NATO Naval Forces Sensor and Weapon Accuracy Check Sites

NATO
OTAN

NATO FORACS

OPERATIONAL CONFIDENCE THROUGH ACCURACY

"This has given the Ship's Company the opportunity to widen our knowledge of our Operational Capability, allowing us to identify the strengths in our key systems, as well as where improvements are to be made prior to going on task. The end game is ultimately to fight and win, which by conducting FORACS Ranging I am undoubtedly sure we can."

Commander A. S. Brown
MBE Royal Navy
Commanding Officer
HMS KENT

OPERATIONAL SUCCESS..... OR FAILURE?

A modern warship, submarine or maritime helicopter relies upon multiple sensors presenting an accurate, coherent picture without which:

- **The Command will not** have clear tactical awareness
- **The Command cannot** make correct operational decisions
- **The unit cannot** effectively engage the enemy or adequately defend itself against attack
- **The unit cannot** effectively be part of combined or joint operations

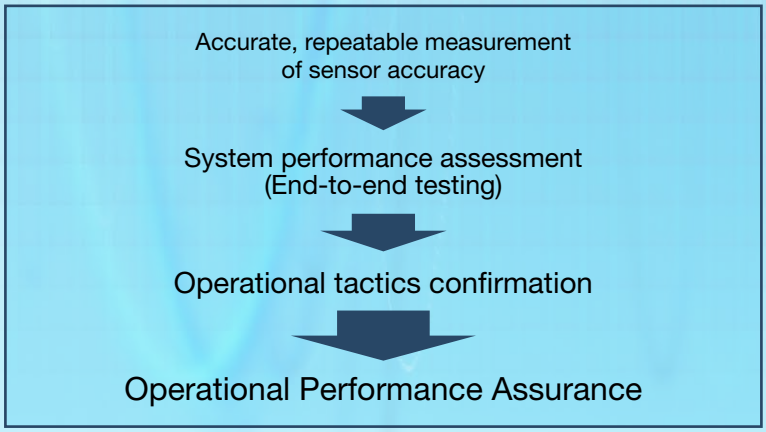
To overcome this, NATO FORACS quantifiably provides the necessary Command Assurance by:

Equipment and System Level Accuracy Measurement

The variety of FORACS tests allows for the accuracy measurement of individual sensors or whole systems. Equipment level measurements give a measure of unit level performance, whereas system level analysis provides information, which includes the effects of system integration and interfaces plus data latency issues within the Combat Management System. All of these will affect the ship's ability to engage a target successfully.

Operational Assurance Tests

Although FORACS tests concentrate on engineering measurements and error calculations, the real benefit is in providing Operational Assurance to the Command onboard and higher level command in operational headquarters.



NATO FORACS' SCOPE

NATO FORACS is an international NATO project available for use by all NATO nations but with eight permanent member nations: **Canada, Denmark, Germany, Greece, Italy, Norway, the United Kingdom and the United States of America.** Non-NATO nations may also use the facilities subject to approval by the North Atlantic Council.

Its mission is to provide NATO maritime and naval forces with the opportunity to undergo regular comprehensive calibration of sensor, weapon and navigation systems to clearly defined accuracy standards by measuring the bearing, range, heading accuracy and positional errors of systems onboard ships, submarines, maritime helicopters and ROVs against a common geographical reference.

Systems tested include:

- Active, Passive, Dipping, Towed Array and Mine Countermeasures Sonars
- Fire Control, Search and Navigation Radars
- ESM and RDF equipment
- Infrared, Laser and TV Sensors
- Optical Sights and Peloruses
- Periscopes
- Gyrocompasses and Inertial Navigation Systems
- Global Positioning Systems (GPS)
- Communication checks LINK – 11

Additional tests include:

- Antenna Radiation Patterns (ARP)
- Tactical Turns (manoeuvring characteristics)
- Anti-Ship Missile Defence system level check (whole system real time test)

FORACS test results are used by:

- Ship's Command and Engineering Teams
- Operational Commands for Combat Assurance Assessment
- Materiel Commands for engineering standards and equipment performance

OPERATIONS

Dockside Phase

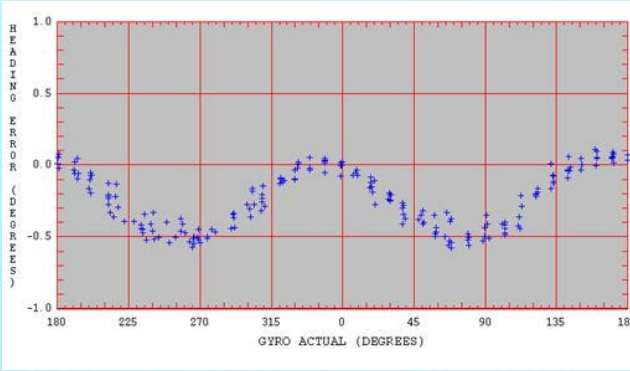
This phase is used for briefing, setting up, confirmation of test serials and conduct of static tests. This normally takes one day and is used for:

- Briefing the ship's personnel
- Establishing the ship's centerline
- Installing FORACS georeferencing equipment
- Installing FORACS Integrated Data Acquisition and Test System (IDATS) network
- Measuring gyrocompass settled error
- Measuring radar and sonar range errors
- Calibrating a submarine's periscope for use as the on-range heading reference

On-Range Phase

This phase is used for dynamic tests requiring ship's motion and different ship-to-target geometries and bearings. The duration of this phase depends upon the type of ship and extent of requested tests. Typically, small surface ships and helicopters can be tested in one day, whilst submarines and surface ships of frigate size and above require two days. Additional days can be added to accommodate additional FORACS or specific national test activities.

