

# Department of Homeland Security

Positioning, Navigation, Timing (PNT)

Program Management Office (PMO)

**National Federal Advisory Brief**

**November 14, 2017**



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Unclassified

# Agenda

- ✓ What are attempting to Mitigate?
- ✓ Applying risk management to critical infrastructure
- ✓ Update on DHS PNT findings



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# What are we mitigating?

- June 13, 2016 NAB letter
  - \$55B in economic impacts
  - > 1/2 comes from high precision receivers
  - Majority of the rest still require accuracy only provided by GPS/GNSS
- 2017 UK Report, eLoran not sufficient for turn by turn direction (need to verify)
- Timing impacts understated

Market Segment	Billions(\$)
Precision Agriculture	13.7
Consumer and other non-fleet	13.1
Fleet Vehicle connected telematics	11.9
Surveying	11.6
Construction (Earth moving)	5
Maritime Transportaiton	0.2
Air Transportation	0.1
Rail Transportation	0.1
Timing	0.1
Total	55.8



# What does recommended Mitigation Buy?

- P&N Studies to verify requirements for turn by turn
- Need assistance from Manufactures

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 *Timing*

 *GPS Like precision without augmentation*



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# Challenges

- Barriers to entry
  - Foreign GNSS integrated in global products providing even great accuracy
  - Not as accurate as GPS
  - Increased user cost
  - Requires Augmentation from supporting infrastructure
  - Form Factor

Twelve Major GPS Application Areas – 64 Examples  
(Red Underlined are *Precision* Examples)

Application Area	Example Applications
Aviation	Area navigation, <u>approach</u> , <u>landing up to Cat III</u> , <u>NextGen</u>
Agriculture	AutoFarming: crop spraying, <u>precision cultivating</u> , <u>yield assessment</u>
Automotive	Turn-by-turn guidance, OnStar, <u>driverless cars</u>
Emergency and Rescue Services	911, ambulance, fire, police, <u>rescue helicopters</u> , emergency beacons, airplane and ship locaters, OnStar
Intelligent Transport	<u>Train control and management</u> , UAVs, <u>Intelligent Highways</u>
Military	Rescue, <u>precision weapon delivery</u> , unit and individual location, CONUS test and training range safety, control
Recreation	GeoCaching, control of models, hiking, outdoor activities
Robotics and Machine Control	<u>Bulldozers</u> , <u>Earth graders</u> , <u>mining trucks</u> , <u>oil drilling</u>
Scientific	<u>Earth movement</u> and <u>shape</u> , <u>atmosphere</u> , weather forecasting, climate modeling, ionosphere, <u>space weather</u> , <u>tsunami warning</u> , soil moisture, ocean roughness, wind velocity, snow, ice, and foliage coverage.
Survey and GIS	<u>Mapping</u> , environmental monitoring, tagging disease outbreaks
Timing	Cell phone towers, banking, power grid
Tracking	Fleets, assets, equipment, shipments, children, Alzheimer's patients, wildlife, animals, law enforcement, criminals, parolees



# How is timing impacted?

- Power Grid
  - Not dependent (yet)
  - Mitigating risk through risk based implementation
- Banking
  - Reliant on Cell phones for non hardwired end points
  - Some estimates as high as 50%
- Cell Phones – 4G-LTE
  - 1.5  $\mu$ s
  - 50-200 ppb Frequency Stability

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# Questions



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