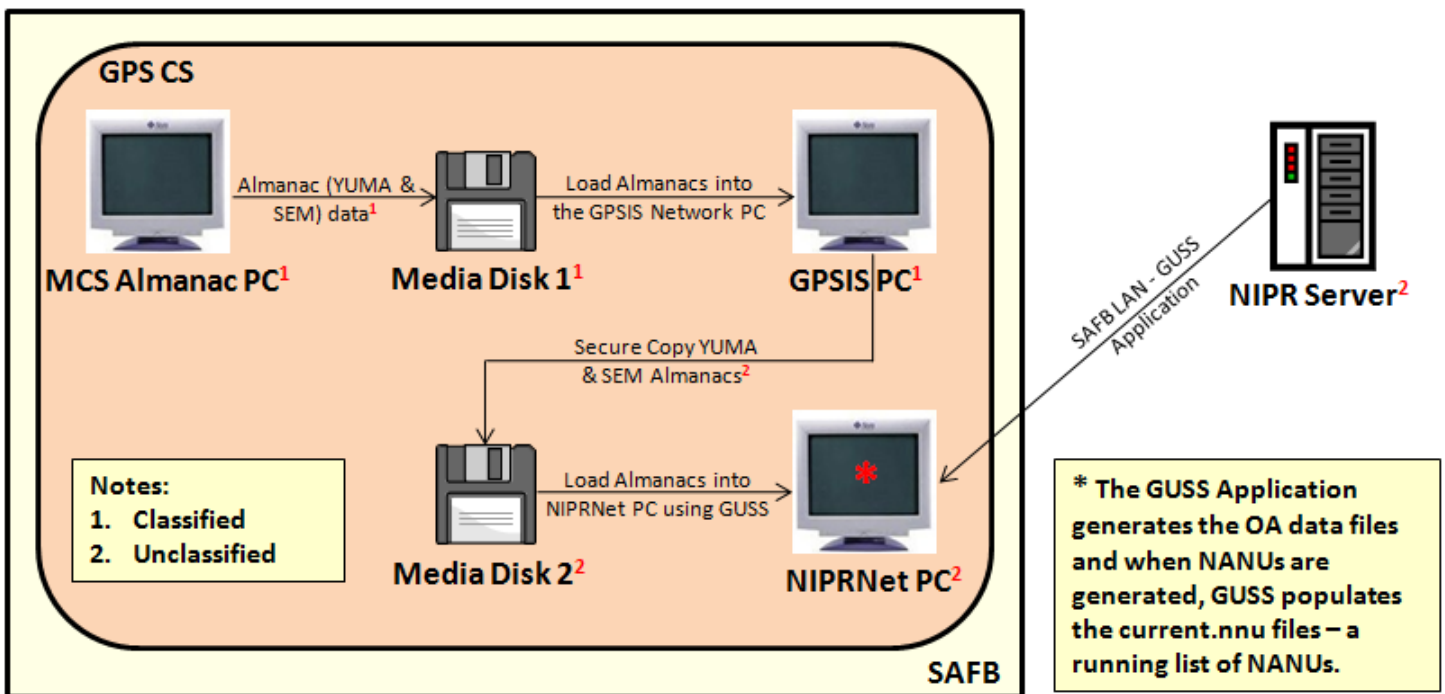


Figure 1 GPS CS to GUSS Interface

### 3.2.2 Interfaces between the GPS CS and the USCG NAVCEN

The interface between the GPS CS and the USCG NAVCEN is shown in Figure 2.

