Civil GPS Service Interface Committee (CGSIC)

Munich Satellite Navigation Summit

Captain Bill Burns
CGSIC Deputy Chair
Munich, Germany
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A Global Service Center

- Government **designation** as civil service center
- Website, RSS feeds and e-mail list servers **distribute** all operational GPS data products and interface documents
- 24/7/365 customer service **watch**
- **Answer inquiries** and disruption reports from around the world
- Represent user communities and **advocate** for civilian use of GPS at meetings of the GPS Program
- **Coordinate** operations with other Provider Service Centers

Additional management activities

- PNT Executive Committee - **Governance**
- National Coordination Office - **Policy**
- National PNT Engineering Forum (NPEF) - **Analysis**
- PNT Advisory Board - **Independent Review**
- Civil **Program Management** Review (PMR)
- Interagency Forum for **Operational Requirements** (IFOR)
- CGSIC – **User Forum**

Space-Based Positioning, Navigation, and Timing Advisory Board Members

SGE's are experts from industry or academia who temporarily receive federal employee status during Advisory Board meetings.

Bradford Parkinson (Acting Chair), Stanford University
Thad Allen, Booz Allen Hamilton
Penina Axelrad, University of Colorado
John Betz, MITRE
Dean Brenner, Qualcomm
Joseph D. Burns, Sensurion Aerospace
Per K. Enge, Stanford University
Martin C. Faga, MITRE
James E. Geringer, ESRI
Ronald R. Hatch, consultant to John Deere
Rajiv Khosla, Colorado State University
Peter Marquez, Planetary Resources
Terence J. McGurn, private consultant (retired CIA)
Timothy A. Murphy, The Boeing Company
Ruth Neilan, Jet Propulsion Laboratory
T. Russell Shields, Ygomi

Representatives

Representatives are individuals designated to speak on behalf of particular interest groups.

Gerhard Beutler, International Association of Geodesy (Switzerland)
Elizabeth Cannon, Canadian Aeronautics and Space Institute (Canada)
Ann Ciganer, GPS Innovation Alliance
Arve Dimmen, Norwegian Coastal Administration (Norway)
Matt Higgins, International GNSS Society (Australia)
Hiroshi Nishiguchi, Japan GPS Council (Japan)
Rafaat M. Rashad, Arab Institute of Navigation (Egypt)

CGSIC Organization for Outreach

- Organization has been put in place to brief users on status of programs and solicit feedback on changing user requirements

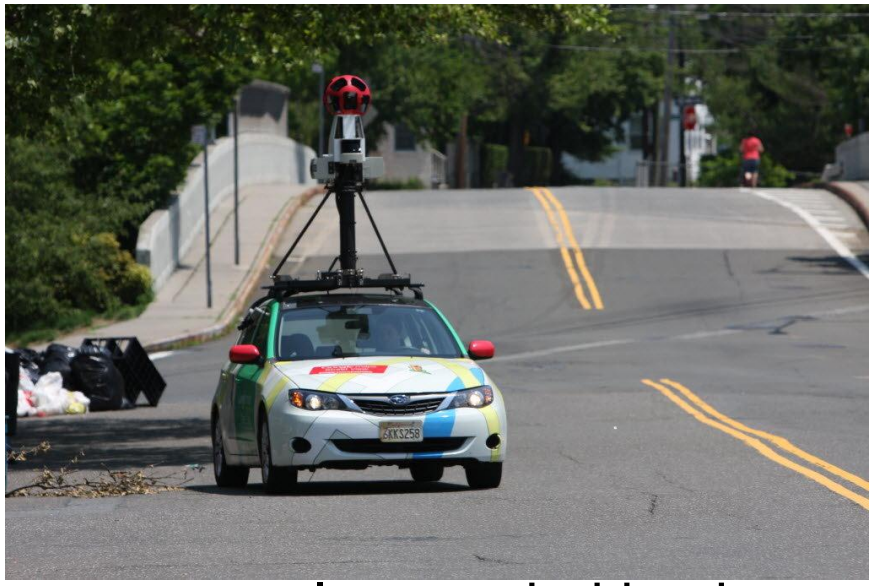
- CGSIC Plenary Committee and Subcommittees
  - International Information Subcommittee
  - Timing Subcommittee
  - State and Local Government Subcommittee
  - Survey, Mapping and Geo-Sciences Subcommittee

Users reporting mapping problems

- “My Grandmother’s address is wrong in GPS and I am worried about emergency services getting to her. You need to fix it.”
- “My customers cannot find my business location in GPS, please fix it.”
- “GPS is directing customers to a competitor’s location instead of mine. The address is wrong and needs to be corrected.”
- “GPS is sending trucks down our road that cannot fit. You have to stop them.”
- “If you send one more car down my driveway in the middle of the night, I don’t care, I’m putting out a spike strip.”

