The graphic features a dark background with a blue grid pattern. At the top left, there are four small squares in shades of gray and blue. To their right is a cyan arrow pointing left, followed by the word "SELECT" in white. The word "DELTA" is written in large, white, serif font. Below it, "GPS IIR-12" is written in large, yellow, serif font. In the top right corner, a red digital timer shows "00:00:00". Below the timer is a circular seal for the 50th Anniversary of the Air Force Space Command, featuring a satellite and the text "50 YEARS OF AIR FORCE SPACE COMMAND", "GPS IIR-12", and "SPACE - 1954 - 2004 - AIRPOWER". Below the seal, the letters "USAF" are written in large, blue, sans-serif font. Underneath "USAF" is a blue triangle with a white border and the Roman numeral "II" inside. At the bottom right, the Boeing logo is visible. On the left side, there is a stylized image of a rocket launch with a bright orange and yellow flame and a blue plume.

GPS IIR-12 Media Kit

This site requires a JavaScript-enabled browser and uses Flash for both animation and navigation. To get the full benefit of the [Boeing Web Site](#), you will need to download and install the latest version of the [Flash player](#), then return to view the [GPS IIR-12 site](#).

You can still view a non-Flash web page by clicking on the links below.

- [Delta Launch Videos](#)
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Delta Launch Vehicle

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VIDEO



Delta II Rocks!

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.rpm files require Realplayer plug-in installed for viewing



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PHOTO GALLERY



Previous GPS missions



GPS IIR-11 — Mar. 20, 2004

The 50th satellite launched for the U.S. Air Force Global Positioning System (GPS), GPS IIR-11, was delivered to space by a Boeing Delta II rocket. The three-stage rocket lifted off from Space Launch Complex 17B at Cape Canaveral Air Force Station, Fla., at 12:53 p.m. EST and was deployed to a transfer orbit following a 68-minute flight, where it joined the 24-satellite system.



GPS IIR-10 — Dec. 21, 2003

A Boeing Delta II 7925-9.5 launch vehicle lifts off from Space Launch complex 17A, Cape Canaveral Air Force Station, Fla., carrying the GPS IIR-10 spacecraft for the U.S. Air Force. The rocket lifted off at 3:05 a.m. EST. The deployment sequence was completed in 68 minutes at 4:13 a.m. EST.



GPS IIR-9 — Mar. 31, 2003

A Boeing Delta II 7925-9.5 launch vehicle lifts off from Space Launch complex 17A, Cape Canaveral Air Force Station, Fla., carrying the GPS IIR-9 spacecraft for the U.S. Air Force. The rocket lifted off at 5:09 p.m. EST. The 68-minute mission ended with the successful delivery of the spacecraft to the targeted orbit.



GPS IIR-8 and XSS-10 — Jan. 29, 2003

A Boeing Delta II 7925-9.5 launch vehicle lifts off from Space Launch Complex 17B, Cape Canaveral Air Force Station, Fla., carrying the GPS IIR-8 spacecraft for the U.S. Air Force Space Command and the XSS-10 demonstration satellite for the Air Force Research Laboratory. The rocket lifted off at 1:06 p.m. EST. This was the 35th launch for the GPS program aboard a Delta rocket.



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GPS IIR-12



U.S. Air Force

Delta Launch Vehicle Programs



GPS Mission

The Navstar Global Positioning System (GPS) is a constellation of orbiting satellites that provides navigation data to military and civilian users all over the world. The system is operated and controlled by the 50th Space Wing, located at Schriever Air Force Base, Colo.

GPS satellites orbit the Earth every 12 hr, emitting continuous navigation signals. With the proper equipment, users can receive these signals to calculate time, location, and velocity. The signals are so accurate that time can be figured to within a millionth of a second, velocity within a fraction of a mile per hour, and location to within 100 ft. Receivers have been developed for use in aircraft, ships, and land vehicles, as well as for hand carrying.