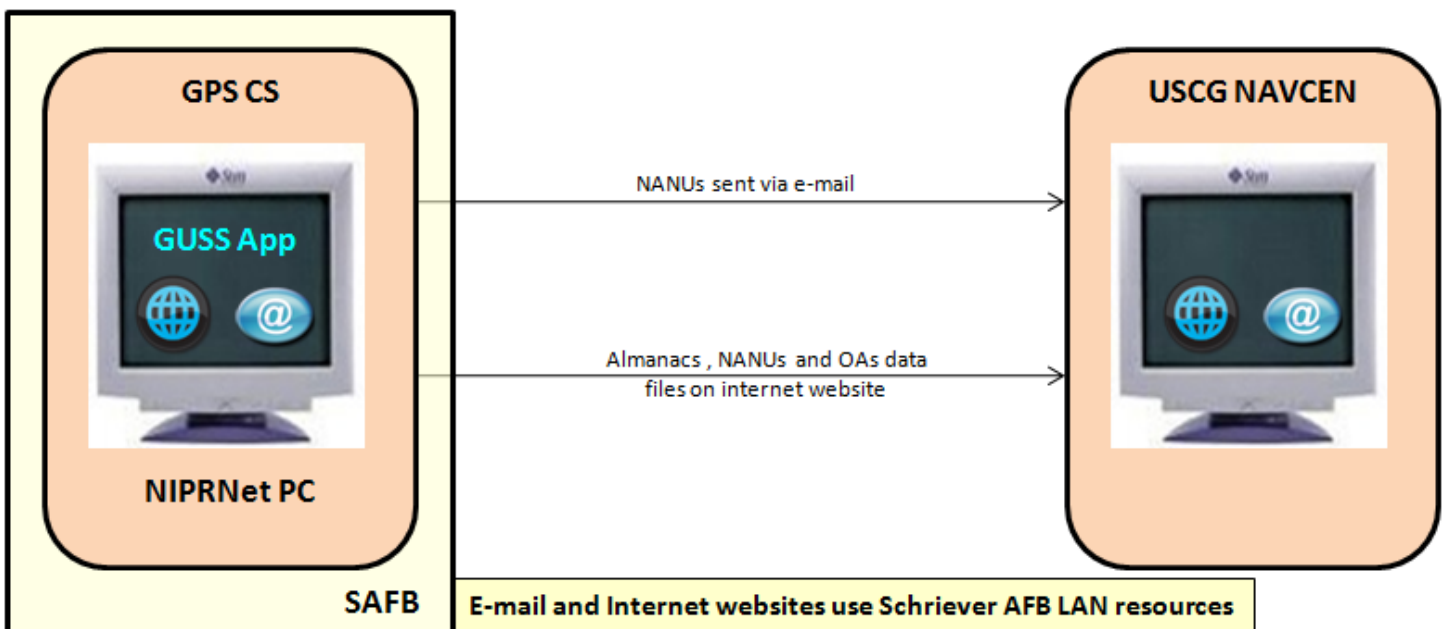


Figure 2 GPS CS to USCG NAVCEN Interface



### **3.2.2.1 NAVCEN NANU Interface**

NANU messages are transmitted to the USCG NAVCEN via e-mail from the CS to an e-mail address provided by the NAVCEN. NANU products from 2SOPS are also received via automated processes that link back to the 2SOPS internet website (<https://gps.afspc.af.mil/gps/archive/>). The NANUs are transmitted in a tabular format described in Appendix 1. NANU messages are transmitted whenever they are generated (intermittently) including weekends and holidays. Circumstances that may initiate the generation and transmission of specific NANUs are described in Appendix 1. The NANU file is named current.nnu, which is a running list of NANUs.

### **3.2.2.2 NAVCEN OA Interface**

OAs are distributed as a data file via the 2 SOPS internet website. An OA data file is normally uploaded to the 2 SOPS internet website once per day via file transfer protocol (FTP), prior to 1700 Zulu time (10 am MST, 11 am MDT). OA data files are identified with a file name consisting of the Julian day they were generated and a “.oa1” extension, e.g., 123.oa1. The NAVCEN can access the 2 SOPS internet website and download the data file, as required, via FTP.

### **3.2.2.3 Satellite Outage File (SOF)**

The Satellite Outage File (SOF) is built by the GPSOC GPSIS (GPS Information Service) to provide a complete and up-to-date statement of past, current, and forecasted satellite outages in the GPS constellation. The information contained in the SOF is based solely on NANUs supplied by the 2 SOPS. It only applies to the GPS satellites managed by the US Air Force, and thus does not reflect status of augmentation satellites, such as those in the WAAS and EGNOS constellations. SOF data is updated and posted to GPSOC GPSIS web sites whenever the GPSOC issues a Notice: Advisory to Navstar Users (NANU).

### **3.2.2.4 NAVCEN Almanac Interface**

Almanacs are distributed as YUMA- and SEM-format data files via the 2 SOPS internet website. Almanac data files are normally uploaded to the 2 SOPS internet website once per day, prior to 1700 Zulu time (10 am MST, 11 am MDT). YUMA-format almanac data files are identified with an “.alm” extension. SEM-format almanac data files are identified with an “.al3” extension. The NAVCEN can access the 2 SOPS internet website and download the data file, as required, via FTP.

### 3.2.3 Interfaces between the GPS CS and the Military User Community

The interface between the GPS CS and the Military User Community is shown in Figure 3.

