Report by
Augment Working Group and
International Sub-Group

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SPACE-BASED POSITIONING
NAVIGATION & TIMING
NATIONAL ADVISORY BOARD

Outline of Activities on Prep-Day

- **Session 1 - "Augment" part of Working Group 1**
  - **Status and reliability of other Global and Regional satellite systems (GNSS and RNSS);**
  - **Current situation with non-GNSS Augmentations, especially Loran/eLoran.**
- **Session 2 - International Engagement**
  - **Types of International Actors;**
  - **Types of Interaction.**
- **Wrap Up – Actions to take to the main Advisory Board meeting.**

Session 1:
"Augment" part of Working Group 1

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1. Status and reliability of other Global and Regional satellite systems (GNSS and RNSS):
   a) Discussion - to identify criteria by which US can trust and use these other GNSS and RNSS;
   b) Decision on any action needed in the main Advisory Board meeting.
2. Current situation with non-GNSS Augmentations:
   a) Situation with eLoran;
   b) Other non-GNSS Augmentations, and;
   c) Decision on any action needed in the main Advisory Board meeting.

“Augment” part of Working Group 1 Status/Reliability of other GNSS and RNSS

Status and reliability of other GNSS

- Terry outlined situation with other GNSS ~ due to time concentrated on GLONASS and BeiDou and covered the following issues:
- Likelihood of reaching goals for system deployments/enhancements;
- Primary Interoperability Issue is Transparency;
- Primary Technical Issues:
  - Integrity
  - Availability/Continuity
  - UERE
  - Viability
- Terry's analysis of these issues raises concerns about the ability of GLONASS to service the most demanding applications, such as safety-of-life applications;
- Balanced by opinions of other working group members that other applications can gain significant value from GLONASS, e.g. precise positioning and mass market applications;
- For the factors above, early indications are that BeiDou seems to be performing well.

Criteria for accepting other GNSS

- Discussed whether we should develop criteria to assess the suitability/reliability of other GNSS, e.g. Criteria like those used by Terry in his analysis;
- However, there is other work happening in this area... e.g. the work in ICG to develop "International GNSS Monitoring and Assessment"
  - The concept is... Rather than have separate monitoring networks with stations hosted by various countries under various agreements... Is it possible to develop a unified approach? e.g. could it be an extension of existing capabilities within IGS?
  - ICG Task Force has been established to develop a list of parameters that would be monitored under that approach.
- IGS Multi-GNSS Experiment (MGEX) is a source of valuable data and growing expertise;
- Also discussed diversity of requirements among applications plus some sectors have criteria defined by international regulatory authorities such as ICAO & IMO;
- ***Overall feeling is that PNT Advisory Board needs to be aware of quality of other systems and needs criteria by which to make such assessments but we should not duplicate work in ICG and/or in specific sectors ~ So we need more work before we can propose best approach to the Board.***

“Augment” part of Working Group 1
Non-GNSS Augmentations

Non-GNSS Augmentations

- Due to limited time, the discussion centred on the situation with eLoran ~ Issues discussed included:
- Business case for eLoran seems to be stronger for timing than for positioning and navigation;
- IMO has a requirement for radio navigation but not specifically for Loran;
- It was noted that for countries who cannot afford their own GNSS, establishment of an eLoran station is a very cost effective way to develop an alternative to GNSS;
- ***Overall for the Board...***
  - ***Concerns about Loran/eLoran were covered in August 2014 letter from Board and those points still stand;***
  - ***Sub-Group noted the establishment of a tiger team to look at complementary PNT with co-leadership from DHS, DoD and DoT;***
  - ***No additional specific recommendations at the moment.***

Session 2:
International Engagement

Types of International Actors

1. **Other System Provider Nations**
   - obviously a key special case of actors for US PNT policy;
2. **Non System Provider Nations**
   - noting that level of PNT use will vary between nations;
3. **Key International Organisations**
   - noting various types of organisations, e.g. political, regulatory, technical, sector based etc.

Types of Interaction

1. Issues where US stands to gain from other countries - **inbound interaction;**
2. Issues where US stands can offer leadership or assistance - **outbound interaction**;
3. Issues where US wants/needs to **cooperate** internationally.

Matrix of Activities

		System Provider Nations	Non-System Nations	International Organisations
Augment	Inbound	Value of non-MEO orbits for the Americas	Developments like Locata from Australia UK's work on eLoran	Support and take advantage of IGS MGEX work
	Outbound	Ensure provider transparency so other systems can be trusted	Help developing countries with complementary PNT (e.g. eLoran)	Encourage IHO to adopt eLoran as backup to GNSS
	Cooperate	Continue push for compatibility, interoperability and transparency	Joint projects on GNSS and non-GNSS augmentations	Maintain strong involvement in ICG Engage with Regulatory bodies

Matrix of Activities

		System Provider Nations	Non-System Nations	International Organisations
Protect	Inbound	?	?	?
	Outbound	?	?	?
	Cooperate	?	?	?
Toughen	Inbound	?	?	?
	Outbound	?	?	?
	Cooperate	?	?	?
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Matrix of Activities

		System Provider Nations	Non-System Nations	International Organisations
Protect	Inbound	?	Learn from spectrum protection elsewhere	?
	Outbound	Share lessons from US spectrum sharing issues	Assist countries to ensure GNSS spectrum is protected	Encourage bans on jammers
	Cooperate	Ensure compatibility across systems	?	Encourage ITU protection for all GNSS signals
Toughen	Inbound	Evaluate signal authentication approaches	?	?
	Outbound		Encourage use of toughened receivers	?
	Cooperate	?	?	?
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