e-LORAN

（**Position, Navigation and Precision Timingの冗長化を目指して**）
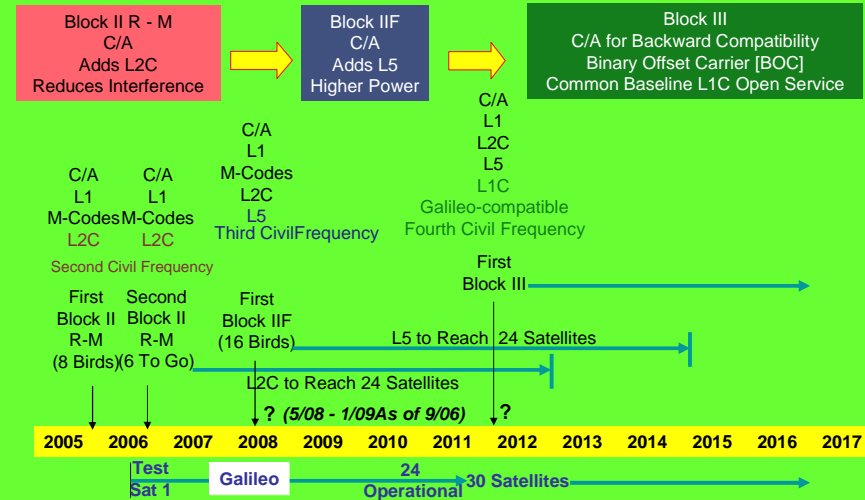
池田　保

2007年6月29日
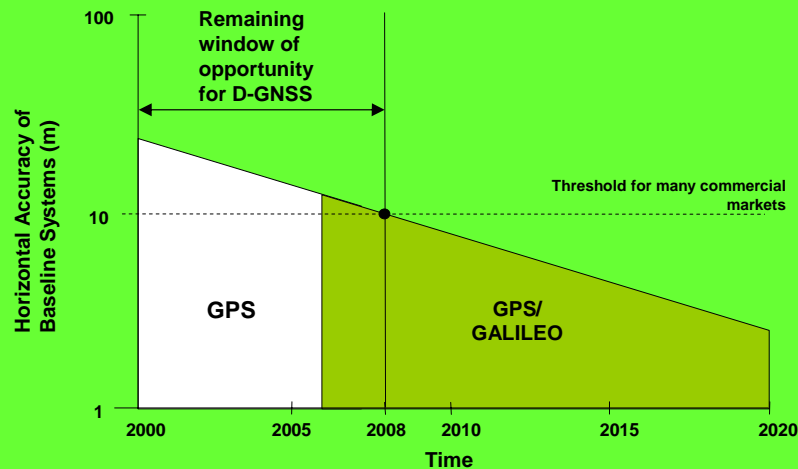

GNSS Transition Snapshot

Current GPS Services

16 Block II/IIA	**Civil Service**	
13 Block IIR	Course Acquisition Code	C/A
29 Operational	Navigation	L1
(June 2006)	**Precision Service**	(L1Y)
	Y-Code Navigation	(L2Y)

Block II R - M
C/A
Adds L2C
Reduces Interference
➡
Block IIF
C/A
Adds L5
Higher Power
➡
Block III
C/A for Backward Compatibility
Binary Offset Carrier [BOC]
Common Baseline L1C Open Service

C/A
L1
M-Codes
L2C
L5
Third Civil Frequency

C/A
L1
M-Codes
L2C
Second Civil Frequency

C/A
L1
M-Codes
L2C

C/A
L1
L2C
L5
L1C
Galileo-compatible
Fourth Civil Frequency

First
Block II
R-M
(8 Birds)

Second
Block II
R-M
(6 To Go)

First
Block IIF
(16 Birds)

First
Block III

L5 to Reach 24 Satellites

L2C to Reach 24 Satellites

? *(5/08 - 1/09As of 9/06)* ?

| 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |

Test Sat 1 — **Galileo** — **24 Operational** — **30 Satellites**

Possible Accuracy timeline

Remaining window of opportunity for D-GNSS

Horizontal Accuracy of Baseline Systems (m)