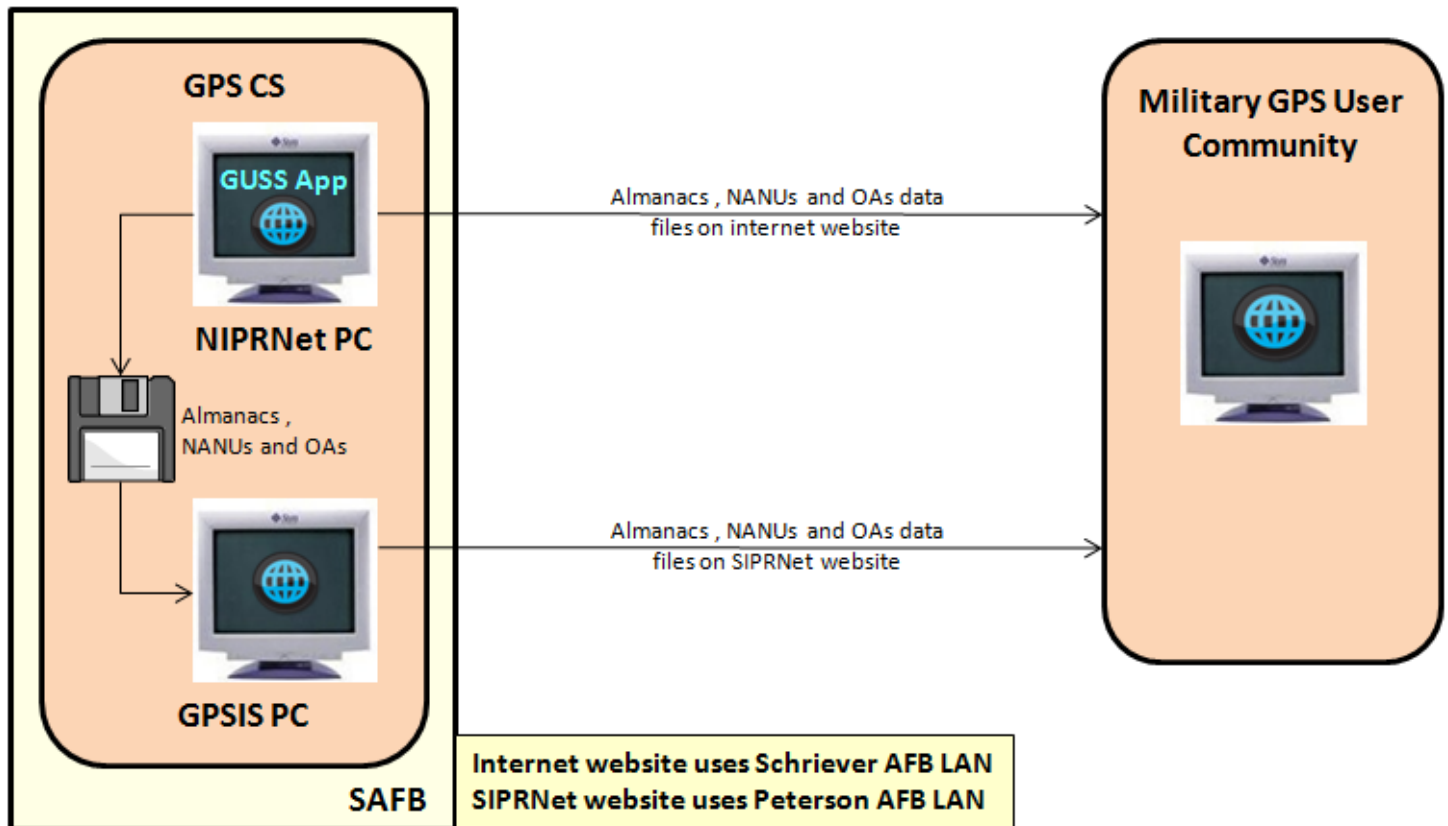


Figure 3 GPS CS to Military User Community Interface

#### 3.2.3.1 Military User Community Internet NANU, OA, SOF and Almanac Interfaces

NANUs, OAs, SOFs and almanacs are distributed to the Military user community over the internet by uploading NANU, OA, SOF and almanac files to the 2 SOPS internet website. Military users with internet connectivity can access the 2 SOPS internet website directly or via a direct page-to-page hyperlink from the GPS Operations Center (GPSOC) internet website to the 2 SOPS internet website. Files are downloaded from the 2 SOPS internet website using FTP by selecting a hyperlink to the desired NANU, OA, SOF or almanac file.

#### 3.2.3.2 Military User Community SIPRNET NANU, OA, SOF and Almanac Interfaces

NANUs, OAs, SOF and almanacs are distributed to the Military user community over the SIPRNET by uploading NANU, OA, SOF and almanac files to the GPSOC SIPRNET website. Military users with SIPRNET connectivity can download a NANU, OA, SOF or almanac file using FTP by selecting the corresponding hyperlink.

## **4 QUALITY ASSURANCE**

Not Applicable

## **5 PREPARATION FOR DELIVERY**

Not Applicable

## 6 NOTES

### 6.1 Acronyms and Abbreviations

2 SOPS	2nd Space Operations Squadron
50 SW	50 <sup>th</sup> Space Wing
AEP	Architecture Evolution Plan
AF	Air Force
AFB	Air Force Base
AFSPC	Air Force Space Command
ANOM	Anomaly
ASCEN	Ascension
ASCII	American Standard Code for Information Interchange
COMM	Commercial
CS	Control Segment, Cesium
DSN	Defense Switched Network
DTG	Day Time Group
FTP	File Transfer Protocol
GPS	Global Positioning System
GPSOC	GPS Operations Center
GUSS	GPS User Support Software
IBM	International Business Machines Corporation
ICC	Interface Control Contractor
ICD	Interface Control Document
ICWG	Interface Control Working Group
ID	Identification
JDAY	Julian Day of the Year
JPO	Joint Program Office
LAN	Local Area Network
LLC	Limited Liability Company
LSB	Least Significant Bit
m	Meters
MDT	Mountain Daylight Time
MOA	Memorandum of Agreement
MSG	Message
MST	Mountain Standard Time
N/A	Not Applicable
NANU	Notice Advisory to Navstar Users
NAV	Navigation
NAVCEN	Navigation Center
NC	No Change
OA	Operational Advisory
OCS	Operational Control System
PC	Personal Computer
PIRN	Proposed Interface Revision Notice
PRN	Pseudorandom Noise (Signal Number)
POC	Point Of Contact

RB	Rubidium
s	Seconds
SEM	System Effectiveness Model
SIPRNET	Secret Internet Protocol Router Network
SMC	Space and Missile Systems Center
SQRT	Square Root
SUBJ	Subject
SV	Space Vehicle
SVN	Space Vehicle Number
URA	User Range Accuracy
USAF	United States Air Force
USCG	United States Coast Guard

## **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.

## 10 APPENDIX 1: NANU DATA FORMATS

### 10.1 Notice Advisory to Navstar Users

NANUs are used to notify 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 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**

<b>NANU ACRONYM</b>	<b>NAME</b>	<b>DESCRIPTION</b>
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. May be issued after the start time of the referenced NANU.
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.



## 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-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**

<b>NANU ACRONYM</b>	<b>NAME</b>	<b>DESCRIPTION</b>
UNUSUFN	Unusable Until Further Notice	Notifies users that a satellite will be unusable to all 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.

