

SAE INTERNATIONAL

Interface Requirements for SAE-Compliant GPS Receivers

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Interface Requirements

<https://www.gps.gov/governance/advisory/meetings/2015-06/farrell.pdf>

Ramifications profound, no exaggeration

Data from flights conducted by Ohio University

Results and algorithms documented

Public domain (no strings)

No new inventions or scientific breakthroughs

cm/sec velocity, both navigation and tracking

***THOUSAND*fold improvement over ADSB *10* m/s**

Two horizontal directions  *MILLION* × area

Much broader set of dramatic improvements

Multiple performance criteria, *RE* definition

Interface Requirements

PROCEDURES BASED ON INGRAINED HABITS

- Surveillance largely separate from navigation
- Position sequences, dynamics an afterthought
- Accuracy stressing instantaneous position
- Severe performance limitations (coordinates)
- Uncritical in most phases (*400* kt)
- VELOCITY accuracy sans precise position
- Initial GPS euphoria ➡ Oversimplification
- Integrity now requires "whole silver platter"
- Overstated "loss of GPS" ➡ lower quality data used

Stunning advances in many facets, integration *restrained*

Interface Requirements

Change via PNT Committee standards: Bill Woodward
Chairman, SAE Intl Aerospace Avionics Systems Div
Hardware lead for next generation EGI Resilient EGI

- Yesteryear's constraining technology
- Removal to enable benefits of digitization
- Limitations of LEGACY SYSTEMS can vanish
- Partial information is only the beginning
- Long overdue acceptance of innovation
- ICNS 18 – very encouraging

<https://jameslfarrell.com/opening-of-doors-previously-riveted-shut/>

Interface Requirements

Extendable beyond in-air application

- **aircraft on the ground**
- **maritime operation**
- **UAVs + Driverless cars (SAE VIoT board)**
 - **Servers for heavy processing**

Navigation and tracking sensors in general

Preparation corresponding to evolving changes

Interface Requirements

INNOVATIONS AGAINST THE TIDE FOR DECADES

<http://jameslfarrell.com/wp-content/uploads/2012/03/GPSINS.pdf>

"no stone unturned"

"Teeming ... insights ... hard to find or unavailable elsewhere"

Website jamesLfarrell.com

AFTER June 2015 :

<https://www.ion.org/publications/upload/v26n3.pdf>, p.14-15

<http://www.insidegnss.com/node/5567>

<https://youtu.be/9UKuOTnQa5w>

<https://jameslfarrell.com/1950-2/> (ICNS)

<https://jameslfarrell.com/two-pillars-of-our-industrys-expertise/>

Interface Requirements

HOW LONG AGO ?

1999 ION Journal (Autumn) "Send Measurements, not Coordinates"
[from combining two Jan 1998 IoN papers]

1993 NAECON "System Integration: Performance Doesn't Measure Up"
<https://jameslfarrell.com/wp-content/uploads/2018/04/NAEC93.pdf>

1992 ION GPS "Extended RAIM (ERAIM): Estimation of SV Offset"
<https://jameslfarrell.com/wp-content/uploads/2010/07/iongps92.pdf>
Included multiple biased SVs

1990 ION GPS "That All-Important Interface"
<https://jameslfarrell.com/wp-content/uploads/2010/06/IONGPS90.pdf>

1977 NAECON "Keeping Pace with Avionics Innovations"
" ... *all nav estimates will always account for all data ... every*
... *function ... will therefore benefit from all that data ...* "
" *sacrifices ... nonessential, and will presumably be corrected with*
... *assimilation of advanced methods into operational systems*"

Questions?