GPS provides 24-hr navigation services including:

- Extremely accurate, three-dimensional location information (latitude, longitude, and altitude), velocity, and precise time
- A worldwide common grid that is easily converted to any local grid
- Passive all-weather operations
- Continuous real-time information
- Support to an unlimited number of users and areas
- Support to civilian users at a slightly less accurate level

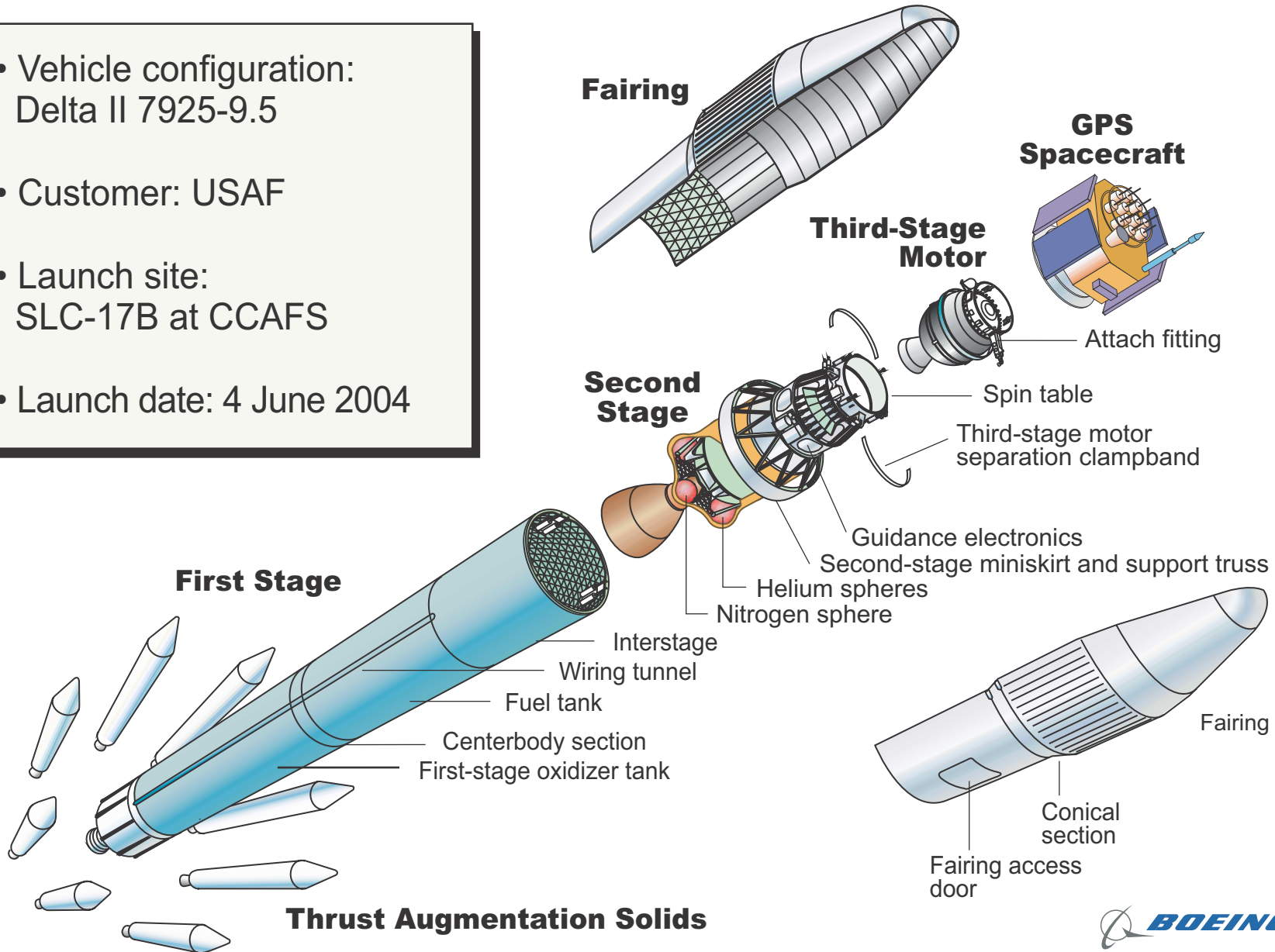
The GPS constellation is designed and operated as a 24-satellite system, consisting of six planes, with a minimum of four satellites per plane.