## 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 10-1. 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 ***

NANU DTG: 140649Z FEB 2016

```

**Figure 10-1 General Message Format**

### 10.1.4 Other Messages

NANU types in the “other” group describe events that occur infrequently. 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**

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

The LAUNCH and DECOM NANU message templates are shown in Figure 10-2 and Figure 10-3, respectively.

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVN XX (PRN XX) LAUNCH JDAY JJJ
1.   NANU TYPE: LAUNCH
      NANU NUMBER: YYYYSSS
      NANU DTG: HHHHDDZ MMM 2007
      SVN: XX
      PRN: XX
      LAUNCH JDAY: JJJ
      LAUNCH TIME ZULU: HHHH
2.   GPS SATELLITE SVN XX (PRN XX) WAS LAUNCHED ON JDAY JJJ A USABINIT NANU WILL BE SENT WHEN THE SATELLITE IS SET ACTIVE TO SERVICE.
3.   POC: CIVIL NON-AVIATION - NAVCEN at 703-313-5900, HTTPS://WWW.NAVCEN.USCG.GOV,
      CIVIL AVIATION - FAA Satellite Operations Group at 540-422-4178, https://www.faa.gov/air\_traffic/nas/gps\_reports/,
      MILITARY - GPS Operations 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 LAUNCH NANU Message Template**

```
NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYJJJ
SUBJ: SVNXX (PRNXX) DECOMMISSIONING JDAY JJJ/HHHH
1.   NANU TYPE: DECOM
      NANU NUMBER: YYYYSSS
      NANU DTG: HHHHDDZ MMM YYYY
      REFERENCE NANU: YYYYSSS
      REF NANU DTG: HHHHDDZ MMM YYYY
      SVN: XX
      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 ZUU: HHHH
      DECOMMISSIONING START CALENDAR DATE: DD MMM YYYY
2.   CONDITION: GPS SATELLITE SVNXX (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: CIVIL NON-AVIATION - NAVCEN at 703-313-5900, HTTPS://WWW.NAVCEN.USCG.GOV,
      CIVIL AVIATION - FAA Satellite Operations Group at 540-422-4178, https://www.faa.gov/air\_traffic/nas/gps\_reports/,
      MILITARY - GPS Operations 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 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 threshold NANU notification times for the four NANU groups are summarized in Table 10-IV.

**Table 10-IV NANU Notification Times**

<b>NANU Group</b>	<b>Nominal Notification Times</b>	<b>Threshold</b>
Scheduled	96 hours prior to outage start	NLT 48 hours prior to outage start (see note #1)
Unscheduled	15 minutes after outage start	Less than 1 hour after outage start
General	None – Timing determined on a case-by-case basis	
Other	None – Timing determined on a case-by-case basis	
NOTE 1: If the need for a planned outage is determined less than 48 hours prior to the start time of the outage, the associated Forecast NANU will not meet the Scheduled outage Threshold.		

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 and DECOM messages, is based on a tabular format that simplifies the readability of data. A template for these messages is illustrated in Figure 10-4. 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: SVNXX (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: XX
   PRN: XX
   START DAY: 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 SVNXX (PRNXX) WILL BE UNUSUABLE ON JDAY JJJ
   (DD MMM YYYY) BEGINNING HHMMZULU UNTIL JDAY JJJ (DD MMM YYYY) ENDING HHMM ZULU.
3. POC: CIVIL NON-AVIATION – NAVCEN at 703-313-5900, HTTPS://WWW.NAVCEN.USCG.GOV,
   CIVIL AVIATION - FAA Satellite Operations Group at 540-422-4178,
   https://www.faa.gov/air\_traffic/nas/gps\_reports/,
   MILITARY - GPS Operations 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 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 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), two digit minute (MM) format. The NANU header is illustrated in Figure 10-5.

```
2009022-----  
NOTICE ADVISORY TO NAVSTAR USERS (NANU) 2009022  
SUBJ: SVN54 (PRN18) FORECAST OUTAGE JDAY 092/1600 - JDAY 093/0630  
1.  NANU TYPE: FCSTDV  
    NANU NUMBER: 2009022  
    NANU DTG: 261836Z MAR 2009  
    REFERENCE NANU: N/A  
    REF NANU DTG: N/A  
    SVN: 54
```

Figure 10-5 NANU Header Example

### 10.3.2 NANU Section One

Section one 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 10.4.1. 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 10-6.

```
2009022-----  
NOTICE ADVISORY TO NAVSTAR USERS (NANU) 2009022  
SUBJ: SVN54 (PRN18) FORECAST OUTAGE JDAY 092/1600 - JDAY 093/0630  
1.  NANU TYPE: FCSTDV  
    NANU NUMBER: 2009022  
    NANU DTG: 261836Z MAR 2009  
    REFERENCE NANU: N/A  
    REF NANU DTG: N/A  
    SVN: 54  
    PRN: 18  
    START JDAY: 092
```

Figure 10-6 Message Description Example

#### 10.3.2.2 NANU Reference Information

As shown in Figure 10-7, 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.

```
2009022-----  
NOTICE ADVISORY TO NAVSTAR USERS (NANU) 2009022  
SUBJ: SVN54 (PRN18) FORECAST OUTAGE JDAY 092/1600 - JDAY 093/0630  
1.   NANU TYPE: FCSTDV  
     NANU NUMBER: 2009022  
     NANU DTG: 261836Z MAR 2009  
     REFERENCE NANU: N/A  
     REF NANU DTG: N/A  
     SVN: 54  
     PRN: 18  
     START JDAY: 092
```

Figure 10-7 Reference Information Example

### 10.3.2.3 Satellite Identification

As shown in Figure 10-8, the satellite identification information specifies the satellite that is the subject of the NANU. The identification information includes the satellite two-digit SVN and two-digit PRN number.

```
2009022-----  
NOTICE ADVISORY TO NAVSTAR USERS (NANU) 2009022  
SUBJ: SVN54 (PRN18) FORECAST OUTAGE JDAY 092/1600 - JDAY 093/0630  
1.   NANU TYPE: FCSTDV  
     NANU NUMBER: 2009022  
     NANU DTG: 261836Z MAR 2009  
     REFERENCE NANU: N/A  
     REF NANU DTG: N/A  
     SVN: 54  
     PRN: 18  
     START JDAY: 092
```

