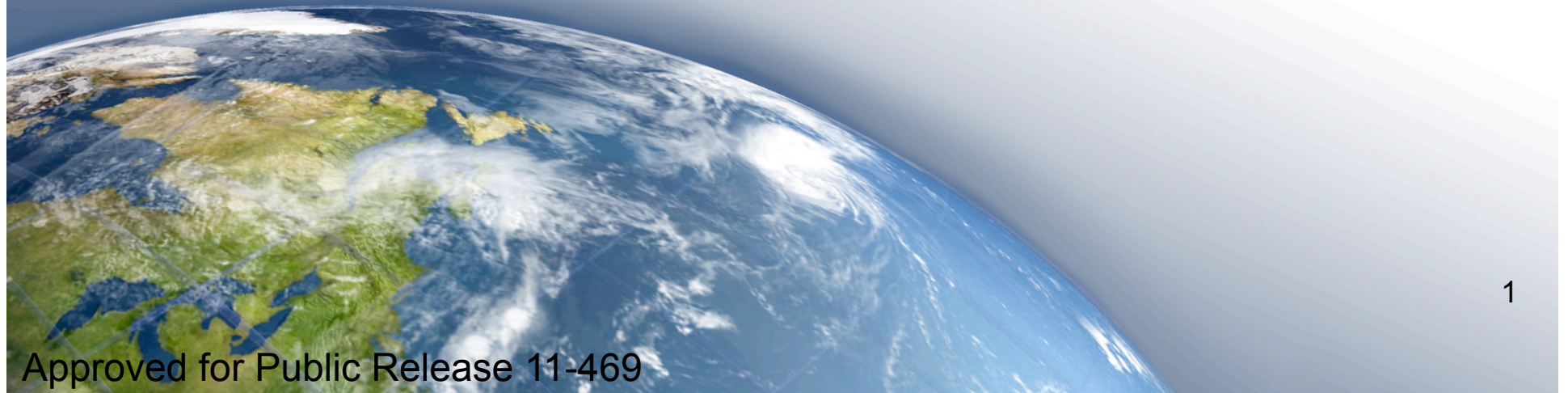




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# **Proposal for the Redefinition of UTC: Influence on NGA Earth Orientation Predictions and GPS Operations**

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# Outline

- **NGA's Role in GPS**
- **DoD GPS Monitor Station Network**
- **NGA and GPS Operations**
- **Redefinition of UTC - Effects on NGA GPS Operations**
- **Summary**

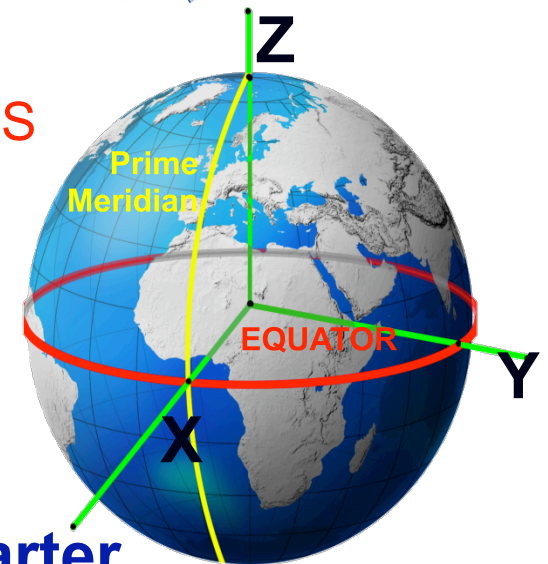
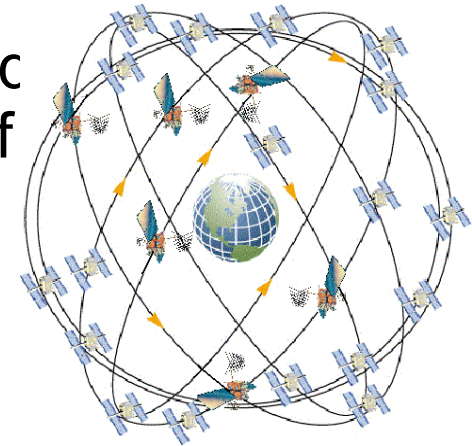


## NGA's Role in GPS

NGA's mission is to provide timely, relevant and accurate geospatial intelligence in support of national security objectives

### NGA's GPS Mission

- Provide global geodetic reference frame and geophysical models (WGS 84)
- Provide satellite tracking data to GPS OCS
- **Provide Earth Orientation Predictions to GPS OCS**
  - UT1-UTC,  $X_p$ ,  $Y_p$
- Generation and distribution of GPS precise ephemerides and GPS clock solutions
  - Precise geodetic surveying world-wide
- GPS contributes to the determination of WGS 84