Easy to dismiss but….

- These are your users and system as a whole is blamed
- Some are economically important business users:
  - Grocery Stores
  - Hotels
  - Dealerships
  - Tech industry
  - Gas Station
  - Government Services
  - Financial services



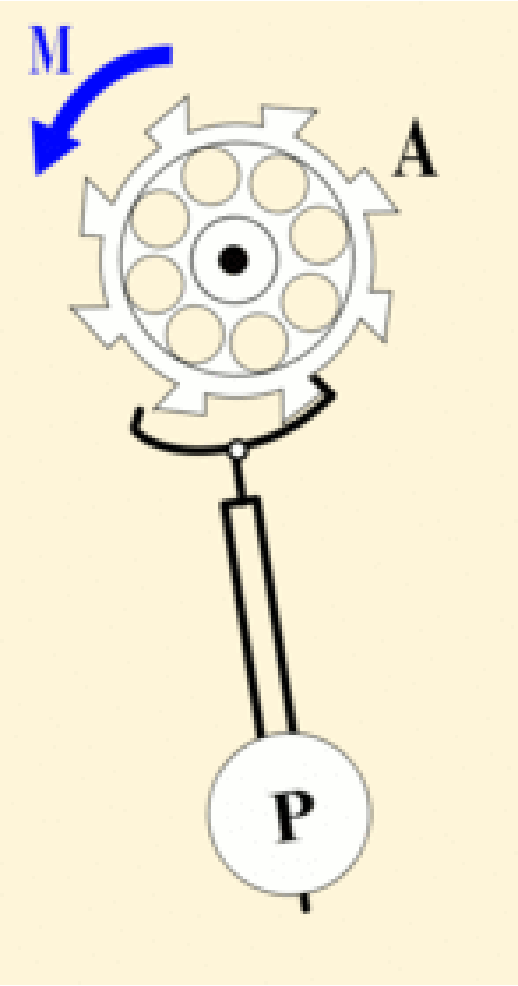
- Unless the address has been accurately recorded by the Google StreetMap car or other GIS data mapper, it may, in fact, not be in the correct location.
- Education is important and necessary

International Finance

- Machine assisted trading dominates
  - Requirement for precision timing
  - Soon requiring time stamping of ALL financial transactions
  - One US bank alone transacts over $35 Trillion dollars a day
  - NYSE averages over $15B in the first 2 minutes after the opening
- Challenges:
  - Developing a timing solution accurate to 1µS per transaction across a data center
  - Developing the ability to time stamp every transaction
  - Developing analytics to measure the performance of the transaction environment at 100's of millions of transaction per second.
- Market transparency
  - Did all market participants have fair and equal access?
  - Are all the markets seeing information at nearly the same time?

Timing compatibility

- Much of the world's precise timing comes from our GNSS satellites.
- Need to work towards compatible time in a system of systems
- One issue in the user community is the insertion of Leap Seconds
- CGSIC Timing Subcommittee has looked at the issue and issued an opinion which they have forwarded to the ITU



CGSIC opinion on the redefinition of UTC now under consideration by the International Telecommunications Union (ITU) *Prepared by Timing Subcommittee*

Considering that

•In 1971, the ITU-R (formerly CCIR, International Consultative Committee for Radiocommunications) proposed the present form of Coordinated Universal Time (UTC), which is based upon the SI second but remains linked to the variable rotation of the Earth through the introduction of leap seconds, which are inserted preferentially at the end of December 31 or June 30 in such a manner that |UT1-UTC| will always be less than 0.9 second.

•At the time of introduction, the future implementation of satellite and other systems which cannot easily incorporate the leap second was not foreseeable.