Figure 10-8 Satellite Identification Information Example

### 10.3.2.4 Outage Time

As shown in Figure 10-9, 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.

```
2009022-----  
NOTICE ADVISORY TO NAVSTAR USERS (NANU) 2009022  
SUBJ: SVN54 (PRN18) FORECAST OUTAGE JDAY 092/1600 - JDAY 093/0630  
1.   NANU TYPE: FCSTDV  
     NANU NUMBER: 2009022  
     NANU DTG: 261836Z MAR 2009  
     REFERENCE NANU: N/A  
     REF NANU DTG: N/A  
     SVN: 54  
     PRN: 18  
     START JDAY: 092  
     START TIME ZULU: 1600  
     START CALENDAR DATE: 02 APR 2009  
     STOP JDAY: 093  
     STOP TIME ZULU: 0630  
     STOP CALENDAR DATE: 03 APR 2009
```

Figure 10-9 Outage Time Example

### 10.3.3 NANU Section Two

As shown in Figure 10-10, Section 2 is a summary of the NANU in paragraph format including the satellite two-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 SVN54 (PRN18) WILL BE UNUSABLE ON JDAY 092  
    (02 APR 2009) BEGINNING 1600 ZULU UNTIL JDAY 093 (03 APR 2009)  
    ENDING 0630 ZULU.
```

**Figure 10-10 NANU Section 2 Example**

### 10.3.4 NANU Section Three

Section 3 of the NANU identifies points of contact for additional technical and support information. An example of this section is illustrated in Figure 10-11.

```
3.  POC: CIVILIAN - NAVCEN AT 703-313-5900, HTTPS://WWW.NAVCEN.USCG.GOV  
    MILITARY - GPS OPERATIONS CENTER at HTTP://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 10-11 Contact Information**



## 20 APPENDIX 2: OPERATIONAL ADVISORY

### 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      086.0A1
SUBJ: GPS STATUS              27 MAR 2XXX

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, RB, CS, RB, RB, CS, RB
C. BLOCK III: PRNS 29, 30, 31, 32
  PLANE : SLOT C1, B5, A2, E5
  CLOCK : RB, 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)

2XXX022 261836Z MAR 2XXX 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)

2XXX020 202158Z MAR 2XXX GENERAL /-/
2XXX021 241836Z MAR 2XXX 32 LAUNCH /-/
2XXX023 262212Z MAR 2XXX GENERAL /-/

3. REMARKS:
A. THE POINT OF CONTACT FOR GPS MILITARY OPERATIONAL SUPPORT IS THE GPS
OPERATIONS CENTER AT (XXX)XXX-XXXX OR DSN XXX-XXXX
B. CIVIL NON-AVIATION: FOR INFORMATION, CONTACT US COAST GUARD NAVCEN AT COMMERCIAL 703-
313-5900 24 HOURS DAILY AND INTERNET HTTPS://WWW.NAVCEN.USCG.GOV.
C. CIVIL AVIATION: FAA SATELLITE OPERATIONS GROUP AT 540-422-4178,
HTTPS://WWW.FAA.GOV/AIR_TRAFFIC/NAS/GPS_REPORTS/
D. MILITARY SUPPORT WEBPAGES CAN BE FOUND AT THE FOLLOWING
HTTPS://GPS.AFSPC.AF.MIL/GPS OR HTTPS://GPS.AFSPC.AF.MIL/GPSOC

```

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 One

Section one 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. Section 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 one 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
C. BLOCK III: PRNS 29, 30, 31, 32
  PLANE : SLOT C1, B5, A2, E5
  CLOCK : RB, RB, RB, RB
```

Figure 20-3 OA Section One

## 20.4 OA Section Two

Section two 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 two 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 Two

## 20.5 OA Section Three.

Section three identifies points of contact for additional technical and support information. It is organized into three subsections, each in text format. An example of section three 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 HTTP://GPS.AFSPC.AF.MIL/GPSOC

Figure 20-5 OA Section Three

### 30 APPENDIX 3: SATELLITE OUTAGE FILE (SOF)

Following is a list of the rules or protocols for the SOF data.

#### Usage Rules

1. The SOF always contains fields identifying creation date/time and reference date/time.
2. A new SOF is built each time a NANU is issued.
3. The latency of the SOF initially may be 15-20 minutes, and is driven by operational procedures and workload.

#### File Naming Convention

The most recently built SOF is given a standard name that contains the creation date/time and the file format version number, 'yyyy\_ddd\_hhmmss\_vnn.sof', where yyyy is the year, ddd is the Jday (day of year starting with 1), hhmmss is the hour/minute/second UTC, and nn is the file format version number. The file format version number will increment sequentially whenever the file format changes.

#### Dissemination Methods

Unclassified Web Site. The GPSOC maintains a Web site accessible to unclassified military users worldwide. The current SOF is posted at a conspicuous spot on this Web site for download. All other worldwide, civil users may download the SOF from the U.S Coast Guard Navigation Center Web site.

#### Classification

The SOF is Unclassified and approved for public release. [Reference GPS Security Classification Guide, 30 Sep 2008, Topic Number 700.7.10]

#### Format

The SOF is formatted in XML according to the format below. The data type definition (DTD), the data format, and the data field definitions are provided.