The GPS satellites are placed into nearly 11,000-mile circular orbits. While circling the Earth, the systems transmit signals on two different L-band frequencies. Their design life is 7.5 years.



Delta II 7925-9.5 Launch Vehicle

- Vehicle configuration: Delta II 7925-9.5
- Customer: USAF
- Launch site: SLC-17B at CCAFS
- Launch date: 4 June 2004



GPS IIR Spacecraft Mission Requirements

- **Transfer orbit criteria (defined at space vehicle separation)**
 - **Apogee altitude** 10,998.00 nmi (integrated)
 - **Perigee altitude** 101.00 nmi
 - **Inclination** 39.00 deg
 - **Geodetic latitude (at first apogee)**
 - **Descending node** 8.84 deg N
- **Payload weight** 4,480.0 lb (2,032.1 kg)
- **Transfer orbit injection mode** Descending node
- **Launch pad** SLC-17B

GPS IIR Spacecraft Mission Requirements (continued)

- Spin rate 55 rpm
- Second-stage probability of command shutdown (PCS) $\geq 99.7\%$
- Free molecular heating rate at fairing separation $\leq 0.1 \text{ Btu/ft}^2\text{-sec}$
(1,135 W/m^2)

GPS IIR Flight Mode Description

- Delta II 7925-9.5 vehicle configuration
- Launch from CCAFS SLC-17B down flight azimuth of 110 deg
- 6/3 GEM solid motor firing sequence
- Common boost trajectory utilized for both descending and ascending node injection flight modes
- Boost trajectory designed to meet controllability, structural and environmental constraints while maximizing vehicle performance
- Dogleg maneuver used to increase parking orbit inclination
 - Maneuver split between booster and second-stage flight to meet range safety constraints
- Payload fairing jettisoned when free molecular heating rate is $< 0.1 \text{ Btu/ft}^2\text{-sec}$ ($1,135 \text{ W/m}^2$)
- Second-stage first burn places vehicle in parking orbit at SECO-1
 - Descending node: 94 x 212 nmi orbit at 36.90-deg inclination