100 — 10 — 1

Threshold for many commercial markets

GPS

GPS/GALILEO

2000　2005　2008　2010　2015　2020

Time

GPSアプリケーション

航空監視システムの高度化

INS　➡　GPS＋SBAS＋GBAS

SSR　➡　ADS-B（Automatic Dependent Surveillance - Broadcast）

タイミング

携帯電話基地局　➡　San Diego事件
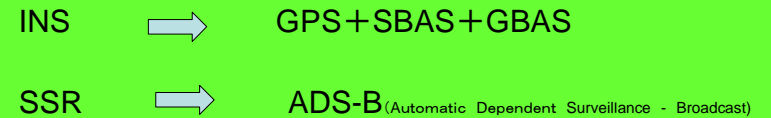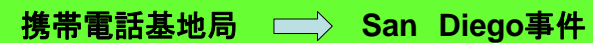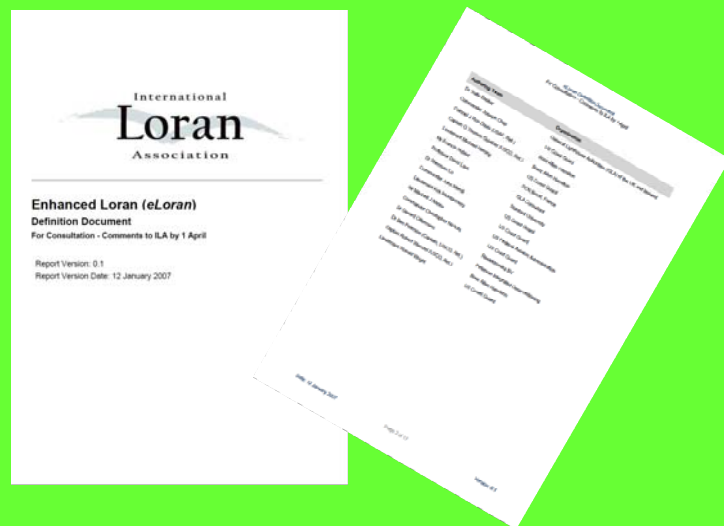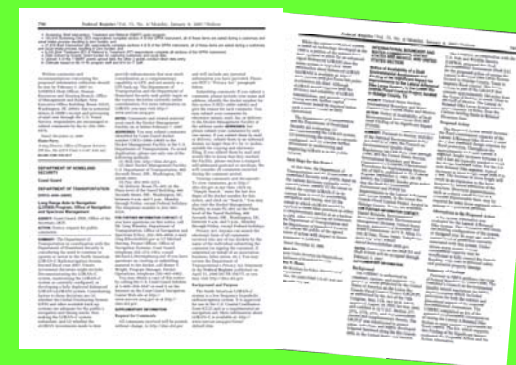
ILAによるe-Loranの定義文書の作成

2007年1月12日

eLoranの存続に関する一般意見聴取（FRN)

2007年3月15日

意見総数952件中

eLoranの継続に賛成の意見が93%

DODとDHSのeLoran作業班

2007年4月10日（非公式情報）

eLoran継続で合意

・ GPSに障害をもたらす要因を太陽活動と指摘

RTCM eLoran規格化作業を開始

2007年6月7日

Radio Technical Commission for Maritime Services
1800 N. Kent St., Suite 1060
Arlington, Virginia 22209-2109
www.rtcm.org   hq@rtcm.org

Telephone: +1-703-527-2000   Telefax: +1-703-351-9932

June 7, 2007

DRAFT TERMS OF REFERENCE

RTCM Special Committee 127
Standards for Enhanced Loran (eLoran) Systems

1. Considering that:

   a) Global Navigation Satellite Systems (GNSS) have certain vulnerabilities to interference and outages from both natural and intentional causes;

   b) Critical navigation, communication, and timing applications depend on GNSS services;

   c) The eLoran system has a robust signal which is less vulnerable than GNSS systems to degradation and outages from natural and intentional causes, and can therefore provide an effective back-up to GNSS systems;

   d) Certain providers of navigation services have identified eLoran as the appropriate complimentary, terrestrial radionavigation service to support GNSS services; and

   e) There are presently no known regional or international standards for modern eLoran system components;

2. The Radio Technical Commission for Maritime Services establishes RTCM Special
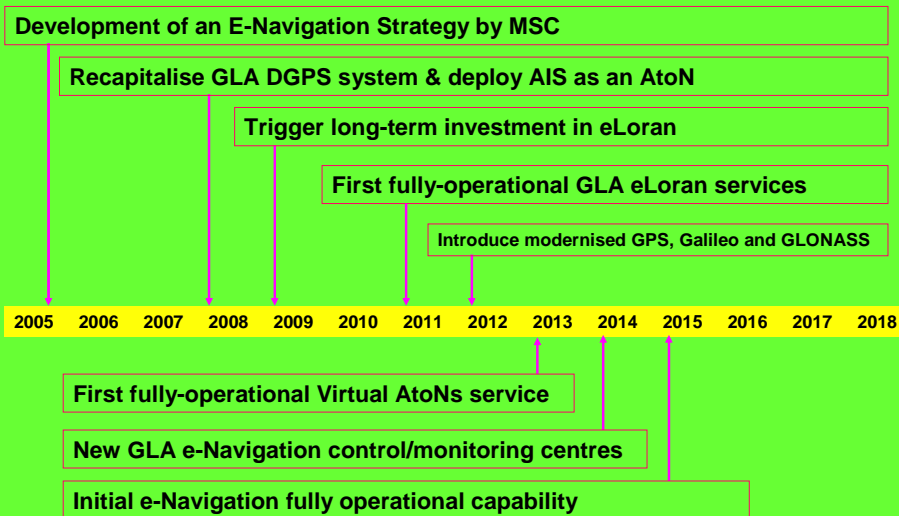
E-Navigationのコンセプト