A sample SOF with an internal DTD is as follows (NOTE: if GPSIS is no longer used to generate the file, the file source tag "GPSISFILE" may be changed):

#### *SOF DTD*

```
<?xml version="1.0"?>
<!DOCTYPE GPSISFILE [
  <!ELEMENT GPSISFILE (CREATION,REFERENCE,(PREDICTED|CURRENT|HISTORICAL)+)>
  <!ELEMENT CREATION EMPTY>
  <!ELEMENT REFERENCE EMPTY>
```

<!ELEMENT PREDICTED EMPTY>  
<!ELEMENT CURRENT EMPTY>  
<!ELEMENT HISTORICAL EMPTY>  
<!ATTLIST GPSISFILE FILEID CDATA #FIXED "SOF">  
<!ATTLIST GPSISFILE SYSID CDATA #FIXED "GPS">  
<!ATTLIST GPSISFILE VERSION CDATA #REQUIRED>  
<!ATTLIST CREATION YEAR CDATA #REQUIRED>  
<!ATTLIST CREATION DOY CDATA #REQUIRED>  
<!ATTLIST CREATION HR CDATA #REQUIRED>  
<!ATTLIST CREATION MIN CDATA #REQUIRED>  
<!ATTLIST CREATION SEC CDATA #REQUIRED>  
<!ATTLIST REFERENCE YEAR CDATA #REQUIRED>  
<!ATTLIST REFERENCE DOY CDATA #REQUIRED>  
<!ATTLIST REFERENCE HR CDATA #REQUIRED>  
<!ATTLIST REFERENCE MIN CDATA #REQUIRED>  
<!ATTLIST REFERENCE SEC CDATA #REQUIRED>  
<!ATTLIST PREDICTED SVID CDATA #REQUIRED>  
<!ATTLIST PREDICTED SVN CDATA #REQUIRED>  
<!ATTLIST PREDICTED NAME (NANU|GOCGIS|USER\_DEFINED) #REQUIRED>  
<!ATTLIST PREDICTED TYPE (FCSTDV|FCSTMX) #REQUIRED>  
<!ATTLIST PREDICTED REFERENCE CDATA #REQUIRED>  
<!ATTLIST PREDICTED START\_YEAR CDATA #REQUIRED>  
<!ATTLIST PREDICTED START\_DOY CDATA #REQUIRED>  
<!ATTLIST PREDICTED START\_HR CDATA #REQUIRED>  
<!ATTLIST PREDICTED START\_MIN CDATA #REQUIRED>

<!ATTLIST PREDICTED START\_SEC CDATA #REQUIRED>  
<!ATTLIST PREDICTED END\_YEAR CDATA #REQUIRED>  
<!ATTLIST PREDICTED END\_DOY CDATA #REQUIRED>  
<!ATTLIST PREDICTED END\_HR CDATA #REQUIRED>  
<!ATTLIST PREDICTED END\_MIN CDATA #REQUIRED>  
<!ATTLIST PREDICTED END\_SEC CDATA #REQUIRED>  
<!ATTLIST CURRENT SVID CDATA #REQUIRED>  
<!ATTLIST CURRENT SVN CDATA #REQUIRED>  
<!ATTLIST CURRENT NAME (NANU|GOCGIS|USER\_DEFINED) #REQUIRED>  
<!ATTLIST CURRENT TYPE CDATA #FIXED "UNUSUFN">  
<!ATTLIST CURRENT REFERENCE CDATA #REQUIRED>  
<!ATTLIST CURRENT START\_YEAR CDATA #REQUIRED>  
<!ATTLIST CURRENT START\_DOY CDATA #REQUIRED>  
<!ATTLIST CURRENT START\_HR CDATA #REQUIRED>  
<!ATTLIST CURRENT START\_MIN CDATA #REQUIRED>  
<!ATTLIST CURRENT START\_SEC CDATA #REQUIRED>  
<!ATTLIST HISTORICAL SVID CDATA #REQUIRED>  
<!ATTLIST HISTORICAL SVN CDATA #REQUIRED>  
<!ATTLIST HISTORICAL NAME (NANU|GOCGIS|USER\_DEFINED) #REQUIRED>  
<!ATTLIST HISTORICAL TYPE (FCSTSUMM|UNUSABLE|UNUNOREF) #REQUIRED>  
<!ATTLIST HISTORICAL REFERENCE CDATA #REQUIRED>  
<!ATTLIST HISTORICAL START\_YEAR CDATA #REQUIRED>  
<!ATTLIST HISTORICAL START\_DOY CDATA #REQUIRED>  
<!ATTLIST HISTORICAL START\_HR CDATA #REQUIRED>  
<!ATTLIST HISTORICAL START\_MIN CDATA #REQUIRED>

```
<!ATTLIST HISTORICAL START_SEC CDATA #REQUIRED>  
<!ATTLIST HISTORICAL END_YEAR CDATA #REQUIRED>  
<!ATTLIST HISTORICAL END_DOY CDATA #REQUIRED>  
<!ATTLIST HISTORICAL END_HR CDATA #REQUIRED>  
<!ATTLIST HISTORICAL END_MIN CDATA #REQUIRED>  
<!ATTLIST HISTORICAL END_SEC CDATA #REQUIRED>
```

]>

### *SOF Structure*

```
<?xml version="1.0"?>
```

```
<GPSISFILE FILEID="SOF" SYSID="GPS" VERSION="2">
```

```
  <CREATION YEAR="2004" DOY="257" HR="11" MIN="2" SEC="11" />
```

```
  <REFERENCE YEAR="2004" DOY="257" HR="11" MIN="2" SEC="11" />
```

```
  <PREDICTED
```

```
    SVID="9" SVN="39"
```

```
    NAME="NANU" TYPE="FCSTMX" REFERENCE="2004094"
```

```
    START_YEAR="2004"   START_DOY="229"   START_HR="12"   START_MIN="0"  
    START_SEC="0"
```

```
    END_YEAR="2004"   END_DOY="230"   END_HR="0"   END_MIN="0"   END_SEC="0"
```

```
  />
```

```
  <CURRENT
```

```
    SVID="31" SVN="31"
```

```
    NAME="NANU" TYPE="UNUSUFN" REFERENCE="2004101"
```

```
    START_YEAR="2004"   START_DOY="257"   START_HR="5"   START_MIN="50"  
    START_SEC="0"
```

```
  />
```

```
<HISTORICAL
```