**Signatory (as DMA) on 1975 GPS JPO Charter**





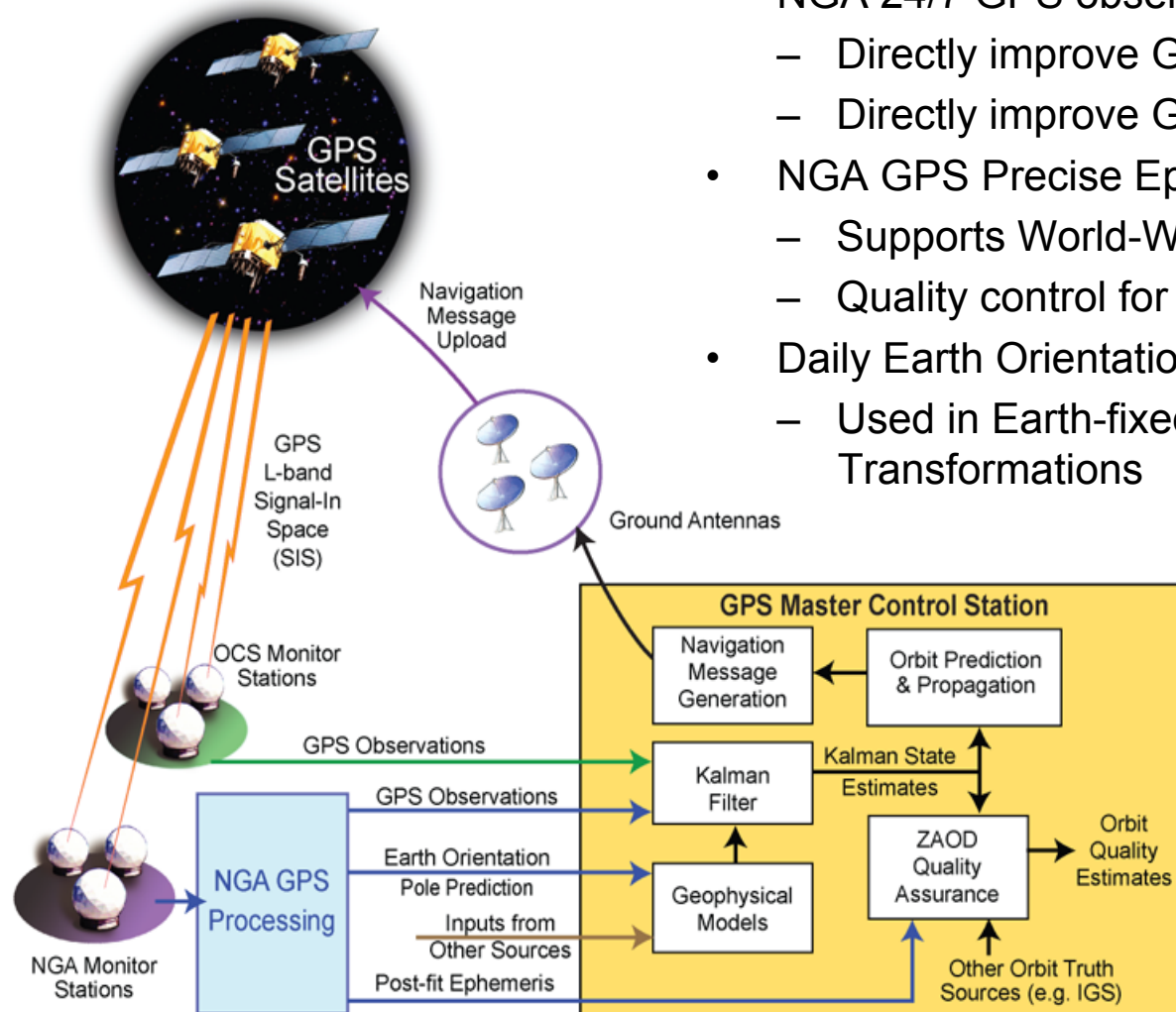
# DoD GPS Monitor Station Network





## NGA & GPS Operations

- NGA 24/7 GPS observations
  - Directly improve GPS Broadcast Accuracy
  - Directly improve GPS Integrity Monitoring
- NGA GPS Precise Ephemeris
  - Supports World-Wide Geodetic Surveying
  - Quality control for GPS operations
- Daily Earth Orientation Predictions and Post-fit estimates
  - Used in Earth-fixed to Inertial Reference Frame Transformations



