ION Outreach Committee
ION Virtual Navigation Museum

ION Southern California Section Meeting
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ION Virtual Navigation Museum (VNM)

- Background
- Policies and Procedures
- Organization
- Some Interesting Items
- Status and Plans
- How to Submit an Item?
- Invited Items
- Conclusions
ION Virtual Navigation Museum
Background

- ION VNM approved by ION Council in January 2004
- ION Outreach Committee (Ad hoc) approved by ION Council, June 2004
  - Tasked to develop, and establish the ION Virtual Navigation Museum (VNM).
- Developments involved:
  - Developed web site
  - Web-based and Form-based submission & review process implemented
  - Editorial Review Board established & expanded
  - ION VNM Policy & Procedures document established
  - Increased public awareness of the ION VNM
    - ION Newsletter publications
      - Bartone, C., "Making the Virtual (Museum) Real, ION Newsletter, Volume 16, Number 2, Summer 2006
      - Bartone, C., “From Sextants to Digital GPS Receivers: The Virtual Navigation Museum Invites Submissions, ION Newsletter, Volume 18, Number 2, Summer 2008
    - ION GNSS 2006 and ION GNSS 2007 booth
Collaboration efforts with physical museums established:
  – Smithsonian Institution, Washington, DC
  – The Mariners' Museum, Newport News, Virginia
  – Maritime Museum of Monterey, Monterey, CA

  – IOC declared

ION Outreach Committee made ION Standing Committee by ION Council, April 2007.
ION VNM Policy & Procedures in two major sections:

I. Collecting Policy
   • Identifies general categories for submissions
   • Identifies mission areas for submissions
   • Addresses physical museum collaboration
   • Puts forward a scope of what items are and are not suitable for inclusions into the ION VNM
   • Documents Collection Evaluation by ION VNM Editorial Advisory Board

II. Collection Development Plan
   • Identifies general categories for submissions
   • Identifies mission areas for submissions
   • Categories will be expanded upon as the ION VNM matures and entries of significant are placed for viewing
   • Contains list of desired collection items
For inclusion into the ION VNM, navigation related items should be:

• of national and/or international historical importance in themselves or by association (e.g. story with national or international impact; cutting-edge material; significant provenance)
• the best of its kind (a developmental milestone; related to a leader in the field; inspirational)
• Items of contemporary use which have extraordinary future research potential.
• Commonplace navigation items that had a significant impact on how people navigate.

The ION VNM will not include manufactured items to promote commercial products. Additionally, the museum will typically not display items that are similar without major distinction or improvement.
• Current categories provide a framework for navigation related artifacts as they relate to:
• APPLICATIONS where navigation takes place:
  – Aviation
  – Marine
  – Land
  – Space
• METHODS used in navigation:
  – inertial navigation
  – Celestial (e.g, optical) navigation
  – radio navigation (terrestrial and satellite)
• TECHNOLOGIES for navigation:
  – Systems
  – Components
  – Documents
• Categories are not fixed and fully populated
• New categories will evolve and expand to meet items submitted and suitable for inclusion

Ref: www.ion.org/museum, date visited Dec 14, 2008
Welcome to the ION Virtual Museum!

The Institute of Navigation is a non-profit professional society dedicated to the advancement of the art and science of navigation. The ION also recognizes the importance of preserving previous art and science in navigation. In June 2004, the ION approved the establishment of an ION Virtual Museum to help preserve this past.

Rather than a physical museum, this virtual museum allows visitors to read descriptions, view photographs, and obtain detailed information on devices, systems, components, and/or methods in a convenient electronic format. In some cases physical artifacts are rare or not available; this virtual museum allows the visitor to obtain information on these artifacts. For actual artifacts on display, the locations are listed on most pages to allow interested participants to visit them.

To begin, select a category below or from the menu at left.

- **Aviation**
  - Aviation related items
- **Marine**
  - Marine related items
- **Land**
  - Land applications
- **Space**
  - Space Navigation
- **Inertial**
  - Inertial Navigation Systems
- **Celestial**
  - Celestial Navigation
- **Radio Navigation (Satellite)**
  - Satellite radio navigation systems and equipment
- **Systems**
  - System Descriptions
- **Components**
  - Components
- **Documents**
  - Archival Documents

Submit your item to the Navigation Museum!

Do you have something that belongs in the ION Navigation Museum? Sharing your...
ION Virtual Navigation Museum
Some Interesting Items

Go to live www.ion.org/museum if available
Some Interesting Items: GPS

Ref: www.ion.org/museum, date visited Dec 14, 2008
ION VNM

Some Interesting Items:

GPS

Magnavox X-Set

Date manufactured: 1974-1975

Period/Dates when in use: In 1974 the GPS-JPO issued contracts for the Space, Control and User Equipment Segments for the GPS Phase 1 Validation Phase. This Phase was to validate the performance objectives of Navigation Accuracy. In addition to performance these included an extensive list of demonstrations of Military Value. These demos were critical since the DOD had not shown much interest in GPS until this point in time.