SVID="27" SVN="27"

NAME="NANU" TYPE="UNUSABLE" REFERENCE="2004100"

START\_YEAR="2004" START\_DOY="242" START\_HR="1" START\_MIN="32"  
START\_SEC="0"

END\_YEAR="2004" END\_DOY="243" END\_HR="19" END\_MIN="12" END\_SEC="0"

/>

</GPSISFILE>

All times are UTC TIME (ZULU) unless otherwise specified. DOY is day of year (same as JDAY); 1=1 January, 366 is valid for leap year

#### 'GPSISFILE' FILE INFORMATION

Occurs once per file

FILEID is always 'SOF'

SYSID is always 'GPS'

VERSION is the version number of the file. The version text should be an integer version number. Example: 2

CREATION indicates date/time of file creation. Time is computer time (UTC time zone).

REFERENCE indicates date/time to which SOF data applies. For example, if January 10, 2003 1550Z is the REFERENCE time then Satellite Outage information will be collected up to and including that time, including past, current, and predicted information. The REFERENCE time is set to be the date/time of the most recent NANU incorporated into the SOF.

#### 'SOF\_RECORD' INFORMATION

Occurs multiple times per file, once for each predicted, current or historical satellite outage issued by the REFERENCE data/time.

There are three types of SOF records.

PREDICTED identifies predicted outages as of the REFERENCE time.

CURRENT identifies any active outages as of the REFERENCE time, along with the time the outage began.

HISTORICAL identifies actual outages that have taken place prior to the REFERENCE time.

SVID - reusable identifier for each satellite in identified system. For GPS the SVID shall be the PRN.

SVN (Satellite Vehicle Number) – unique sequential number associated with satellite-specific program is an integer. For GPS this is assigned by the US Air Force.



#### PREDICTED record fields

NAME – Alphanumeric indicator of outage source (currently ‘NANU’). GOCGIS used when no NANU has been issued, yet outage is predicted or a GENERAL NANU has been issued that affects this outage.

TYPE – If NAME=NANU, then the choices are FCSTDV, FCSTMX. If a FCSTEXTD, then implemented as original type (FCSTDV or FCSTMX) with start date/time the same as in the FCSTEXTD and end date/time fixed twenty years out. If FCSTRESCD, then implemented as original type with dates/times as in the FCSTRESCD NANU. If a FCSTCANC type NANU is issued, the original type will be deleted from the SOF.

REFERENCE – reference info. If NAME=NANU this will be the NANU number of the last valid NANU associated with this outage. For example, if there is a FCSTDV issued with number 2003010, then REFERENCE=2003010. As another example, if there is a FCSTMX issued with number 2003047, followed by a FCSTEXTD with number 2003050, then REFERENCE=2003050.

#### CURRENT record fields

NAME – Alphanumeric indicator of outage source (currently ‘NANU’).

TYPE – If NAME=NANU, then the choices are UNUSUFN and GENERAL. If NANU is initially issued as a GENERAL launch message, then it will be implemented in the SOF as a UNUSUFN with the start date/time as 0000Z on the first day the satellite appears in the almanac.

REFERENCE – reference info. If NAME=NANU this will be the NANU number of the last valid NANU associated with this outage. For example, if there is a UNUSUFN issued with number 2003049, then REFERENCE=2003049.

#### HISTORICAL record fields

NAME –Alphanumeric indicator of outage source (currently NANU).

TYPE – If NAME=NANU, then the choices are FCSTSUMM, UNUSABLE, UNUNOREF, USABINIT, and GENERAL. If NANU is initially issued as a GENERAL launch message, then it will be implemented in the SOF as an UNUSABLE with stop dates/times as in the USABINIT and the start date/time as 0000Z on the first day the satellite appears in the almanac. This closes out the UNUSUFN that was implemented earlier for the GENERAL launch message. If the NANU is initially issued as a GENERAL decommission it will be implemented in the SOF as an UNUSABLE with the decommission date/time as the end date/time. If a GENERAL NANU is issued which cancels a previous NANU, the previous NANU will not appear in the SOF.

REFERENCE – reference info. If NAME=NANU this will be the NANU number of the last valid NANU associated with this outage. For example, if there is a FCSTSUMM issued with number 2003051, then REFERENCE=2003051.

### *Format Changes*

Changes to file formats are implemented as follows:

1. Files implementing a new format have the VERSION attribute of the GPSISFILE element incremented. Version 1 files encoded the file version in the filename. For example, a file with a previous format may have a name like 2004\_202\_145503\_v01.sof. Later file versions encode the version both in the filename, and the XML VERSION attribute. The filenames of the new file versions look like 2004\_202\_145503\_v02.sof.
2. If a new file format is implemented, both the old and the new file formats will be posted to the web site location for a transition period.
3. The old file format will be posted for six months, and then be removed. This provides time for users to adapt to the new file format.
4. Notifications of file format changes, with samples of the new format, will be published to <http://www.GPS.gov> when they are final.

## 40 APPENDIX 4: ALMANAC DATA FILES

### 40.1 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). The YUMA almanac is an easy-to-read format of the almanac data, while the SEM format is intended as input for software tools.

### 40.2 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.

### 40.3 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 40-I 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.