- Key Issues
  Larger & faster vessels
  Congestion at pinch-points
  – Dover Straits, Mallaca Straits …
  Trend to one/two man bridges
  Ubiquity of GPS and waypoint navigation
  Concern over ability to revert from electronic to traditional techniques
  In some cases safety may worsen
  – Electronic systems encourage a false sense of security
  – Human factors

- Definitions
  "*The collection, integration and display of maritime information onboard and ashore by electronic means, to enhance berth-to-berth navigation and related services, for safety and security at sea, and protection of the marine environment*" （IALA）

- Structural components
  – Electronic Navigation Charts
  – Integrated displays using Electronic Chart Display Information Systems
  – Electronic Positioning Systems
  – Vessel route and status information
  – Transmission of positional and navigational information using AIS
  – Information prioritisation and alarm management

- System architecture
  – Currently being developed by the IMO correspondence group led by the UK Department for Transport

---

System architecture　？

- GMDSS
  – 航海士が通信の実施主体
  – IT技術の積極的導入（専門的知識が不要）
  – 陸上主体の遭難通信体系

- E-Navigation
  – ONE　MAN運航
  – GPSによる可視化状況把握
  – 陸上主体の安全航行管理and/or支援体系（地域限定）

Possible e-Navigation timeline（UK）

Development of an E-Navigation Strategy by MSC

Recapitalise GLA DGPS system & deploy AIS as an AtoN

Trigger long-term investment in eLoran

First fully-operational GLA eLoran services

Introduce modernised GPS, Galileo and GLONASS

| 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |

First fully-operational Virtual AtoNs service

New GLA e-Navigation control/monitoring centres

Initial e-Navigation fully operational capability

Saly Basker FERNS TWG 28th Feb. 2007

Possible Long-term European eLoran（GPS Back-up) Programme

| 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |

R&D & Proof of Concept 2004 - 2007	Preparation for Initial Services 2007 - 2010	eLoran Initial Service Provision (ISP) 2010 – 2012	European eLoran Service Roll-out 2012 -2015
Aim: Keep eLoran alive and extend R&D in order to prepare for initial services	**Aim**: Trigger long-term investment and initial services in Europe through ERNP	**Aim**: Launch initial services and transition to European eLoran	**Aim**: Roll-out eLoran services across Europe
Task: Identify where eLoran may be needed, high-level cost/benefit analysis and technical proof of concept.	**Task**: Programme of work for all transport modes: institutional, regulatory, commercial, operational, technical and user. This includes education and PR to build broad support through ERNP.	**Task**: Transition from current to future institutional and commercial arrangements. Upgrade existing system if needed, deploy dLoran and make ASF maps.	**Task**: Roll-out multi-modal eLoran services across Europe

What is the equivalent in the US and elsewhere?

GLAがVTに15年間のeLoran運用委託

The General Lighthouse Authorities award a 15-year eLoran contract to VT Communications

Published:
      May 2007

The General Lighthouse Authorities (GLAs) has announced the award of a prestigious fifteen-year contract to VT Communications (part of VT Group plc) for the provision of a state-of-the-art enhanced Loran (eLoran) radionavigation service to improve the safety of mariners in the UK and Ireland.

The first development phase of this contract, until 2010, will build on existing successes and provide a focus for a European agreement on eLoran service provision. This would then trigger the start of the operational phase from 2010 onwards.

The Department for Transport is sharing the costs during the development phase having recognised the broader potential of Loran to improve the resilience of critical transport infrastructure.

eLoran is intended to assist mariners navigating the complex and crowded waters around our shores and those of our northern European neighbours. It complements Global Navigation Satellite Systems (GNSS) such as GPS and is entirely independent, allowing users to retain the benefits of electronic positioning, navigation and timing when satellite signals are disrupted.

This contract will see VT Communications develop a new Loran station at its radio communications facility in Cumbria, UK. The first signals from the Cumbrian eLoran station will be transmitted on 1st October 2007 with a full trial service launched in November 2007. The existing trial service will be suspended by the end of July 2007.