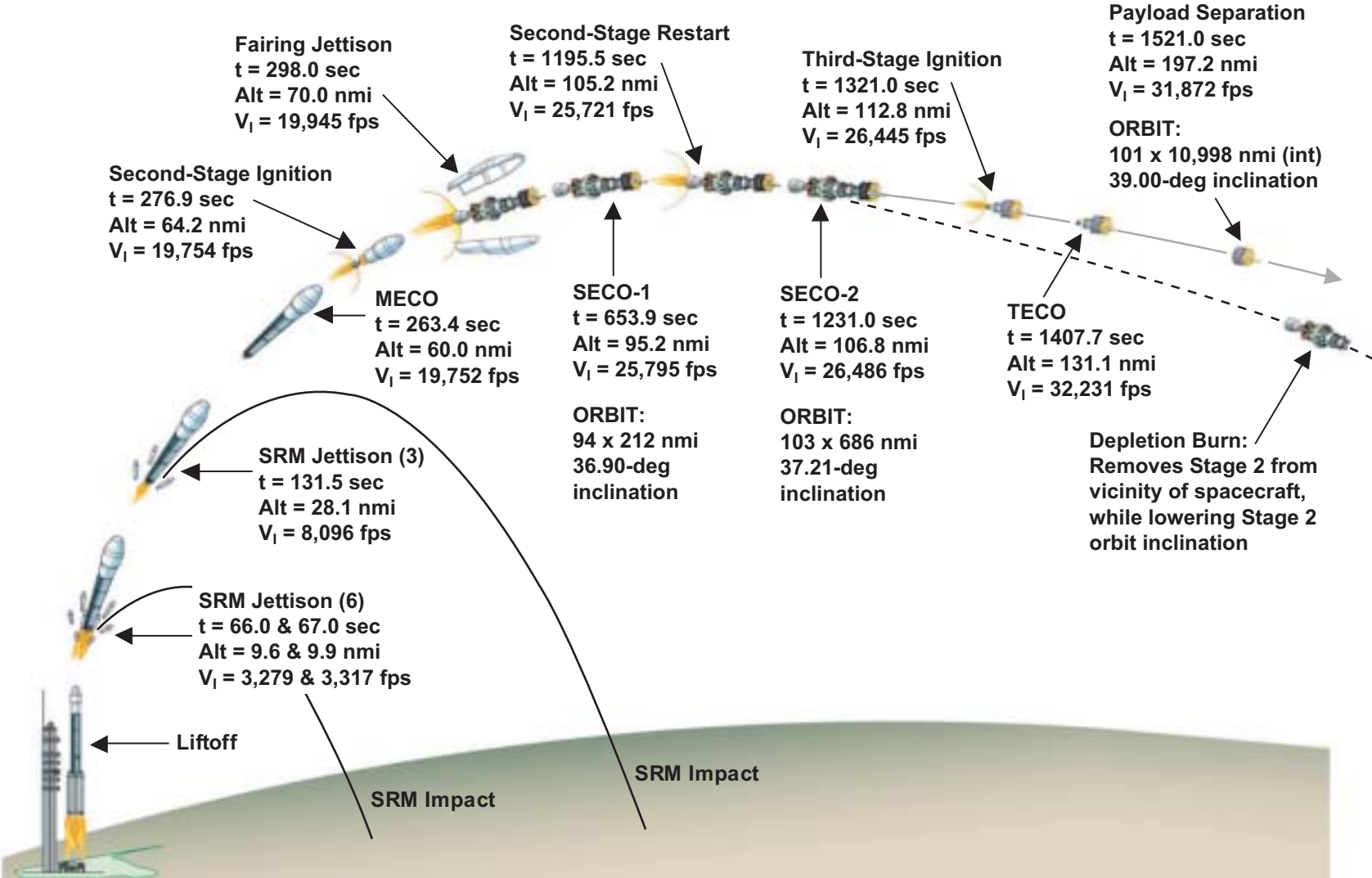
GPS IIR Flight Mode Description (continued)

- **Following SECO-1, vehicle is reoriented to second-stage restart and third-stage burn attitude**
- **At end of reorientation maneuver, vehicle is rolled -75 deg to position second-stage T/M antennas for best reception of T/M data from Ascension T/M tracking station during restart burn**
- **Following short coast period of 9 min, second-stage restart occurs at approximately 20 min after liftoff over Ascension T/M Tracking Station**
 - **Restart burn duration of approximately 35.5 sec**
 - **Restart radar elevation angle of 1 deg at Ascension**
 - **103 x 686 nmi orbit at 37.21-deg inclination**

GPS IIR Flight Mode Description (continued)

- **Spin-up and separation of third stage follows restart burn cutoff**
- **Third-stage burn and NCS blowdown places space vehicle into the transfer orbit**
- **Space vehicle separation occurs approximately 25.3 min after liftoff; third-stage yo deployed 2 sec after separation to tumble stage and preclude recontact with the spacecraft**