**Table 40-I Almanac Health**

Health Setting	Six Bit Health Word in NAV message	SEM and YUMA numerical representation of a 6 bit health word
ACTIVE	000000	000
BAD	111100	060
DEAD	111111	063

### 40.4 SEM Almanac Format

The SEM format, as shown in Figure 40-1, is arranged with a header that identifies the number of records (number of satellites) and file name (extension .alm). The SEM almanac sample illustrated below is a data sample of one record out of 28 in this sample file.

```
LINE
1 28 CURRENT.ALM
2 175 589824
3
R-1 1
R-2 32
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 40-1 SEM Data Sample

**Note:** The **bold** letters and numbers in the rectangles are not part of the SEM format; they are used for identification purposes in Table 40-II. Table 40-II identifies the characteristics of each parameter in the SEM almanac.

**Table 40-II Almanac Description (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 (WN <sub>a</sub> ) for all almanac data in the file	Weeks	0 to 1024 *	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 <sub>oa</sub> ) for all almanac data in the file	Second	0 to 602,112	1	6 significant digits
3	Blank line for format spacing					
<b>Record Format</b>						
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	None	1 to 32	None	2 significant digits
R-2	SVN	The SV reference number. It is equivalent to the space vehicle identification (SVID) number of the SV	None	0 to 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
b	Inclination Offset	Satellite almanac orbital "inclination angle offset" (δ <sub>i</sub> )** This does not include the 0.30 semicircle reference value (i <sub>0</sub> )**	Semi circles	-6.25 E-2 to +6.25 E-2	1.91 E-6	7 significant digits

**Table 40-II Almanac Description (Sheet 2 of 2)**

Line No	Almanac Name	Description	Units	Range	Accuracy	Precision
<b>c</b>	Rate of Right Ascension	Rate of change in the measurement of the angle of right ascension ( $\Omega$ -DOT)**	Semi circles/second	-1.1921 E-7*** to +1.1921 E-7***	3.64 E-12	7 significant digits
<b>R-5</b>	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 <sup>1/2</sup>	0 to 8,192	4.88 E-04	9 significant digits
<b>d</b>	Geographic Longitude of Orbital Plane	Geographic longitude of the orbital plane at the weekly epoch" ( $\Omega_0$ )**	Semi circles	-1.0 to +1.0	1.19 E-07	9 significant digits
<b>e</b>	Argument of Perigee	The angle from the equator to perigee ( $\omega$ )**	Semi circles	-1.0 to +1.0	1.19 E-07	9 significant digits
<b>R-6</b>	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
<b>f</b>	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
<b>g</b>	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
<b>R-7</b>	Satellite Health	The satellite subframe 4 and 5, page 25 six-bit health code **	None	0 to 63	None	2 significant digits
<b>R-8</b>	Satellite Configuration	The satellite subframe 4, page 25 four-bit configuration code **	None	0 to 15	None	2 significant digits
<b>R-9</b>	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.

## 40.5 YUMA Almanac

Parameters used in the YUMA format are not the same as used in the SEM format. The SEM parameters are the same as defined in IS-GPS-200 and broadcast from an SV. 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. Figure 40-2 illustrates one record of 28 in a sample YUMA almanac file. Line one of each record identifies the week in which the file was generated as well as the PRN number of the subject SV.

```
***** Week 175 almanac for PRN-01 *****  
ID:                                01  
Health:                             000  
Eccentricity:                       0.5404472351E-002  
Time of Applicability(s):           589824.0000  
Orbital Inclination(rad):           -0.7931758961E-008  
SQRT(A)    (m 1/2):                 5153.727539  
Right Ascen at Week (rad):          -0.4069756641E+000  
Argument of Perigee(rad):           -1.719371504
```

**Figure 40-2 YUMA Almanac Data Sample**

## **50 APPENDIX 5: LETTERS OF EXCEPTION**

### **50.1 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).

### **50.2 Applicable Documents**

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

### **50.3 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 50-1. Signatories for whom no letter of exception is shown have approved this version of the document without exception.



The Boeing Company  
5301 Bolsa Avenue  
Huntington Beach, CA 92647

10 September 2004  
Letter 03-0426-K211-LFB

Subject: Global Positioning System, (GPS) Block IIF  
Contract F04701-96-C-0025; Subject: Approval of ICD-  
GPS-240

To: ARINC Engineering Services, LLC  
4055 Hancock Street, Suite 100  
San Diego, CA 92110-5152



Attention: Mr. John Dobyne

To: Department of the Air Force  
GPHD  
2420 Vela Way, Suite 1467  
El Segundo, CA 90245-4659

Attention: Mr. Al Mak, PCO

Reference: ARINC Request for review and approval of ICD-GPS-240  
(E-mail dated 08/12/2004)

Pursuant to the ARINC Engineering Services request referenced above, Boeing is submitting the attached Signatory approval cover sheet for ICD-GPS-240, dated 10 August 2004. Boeing approves the subject ICD-GPS-240 with comments and with exception.

The reason for Boeing taking exception to the document is as follows:

The only content within ICD-GPS-240 that applies to the IIF contract relates to the Almanac Data Files (YUMA and SEM) located in section 3.2.1 (definition of the transfer of almanac data by floppy disk from OCS to GUSS offline tool and Appendix 3 (definition of the two almanac data formats). All other content of the ICD falls outside the scope of the IIF contract.

Should you require additional technical information, please contact Ms. Rebecca Gaede at 714-372-5178, or the undersigned at 562-797-2630 for contractual matters.

Please contact me if you have any questions.

Sincerely,

/Signed/

Bruce D. Jensen  
Contract Management  
GPS Programs

### Table 50-I Letter of Exception