•A proposal on the redefinition of UTC is under consideration by ITU, about which the ITU has solicited the opinion of several international bodies

And further considering that

- Leap second insertions have increasingly been associated with failures of navigational as well as timing systems, among them the ground, transmission, or accounting systems of GPS, LORAN, and commercial air travel,
- Uncorrected mis-programming of a GPS receiver was responsible for a failure in mid-month, at a time when no leap second would have been expected,
- Approximately 10% of the world's Network Time Protocol (NTP) servers, which provides an internet-based timing structure upon which many navigational systems depend, failed to correctly handle the leap second insertion of 2012,
- Never, as long as NTP servers have been monitored, has everyone correctly predicted the presence or absence of leap second on a December 31 or June 30,
- Some systems have been mis-programmed to insert leap seconds after 23:59:59 local time instead of 23:59:59 UTC,
- Full impact difficult to judge, many corporations, governments, providers of navigational systems, and other groups do not report failures as a matter of policy
- In the interests of safety, some systems cease operations at the time a leap second is to be introduced

Concludes

- That many navigational and timing systems are at risk of failure due to possible leap second insertions,
- Which, although numerically few, can pose an unacceptable danger to travelers

And [the timing sub…] is therefore of the opinion that

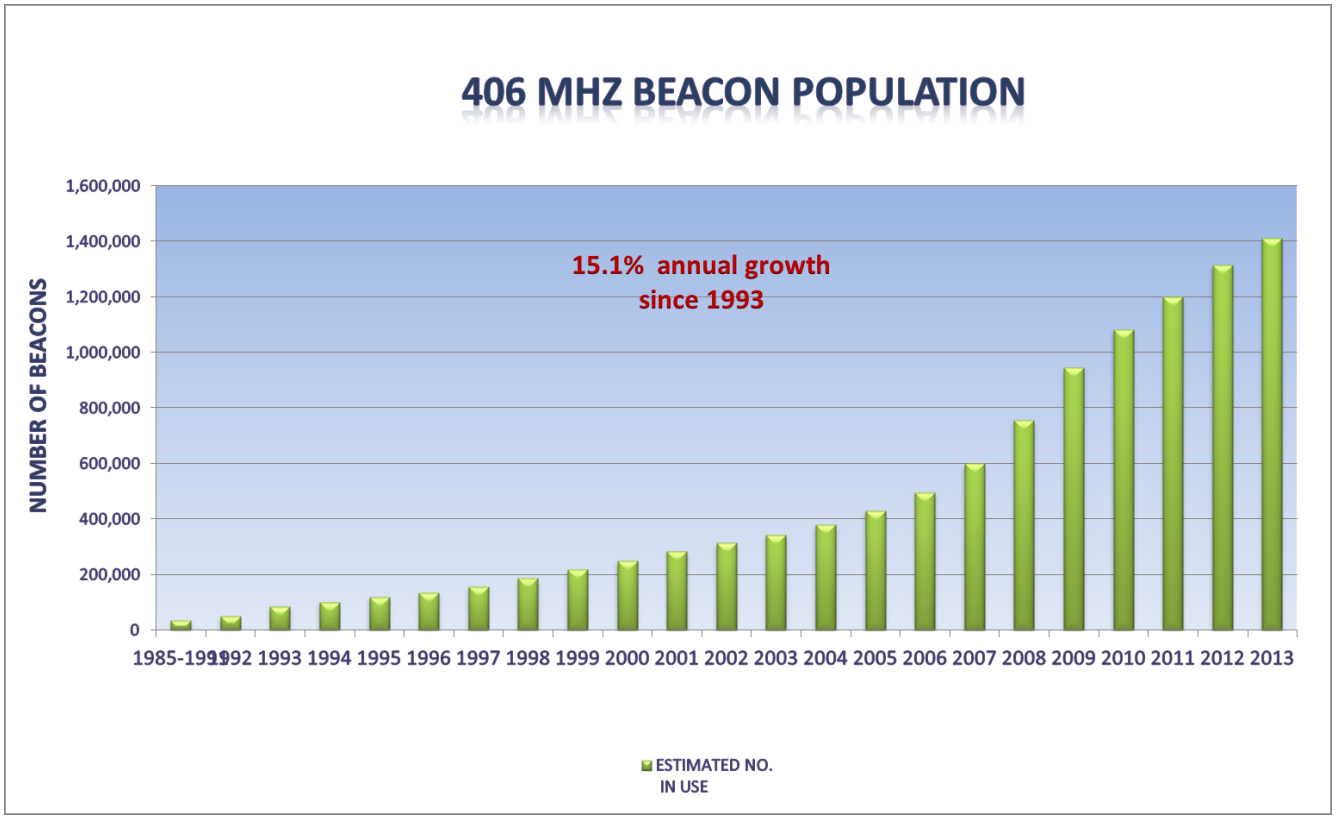
- Leap seconds should cease to be inserted in the near future,
- UTC should become a unique and continuous reference time scale,
- A period of at least 5 years be allowed so that operators of navigational systems can make adequate preparations.

And therefore requests that

- The co-chairs of the CGSIC Timing Subcommittee forward this opinion to the ITU.

