

**KISH P & I LOSS PREVENTION CIRCULAR KPI-LP-145-2013**  
**(Importance of POSITIONS in Safety Of Navigation)**

► **Position:**

Positioning is essential for navigation: to ensure you have situational awareness; know where you are in relation to navigational hazards and, of course, to enable effective commercial operations. At this time, there is no one perfect means of fixing your position. A wide range of options exists, and professional mariners must know when to use each, based on their strengths and weaknesses. Of course, the professional navigator will always employ as many means as possible and will never rely on any one alone. Knowing which methods to use when is the key to success as a navigator.

► **Dead Reckoning and Estimated Position:**

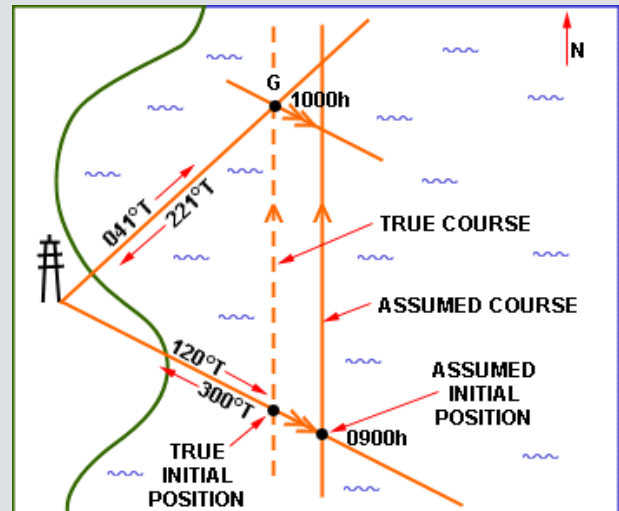
Dead reckoning (DR) is predicting where you will be, based upon speed and course. An 'estimated position' (EP) refines that prediction further by applying set and drift. Estimating where you should be at what time was essential in the past, but still very useful in modern times for aiding situational awareness and giving advanced warning of any anomalies in other means of positioning.

EP Strengths:

- ✓ Proven traditional technique
- ✓ 'Automated' systems embedded within ECDIS
- ✓ Uses existing sensors - log, gyrocompass, etc.
- ✓ Potentially gives rapid alerts of loss of GNSS accuracy
- ✓ Reasonable accuracy over shorter periods

EP Weaknesses:

- ✓ Currently, poor accuracy over long periods
- ✓ Some ECDIS equipment have poor embedded implementations of DR/EP



► **Visual Observations:**

Visual observations are an excellent way of maintaining situational awareness. This can entail everything from plotting compass bearings, following leading lights, to the noting of beam bearings.

Strengths:

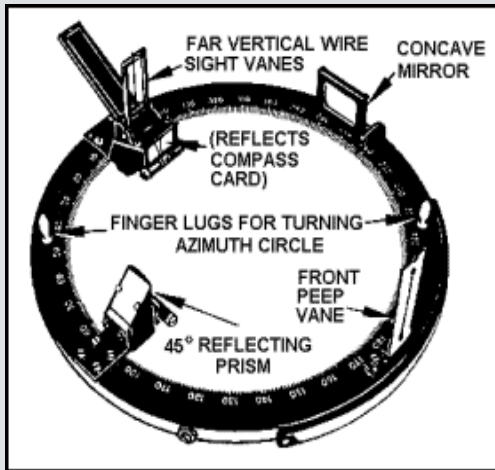
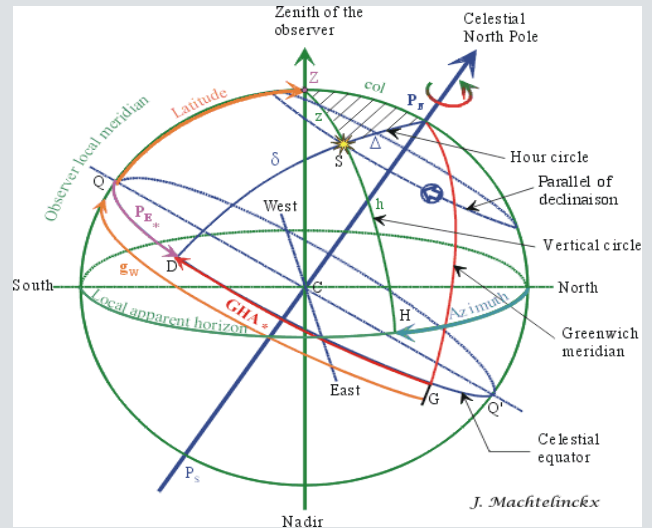
- ✓ Excellent for maintaining situational awareness
- ✓ Leading lights and sector lights are valuable in pilotage areas
- ✓ Should be used in conjunction with ECDIS and radar for checking and back-up
- ✓ Helps when interpreting a radar picture

Weaknesses:

- ✓ Reliant on good visibility
- ✓ Must be within visual range
- ✓ Object of bearing must be clearly identified



- ✓ Needs up-to-date data (paper or electronic) for processing



► **Radar:**

The use of radar is time-tested for positioning and can be highly accurate. It is fully independent of external sources. Radar is highly effective when using parallel indexing, and can supplement GNSS particularly when overlaid on ECDIS.