GPS IIR Descending Node Flight Profile



GPS IIR Mission Sequence of Events

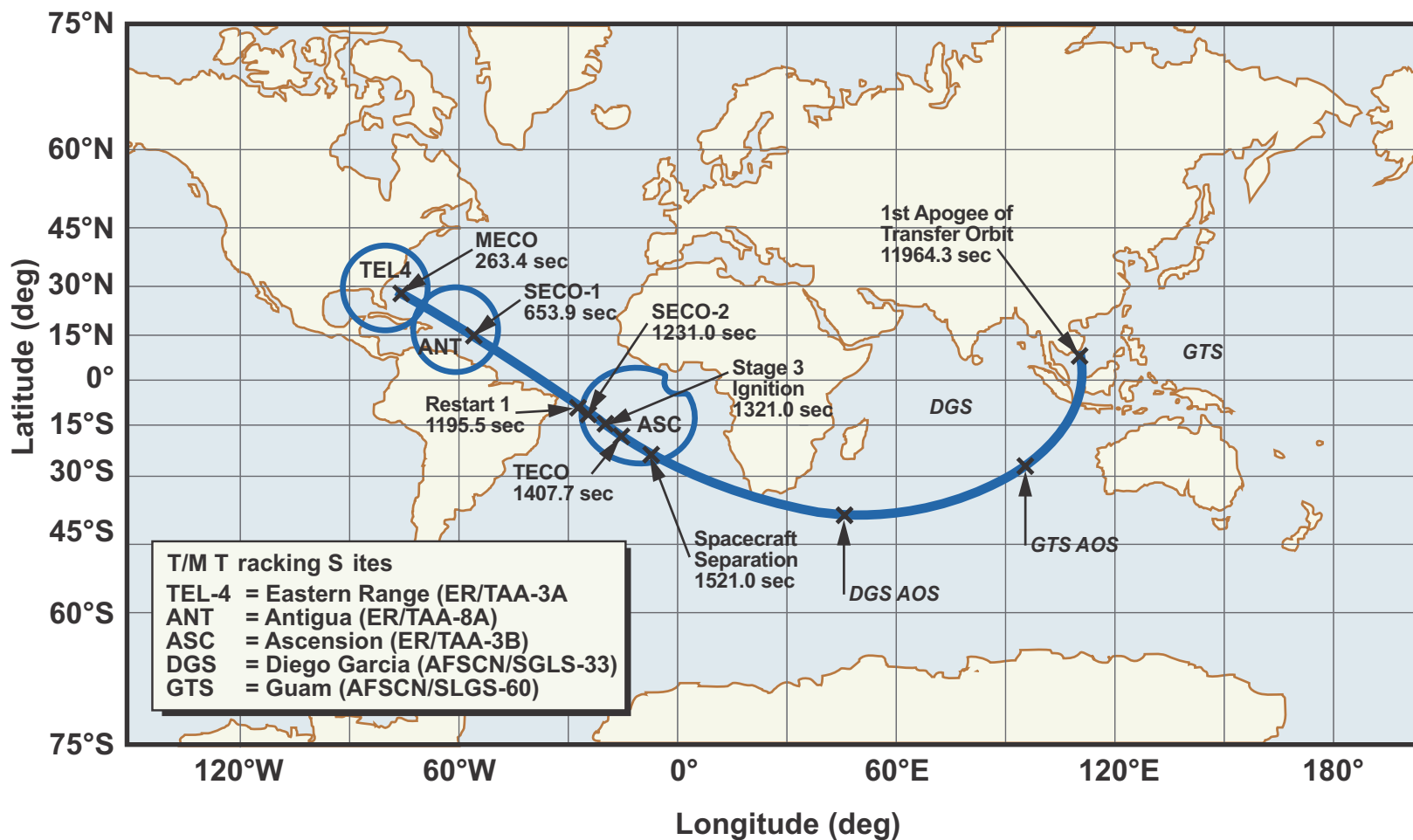
Event	Time (min:sec)
Liftoff	00:00.0
Mach 1	00:32.6
Maximum dynamic pressure	00:49.8
Six solid motors burnout	01:03.1
Three solid motors ignition	01:05.5
Jettison three solid motors	01:06.0
Jettison three solid motors	01:07.0
Three solid motors burnout	02:08.8
Jettison three solid motors	02:11.5
Begin dogleg maneuver – Stage I	02:20.0
End dogleg maneuver – Stage I	02:40.0
Maximum miniskirt temperature	03:14.3
MECO	04:23.4
Stage I-II separation	04:31.4
Stage II ignition	04:36.9
Begin dogleg maneuver – Stage II	04:43.0
End dogleg maneuver – Stage II	04:53.0

