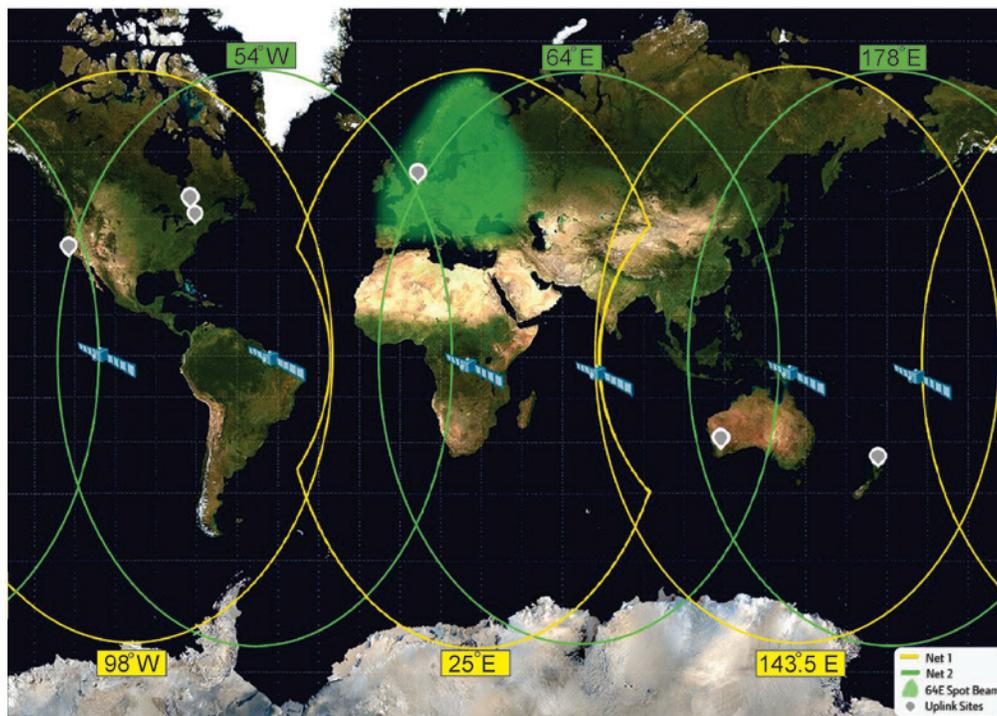


C-Nav[®] GNSS Correction Services Precise point positioning (PPP) correction technology



FEATURES

Two simultaneous correction messages

Six Inmarsat satellites for L-band delivery

High reliability and maximum uptime

C-Nav[®] GNSS Correction Services

Precise point positioning (PPP) correction technology

The Oceaneering[®] C-Nav[®]PPP correction service offers unparalleled levels of redundancy, integrity, and reliability. This is achieved by using a large reference station network, two processing centers, unique solutions, and delivery options of either six Inmarsat satellites or the Internet. With 15 years of experience, 150,000 users, and worldwide 24/7 support, our system is unsurpassed.

C-Nav[®] Services

- » **SF2** – C-NavC¹ and C-NavC² correction streams at optimum sub-decimeter accuracy from six Inmarsat L-band satellites
- » **SF1** – C-NavC¹ and C-NavC² correction streams at sub-meter accuracy from six Inmarsat L-band satellites
- » **Internet** – C-NavC² correction stream available at 1-second, 15-second, and 60-second update rates

Features

- » C-NavC¹ GPS correction, and C-NavC² GPS and GLONASS corrections on satellite-delivered services
- » Over 55 dual GPS/GLONASS reference sites
- » Ten network monitoring sites
- » Six user-access monitoring sites

Redundancy in Key Areas:

- » System performance can be maintained even with a loss of up to 30% of monitoring stations
- » Multiple receivers and communications links to processing centers
- » Two geographically separated processing centers with redundant communications links to the Inmarsat uplink sites
- » Two unique correction calculation methods available to all users
- » Six Inmarsat satellites send corrections, with a choice of two Inmarsat satellites for most users

A PPP correction system consists of:

- » **Reference network** – Measures the range to each satellite from multiple locations
- » **Processing center** – Provides algorithms that are used to compute the clock and orbit errors of each satellite
- » **Delivery system** – Sends corrections to users
- » **User equipment** – Uses the correction data to produce high-accuracy, stable-position data

Reference Network

C-Nav[®] GNSS correction system satellite tracking stations include a minimum of two active receivers at each site, and also comprises:

- » Worldwide network of dedicated sites
- » Redundant A and B dual-frequency receivers at each site
- » Simultaneous observations to each tracked satellite from typically seven stations
- » Secure, multi-routed communication links to processing centers
- » Monitoring sites with feedback to the processing centers

Processing Centers

We have two identical processing centers, one in California and one in Illinois. At each processing center, two unique correction solutions are calculated: C-NavC¹® (the GPS-only solution) and C-NavC² (the GPS and GLONASS solution). Each processing center:

- » Receives the full complement of C-Nav[®] reference station data (both A and B receivers)
- » Compares the observables from each A and B receiver and independently selects the optimum solution
- » Calculates C-NavC¹ and C-NavC² solutions, which handle the data cloud independent of each other, producing two independent sets of PPP corrections
- » Continuously monitors PPP correctors for quality assurance
- » Is fed by resilient and spatially diversified communication routing links
- » Sends correctors to the Land Earth Station (LES) network for uplink to the C-Nav[®] Inmarsat satellites (Net-1 and Net-2) and via dedicated servers to the Internet

Delivery Systems

The C-Nav[®] satellite delivery system has six geostationary satellites providing global, high-power L-band signals. A minimum of two satellites are visible to most C-Nav[®] PPP corrections users. The six-satellite constellation is divided into Net-1 and Net-2 to simplify redundancy settings on the user equipment.

- » Correction data from both processing centers are compared, and the best is sent to the satellite.
- » Secure, high-speed cable and VSAT with ISDN backups are used for data flow between the processing centers and the uplink sites.
- » The Inmarsat satellites are constantly monitored to ensure service continuity and quality.
- » Backup channel capacity is available on adjacent satellites covering the same regions.
- » Since the expansion of Net-1 and Net-2 to six satellites, the uptime of the combined system has been 100%.

User Segment Receiver Technology

C-NavC¹ and C-NavC² subscription services can be used by the C-Nav5000™, C-Nav3050®, and C-Nav7000® GNSS receivers. The C-NavC¹ service is used by C-Nav legacy receivers (the C-Nav2050 and C-Nav2000).

Because these receivers are designed by the same experts that developed the correction algorithms, they make optimum use of the data to produce outstanding stable, reliable, and accurate results.



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