Strengths:

- ✓ Self-contained positioning system, can be set to require no external support
- ✓ Racons provide clearly identified important objects and aids to navigation
- ✓ Radar and target tracking functionality (ARPA/AIS) provide a range of effective tools and alarms to support decision making, e.g. target notification, CPA notification
- ✓ Improves situational awareness in restricted visibility

Weaknesses:

- ✓ Objects must be within radar visibility
- ✓ Subject to interference from heavy seas and weather
- ✓ Reliant in some modes on accurate gyro input
- ✓ At times a Radar picture can be difficult to interpret

► **Celestial:**

Celestial navigation remains a valid means of positioning and an excellent back-up to GNSS and compass checking, particularly when offshore.

Strengths:

- ✓ Sole (universally available) back-up for GNSS and compass checking offshore
- ✓ Capable of very good accuracy, 1 NM or better is possible from dawn and dusk star fixes
- ✓ Not reliant on electronic systems

Weaknesses:

- ✓ Needs clear sight of celestial bodies and horizon
- ✓ Can be difficult to accomplish in heavy weather
- ✓ Competency for use relies on regular practice
- ✓ Not suitable for inshore navigation – not a “real time” method



► **Global Navigational Satellite Systems:**

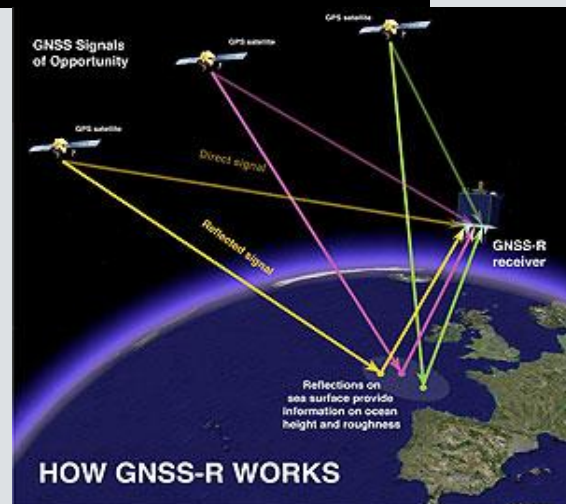
GNSS, and more specifically GPS, have been rapidly integrated into modern navigation and can be particularly effective when integrated with ECDIS. These systems give real-time global coverage and historically, have been highly reliable.

Strengths:

- ✓ Generally very accurate and reliable position fixes
- ✓ Global coverage with 24/7 availability
- ✓ Increased accuracy and reliability when used with differential systems, including Satellite Based Augmentation Systems (SBAS)
- ✓ Easily integrated into a wide range of onboard systems
- ✓ Position can be clearly displayed on ECDIS

Weaknesses:

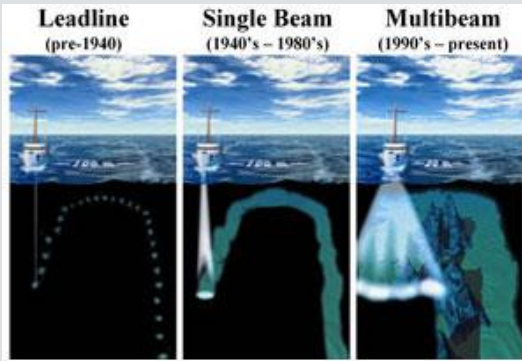
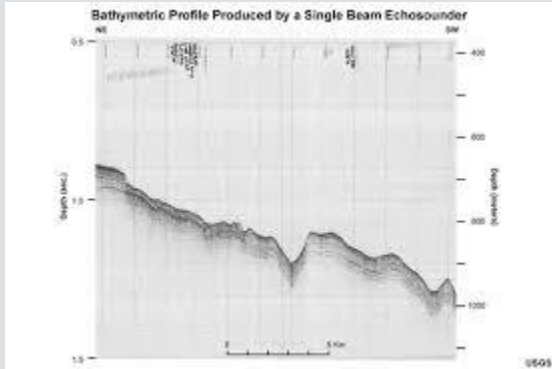
- ✓ Easily susceptible to intentional or non-intentional jamming or spoofing
- ✓ Complacency from ease of use can lead to over reliance on a single system



► **Other Systems:**

**Echo Sounder:** Excellent complementary tool to confirm when you come across anticipated depth areas, but can rarely give an independent position. Vessel can follow a depth contour as a crude form of indexing.





**Loran and eLoran:** Terrestrial electronic positioning systems that are much more resilient against intentional jamming, interference or spoofing than GNSS. Although Loran has been largely decommissioned, its potential successor, eLoran, is currently being

explored by a number of countries, including India and the UK, as a valuable back-up to GNSS.

**Multi service or integrated receivers:** A device being developed to accept input from all forms of GNSS, eLoran and other yet-to-be-developed systems. Currently integrated GPS/GLONASS/SBAS systems are available and more comprehensive systems will follow in time.

**Inertial Navigation Systems:** Use accelerometers and gyros to measure the movement of the ship and provide position by an automatic assessment of EP. These systems are used to good effect in military applications, but are currently very expensive and so not cost-beneficial for commercial merchant service.

**Specialist close-in systems:** Operations such as Dynamic Positioning require multiple independent automated navigation systems, although these are only useful over short ranges and for vessels with the specialist equipment. These systems can include taut wire, acoustic transponders, fan-beam, etc.