Description: The elements of the X-Set shown in Figure 1 were an X Receiver, a Data Processor with a software program loader (Philips cassette), a Power Supply designed for both 400Hz and 28V DC power, a Battery Backup, a Control Display that had, in addition, the ability to load program patches thru the keyboard, a Pilot Steering Display and a Preamp. The equipment shown in Figure 1 dissipated over 750 watts and weighed 790 lbs. The data processor alone weighed 150 lbs and dissipated 500 watts. This was characteristic of the parts available in the 1974-6 timeframe. X Receiver The X Receiver was a 4 Satellite/Pseudoflote continuously tracking receiver designed to meet the full performance specifications including jamming and had the ability to track to high levels of jamming when aided. The X Receiver's functional design had the ability to use two antennas and to use either L1 or L2 for each channel. This mode of operation had 4 channels tracking carrier signals and the fifth channel time-sharing code tracking. The mode changed to code tracking with high jamming. The X Receiver was substantially a digital design and samples were transferred to the Process Controller (PC), part of the receiver, at a 1 KHz rate where all of the signal processing was done in software. Magnavox built the PC from available computer chips (ALU, RAM, ROM and I/O) and micro coded to emulate the Hewlett Packard 2160 minicomputer family.

Additional text here cut for slide

Additional Photos:

Figure 1: Magnavox X-Set without IMU

Figure 2: Military Demo Results

For More Information, Contact:

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Some Interesting Items:

GPS

GPS 12

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Some
Interesting
Items:
GPS
TI 4100
NAVSTAR Navigator

Ref: www.ion.org/museum, date visited Dec 14, 2008
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Some Interesting Items: Maritime Celestial

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ION Virtual Navigation Museum
Status and Plans

Current Status:
• ION VNM currently consists of:
  – >50 entries approved and viewable (>1/2 are unique entries)
  – >20 entries in official review process
• Review and validation of entries accomplished by Editorial Review Board

Ongoing Developments and Plans:
• Continued refinement of submission and review process.
• Broaden area of specialization in Editorial Advisory Board by adding members.
  – Have had to go outside of current review board for several entries.
• Continue to work with GPS JPO/Wing on “Historical GPS Documents” and
  navigation related movies suitable for web site.
• Continue solicitation of entries, increasing breadth of entries, general
  awareness of ION VNM, exhibit booth at GNSS 2008
• Increase collaboration efforts with physical museums:
  – USCG Historian
  – The Royal Observatory, Greenwich, England
  – The National Maritime Museum, Greenwich
  – The Oxford Science Museum, Oxford England
  – Other?? (The Aerospace Corporation, Northrop-Grumman, Boeing, etc.??)
• Plan to establish and achieve a FOC metric.
How to Submit an Item?

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To begin, select a category below or from the menu at left.

- Aviation
- Marine
- Land
- Space
- Inertial
- Celestial
- Radio Navigation

Submit your item to the Navigation Museum!

Do you have something that belongs in the ION Navigation Museum? Sharing your...
Is the item I have in mind suitable for the ION VNM?
- See ION VNM Policy & Procedures for scope and guidelines.
- Talk to an ION VNM Editorial Advisory Board Member.

Submissions have come in the form of:
- Actual artifact that someone holds and is knowledge about it
- Photograph, manual, drawings, etc and a knowledgeable person
- Actual artifact in a physical museum (public, private, corporate)
- Technical document of significant (e.g., Klobuchar model)
- Working with an ION VNM Editorial Advisor Board member

Items not suitable for the ION VNM:
- Company products and services offered today
- Common items of non-significant

Submissions via:
- Web form: [www.ion.org/museum/itemSubmission.cfm](http://www.ion.org/museum/itemSubmission.cfm)
- Word Template: [www.ion.org/museum/VNM_Submission_Form.doc](http://www.ion.org/museum/VNM_Submission_Form.doc)
  then email to: bartone@ohio.edu

Authorship provided for submitter.
ION Virtual Navigation Museum
Editorial Advisory Board

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Ref: www.ion.org/museum/editorialBoard.cfm, date visited Dec 14, 2008
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Invited Items

- Some key items have not been submitted to ION VNM:
  - 621B
  - Decca
  - VOR/DME/TACAN
  - Early Draper’s work
  - Fresnel Lens
  - GLONASS
  - Goldstone’s Deep Space Network
  - Loran A & B
  - Omega
  - Sextant Varieties
  - Apollo Sextant
  - Early Sperry work
  - Timation
  - Transit
  - Y, Z, and T-set GPS Receivers
  - Other?? – LET US KNOW…

Ref: Bartone, C., “From Sextants to Digital GPS Receivers: The Virtual Navigation Museum Invites Submissions, ION Newsletter, Volume 18, Number 2, Summer 2008
Development of the ION VNM illustrates the commitment by the ION not only to the advancement of the art and science of navigation, but also to the important task of preserving a record of the progress of navigation over the centuries.

ION VNM development continues.

Collaboration with physical museums have been beneficial and shown worthy to expand.

Some of the most unique and detailed entries have been from individuals with knowledge and insight into the navigation item.

The ION VNM Editorial Advisory Board actively invites:
- Submissions to Invited Items List
- Additions to the Invited Items List
- Volunteers for reviews and Editorial Advisory Board Membership
- Volunteers for ION GNSS Booth help
- Volunteers for entry solicitation and follow up.
- Suggestions on physical museums for collaboration.