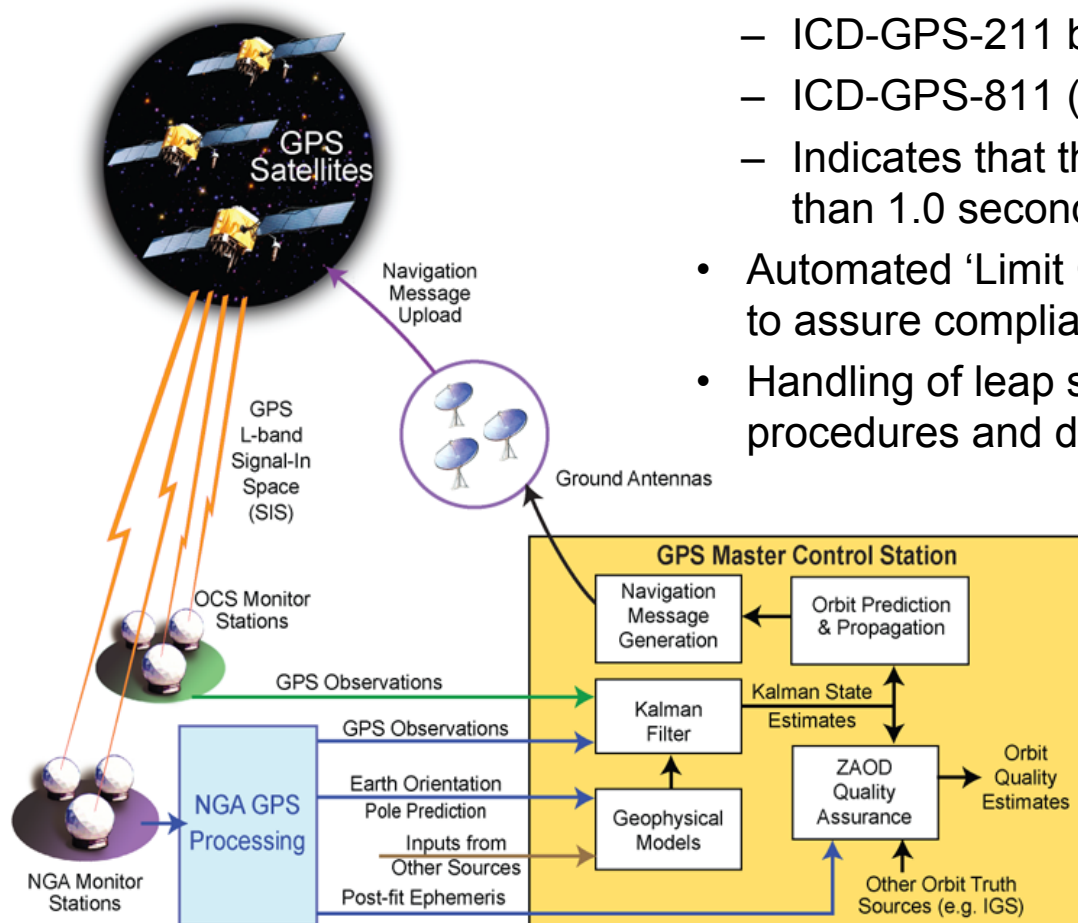
- Collaboration
  - Sharing of data
  - Anomaly resolution
  - Real-time support
  - Provide GEOINT technical assistance to the USAF



# NGA Earth Orientation Predictions

## Requirements Driven

- Interface Control Documents (ICDs)
  - ICD-GPS-211 between NGA and the GPS OCS
  - ICD-GPS-811 (in prep) between NGA and the OCX
  - Indicates that the UT1-UTC parameter is to be less than 1.0 second
- Automated 'Limit Checks' have been established in code to assure compliance with ICDs.
- Handling of leap seconds has been 'institutionalized' with procedures and documentation



ICD-GPS-211D Requirements		
Predictions (days)	Polar Motion X & Y (mas)	UT1-UTC (ms)
1	3	3
7	7	5
14	10	7
35	15	12





# Redefinition of UTC -Effects on NGA GPS Operations

- Modification to Interface Control Documents (ICDs)
  - ICD-GPS-211
  - ICD-GPS-811
- A regular source of UT1-UTC predictions will continue to be needed for NGA, GPS and other DoD Satellite Operations
- Modification to Operational Software
  - Code requiring modification will have to be identified
  - Code modified and its documentation updated
  - Execution will then need to be tested, verified, and certified for operational use
  - At NGA, GPS OCS, and other users of ICD-GPS-211 data
  - Required resources and schedule are not identified at this point
- Redefinition of UTC (Elimination of LS) offers no benefits to NGA GPS operations



## Summary

- DoD GPS Monitor Stations, the 'starting point' for all GPS Positioning, Navigation and Timing (PNT) are located on the Rotating Earth
- A regular source of UT1-UTC predictions will continue to be needed for NGA, GPS and other DoD Satellite Operations
- Allowing UT1-UTC to grow beyond the current 1 sec limit
  - Will require resources to modify existing ICDs and operational software
  - Offers no benefits to NGA or GPS Operations





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