GPS IIR Mission Sequence of Events (continued)

Event	Time (hr:min:sec)
Jettison fairing	00:04:58.0
First cutoff – second stage (SECO-1)	00:10:53.9
Begin maneuvers to restart attitude	00:11:50.0
Restart attitude achieved	00:17:35.0
Restart second stage	00:19:55.5
Second cutoff – second stage (SECO-2)	00:20:31.0
Start Stage III ignition time delay relay – fire spin rockets	00:21:21.0
Stage II-III separation	00:21:24.0
Stage III ignition/NCS enable	00:22:01.0
Stage III burnout	00:23:27.7
Begin NCS blowdown	00:24:11.0
End NCS blowdown	00:25:03.3
Spacecraft separation	00:25:21.0
Stage III yo deploy	00:25:23.0
First apogee of transfer orbit	03:19:24.0

GPS IIR Descending Node Orbit Trace

Flight Azimuth = 110 deg
 Radar elevation angle = 2.0 deg



GPS IIR Flight Mode Description (continued)

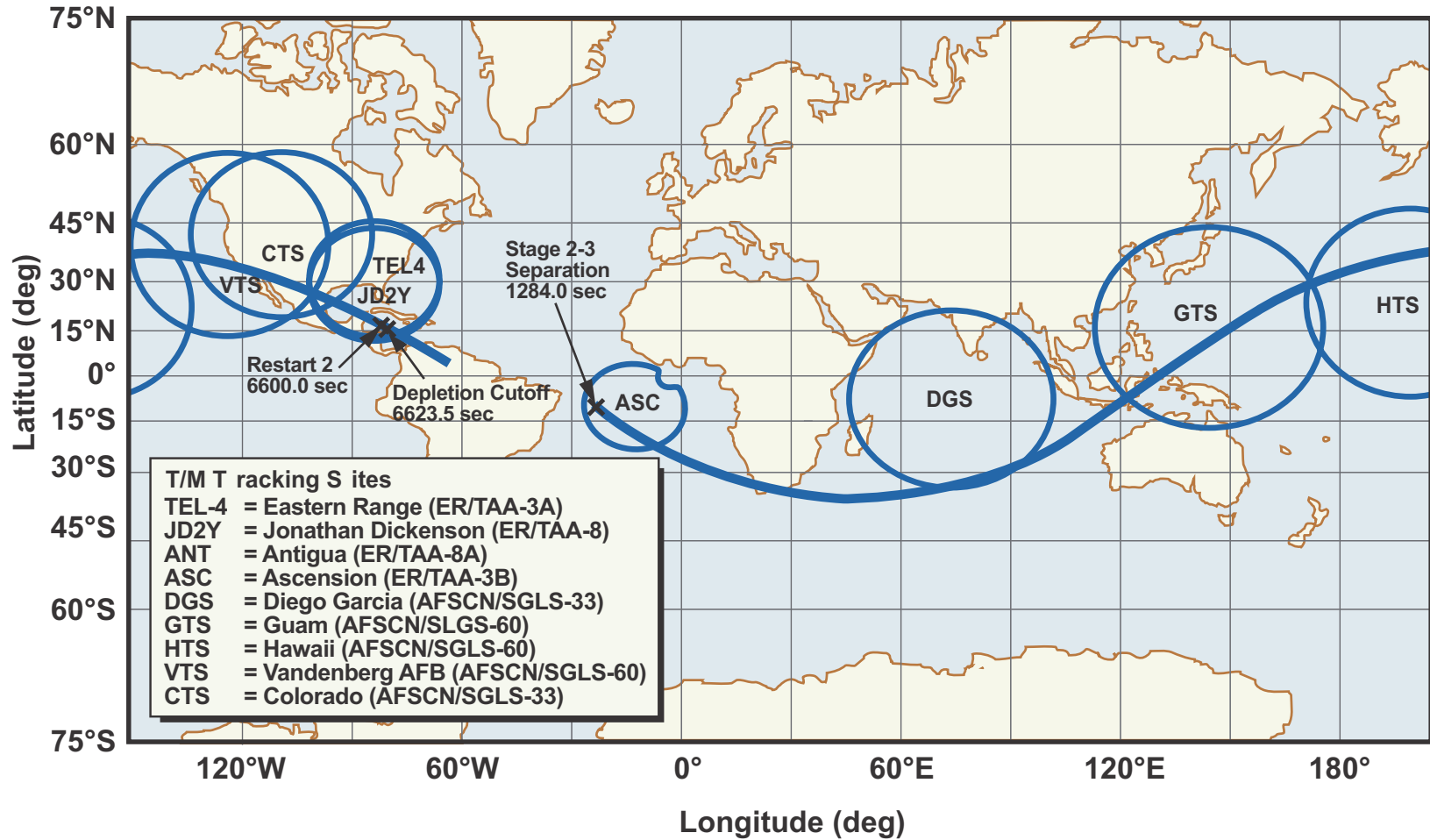
- **Following second/third-stage separation, vehicle is reoriented to second-stage depletion burn attitude**
- **After reorientation maneuver, vehicle is rolled to position the second-stage T/M antennas for best reception of T/M data from tracking station(s) during depletion burn**
- **Second-stage depletion burn follows primary mission to safe the stage and lower inclination to minimize casualty probability**
 - **Occurs in view of the Eastern Range TEL-4 and Jonathan Dickenson T/M Tracking Stations**