GNSS Search and Rescu

- **48 beacon manufacturers participated in 2014 survey**
- **Over 1,411,000 beacons were in use at the end of 2013**



156,100 beacons were produced in 2013 worldwide, including :

- 68,900 **EPIRBs**
- 23,200 **ELTs**
- 64,000 **PLBs**

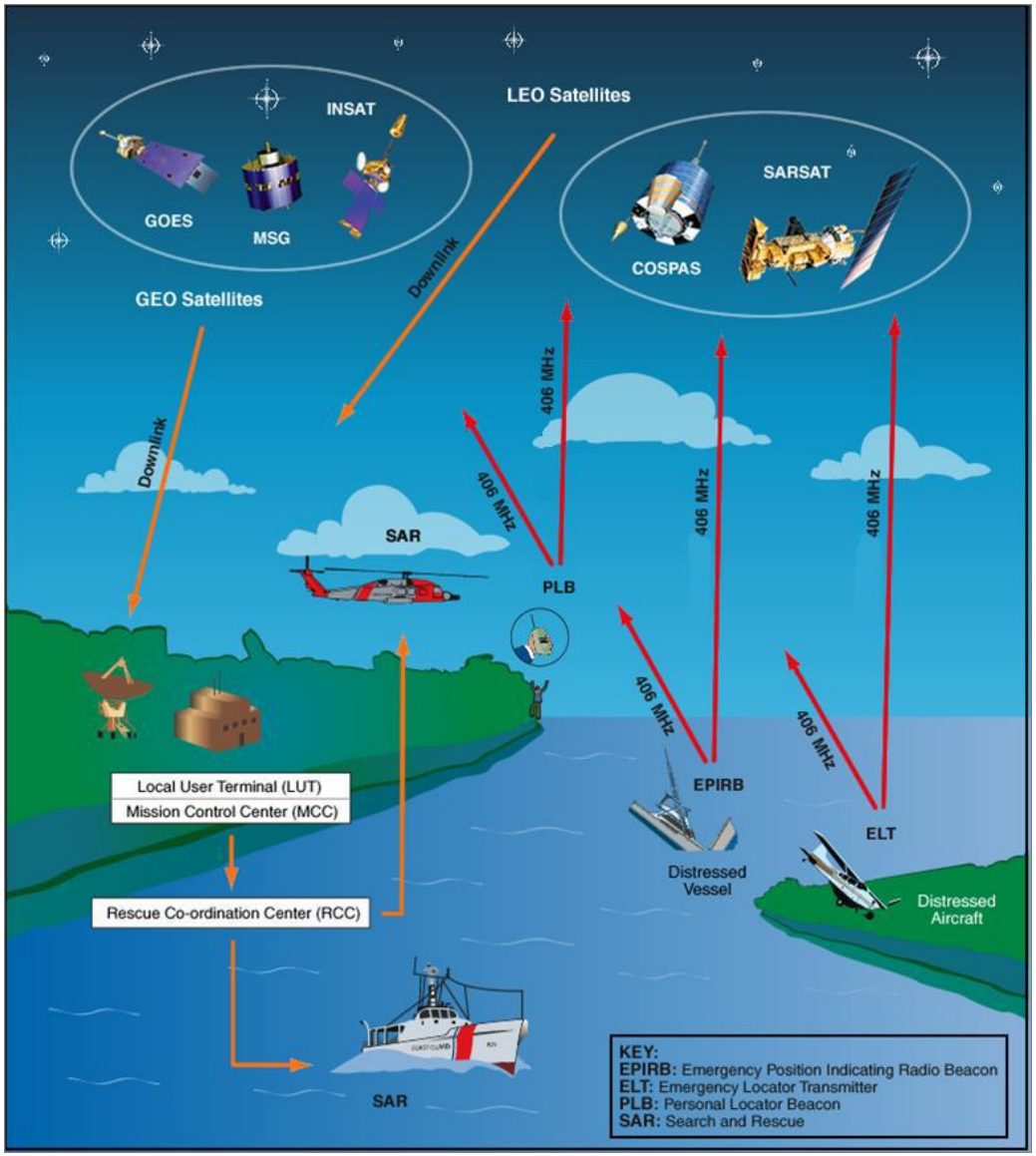
COSPAS-SARSAT

5 Low Earth Polar Orbiting Search And Rescue (LEOSAR)

7 Geostationary Orbiting Search And Rescue (GEOSAR) with 2 under test

30 mission control centers around the world

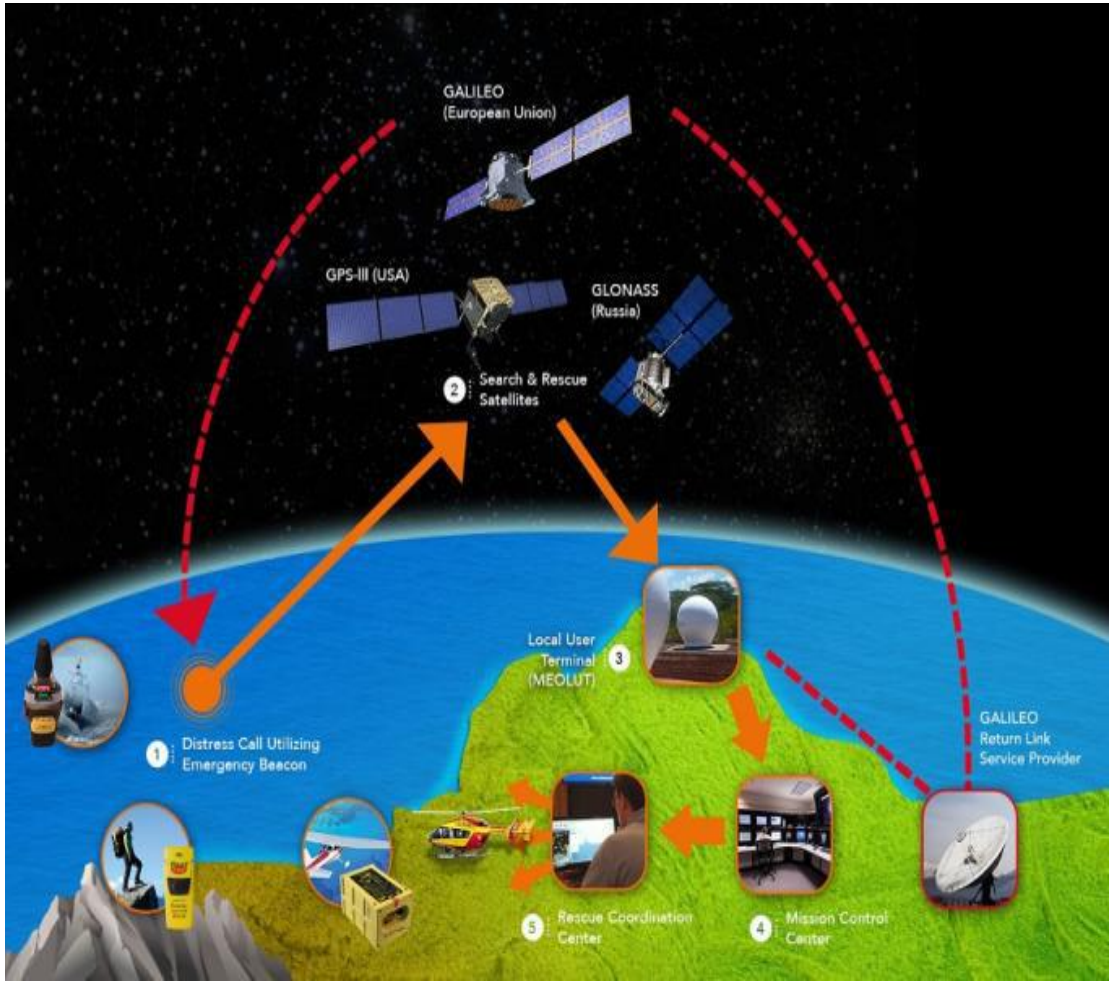
MEOSAR will replace the LEO SAR portion of the system when the LEO satellites reach end-of-life.



MEOSAR

The COSPAS-SARSAT Program uses some MEOSAR constellation already. Includes 3 satellites with an operational L-band downlink repeater: 1 Glonass-K1 and 2 Galileo IOV satellites (IOV-3 and IOV-4)

- Experimental Distress Alerting Satellite System (DASS) repeaters with S-band downlink aboard all IIR-M and IIF GPS satellites
- 16 active now
- Will fly on all GPS-III satellites to #8
- #11 and beyond will have the new MEOSAR L-band payload.



Cooperation between Global Service Centers

- Work on interoperability, compatibility and transparency in our systems through the International Committee on GNSS
- Work country-to-country through official bi-lateral GNSS talks to improve communications between centers
- Connect our service centers together for day-to-day operations to benefit user communities of the world
- Improve processes for Information sharing to respond to the needs of equipment manufacturers and user communities.

NAVCEN Contact Information

- Navigation Information Service

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