Offshore GPS Requirements & Utilization for the Gulf of Mexico

Maritime Briefing for CGSIC
ION GNSS+
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Maritime use of GPS in the Gulf of Mexico

- Industries and Operations where GPS is utilized in the Gulf of Mexico
  - Shipping
  - Recreational Boating
  - Search & Rescue
  - Scientific
  - Military
  - Offshore Oil & Gas

Image courtesy of the USCG

Image courtesy of Subsea 7 Inc.

Image courtesy of DOF Subsea

Image courtesy of ENSCO Inc.

Image courtesy of Royal Caribbean Cruise Lines

Image courtesy of NOAA

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Image courtesy of the USCG

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GPS for Shipping

- **Navigation**
  - Position
  - Interfaced to ECDIS (electronic plotters)
  - Route planning
  - Vessel guidance
  - Speed (Both GPS speed and aiding Doppler speed logs)
  - Heading
  - Communications & GMDSS
  - Interfaced to ARPA Radar
  - Bridge integrated navigation systems

- **AIS**
  - Collision Avoidance
  - Vessel Traffic Services
  - Maritime Security
  - Aids to Navigation
  - Search & Rescue
  - Accident Investigation

- **Docking Operations**
  - Cruise Ships
  - Cargo Ships

- **Cargo & Container Management**
GPS as part of an Integrated Bridge Navigation System

- ARPA Radar Systems (2)
- ECDIS System
- Auto Pilot System
- GMDSS System
- Speed Log
- AIS System
- GYRO System
Government Operations

- Search & Rescue Operations
- Maritime Law Enforcement & Drug Interdiction Missions
- Environmental Response
- Fisheries Enforcement
- NOAA Operations

Images courtesy of the USCG

NOAA Vessel Ronald H. Brown
Photo courtesy of NOAA
Scientific Operations

A few examples:

- MetOcean research
- Fisheries & Sea Mammal monitoring & research
- Environmental research
- Seabed research
- Ocean Archeology
- Sediment monitoring
DGNSS for the Offshore Energy Industry

Offshore Energy Industry
- Dynamically Positioned Vessels
- Drilling
- Hydrographic Survey
- Seismic Survey
- Geotechnical Operations
- Other Operations
- Construction Installation Operations
  - Subsea Installations
  - Surface Installations
- Pipe-lay Operations
- IRM Operations
- Diving Operations
- Abandonment
The DGPS / DGNSS Requirement

• The offshore energy industry requires precise, repeatable and reliable positioning for all types of operations.

• This means the use of commercially available augmentation services such as Veripos and Fugro, and the use of free augmentation services as back-up, such as IALA.

• Veripos currently provides independent high accuracy PPP services based on JPL data and our own network of reference stations with accuracies of +/- 6cm 2 sigma (95%).
Illustration of How a Commercial DGNSS Augmentation Service Works

Receive positioning data from multiple satellites allowing for positioning correctional measures.

Equipped with dual redundant systems and back up power. Located for maximum coverage.

Provide global redundant coverage.

Combine input data with proprietary algorithms to remove satellite-based positioning errors.

Transmit correction data from the NCCS to the vessels on 7 L-band Inmarsat satellites.

Receive positioning signals and correction data, enabling secure and accurate operations.

Transmit data to NCCs. Minimum two separate links.

Communicate with NCCs.

Onboard hardware and software.

Fully redundant facilities. Provide 24/7 customer support.
The Offshore Energy Cycle

1. Finding hydrocarbons
2. Planning & Hazard Survey
3. Drilling
4. Offshore facility installation
5. Pipe Lay
6. Subsea Installation
7. Pre-field development engineering
DGPS/DGNSS for Dynamic Positioning

• Dynamic Positioning is using an on-board control system, fed by various sensors, of which DGPS/DGNSS is a prime sensor, that allows a vessel to keep station offshore.

• Types of DP Vessels include:
  – DP Semi-submersible Drill Rigs and Drill Ships
  – Offshore Support Vessels (OSVs), including Platform Supply Vessels (PSVs), Anchor Handling Tugs (AHTS), and Multiple Purpose Support Vessels (MPSVs)
  – Construction Vessels which include pipelay vessels, subsea installation vessels, heavy lift vessels for platform installations, IRM (intervention, repair, and maintenance) vessels which utilize ROVs, Divers, and AUVs and Abandonment operations vessels, crane barges and accommodation vessels
  – A growing number of Seismic Survey vessels
  – A growing number of Hydrographic Survey vessels
  – Wind Farm installation vessels (not currently in use in the GOM)
Typical DGNSS Installation for DP Operations
Offshore Drilling Operations

- 1\textsuperscript{st} phase: The Rig Move
- 2\textsuperscript{nd} phase: Station Keeping
- 3\textsuperscript{rd} phase: Drilling
- 4\textsuperscript{th} phase: Hitting Pay
- 5\textsuperscript{th} phase: Completion
- Well intervention
DGPS/DGNSS for Survey Operations

Offshore Survey operations include:

• Hydrographic Surveys
• Hazard Surveys
• Pipeline Route Surveys
• Seismic Survey
• Geophysical and Geotechnical Survey
• Survey for Offshore Construction Projects
• Survey for Pipe Lay Operations
• Survey for IRM projects
• Positioning for Rig Moves
Offshore Construction Operations

• DGPS / DGNSS used in all facets of construction operations, including engineering, site survey, installation and post construction IRM.

• In these operations dual use of DGPS is most prevalent as it is used for positioning, whether anchored or DP and for Survey operations for every project.

• As with other all other areas, accuracy, repeatability, and reliability are essential.
Summary

• GNSS is used in all facets of offshore operations for the maritime industry, for scientific work, for government operations, and for the offshore energy industry.

• While the technology and capabilities of GNSS have continuously improved, so have the technical and operational requirements providing a need for more sophisticated systems.

• GNSS has been integrated into more and more systems and the reliance on it offshore has grown exponentially.
Questions?

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Thank You!