GPS IIR Depletion Sequence of Events

Event	Time (hr:min:sec)
Stage II-III separation	00:21:24.0
Begin maneuvers to restart attitude	01:06:40.0
Restart attitude achieved	01:17:00.0
Restart second stage	01:50:00.0
Depletion cutoff – second stage	01:50:23.5

GPS IIR Depletion Orbit Trace

Flight Azimuth = 110 deg
Radar elevation angle = 2.0 deg



GPS IIR-12



Integrated Defense Systems
P. O. Box 516
St. Louis, MO 63166
www.boeing.com

Boeing Delta II GPS IIR-12 Mission

Mission: Global Positioning System (GPS) IIR-12

Date: June 21, 2004

Time: 7:02 – 7:29 p.m. EDT (27-minute window)

Launch Site: Space Launch Complex 17B
Cape Canaveral Air Force Station, Fla.

Launch Vehicle: Boeing Delta II 7925-9.5

Customer: U.S. Air Force Space Command

Spacecraft Maker: Lockheed Martin Space Systems

Overview: GPS IIR-12 is a replacement satellite for the U.S. Air Force's Global Positioning System. GPS provides directional guidance for the U.S. military and civilian users around the world. It offers three-dimensional data (longitude, latitude and elevation) as well as precise time and velocity.

Boeing Delta II rockets have launched all Block II GPS satellites that make up the current operating constellation.

The GPS system is operated by the 50th Space Wing, Schriever Air Force Base, Colo.

###

Contact:
Boeing Communications: (714) 896-1301
Boeing Launch Hotline: (714) 896-4770
Boeing Delta Web site: www.boeing.com/delta



LINKS



[Boeing Launch Services](#)

[Space and Missile Systems Center, Los Angeles Air Force Base, U.S. Air Force \(customer\)](#)

[Lockheed Martin Space Systems Company — Missiles & Space Operations \(GPS IIR-12 spacecraft developer\)](#)



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