A typical FORACS test team consists of:



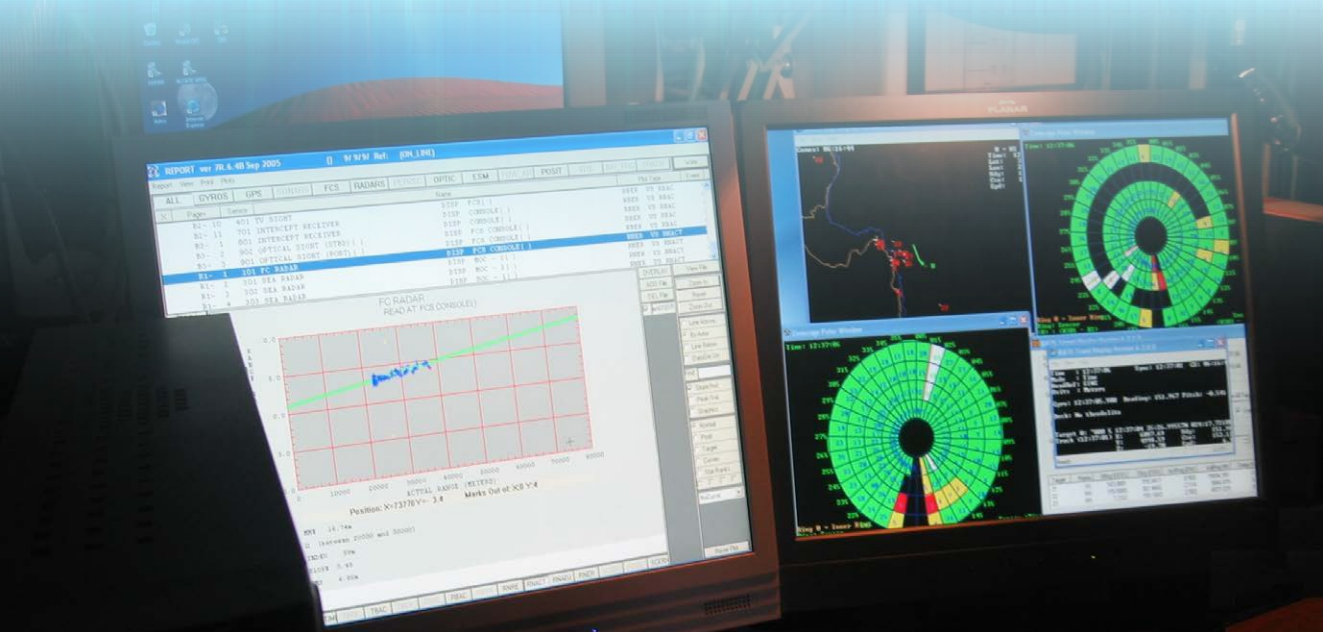
- The Test Director who coordinates all test activities
- The Test Engineer who advises the Bridge on ship manoeuvring aspects, provides technical guidance and monitors the collection of test data.
- Two or three Test Support Technicians who maintain, install and operate IDATS and advise the crew on manual data entry requirements.
- The Control Engineer, located ashore, who is responsible for the operation of all sensor targets and coordinates with the Test Director via radio.

Required Ship's Staff will include:

- The Liaison Officer, who will be the Test Director's principle point-of-contact onboard
- Operators and data recorders as required for systems being tested
- The Officer of the Watch/Deck who coordinates manoeuvring requirements with the FORACS Test Engineer
- The Principal Warfare Officer/Tactical Action Officer who coordinates employment of sensors with the Test Director
- Sensor system and combat system senior technicians on call to provide technical assistance if required

Real Time Analysis

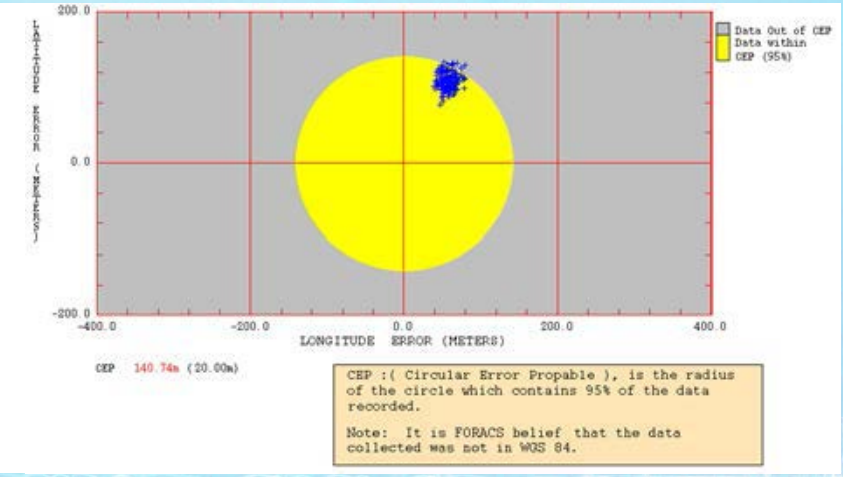
The Integrated Data Acquisition Test System (IDATS) records, stores and analyses test data in near real time, displaying error plots immediately to allow repeat test runs to be conducted if required.



Test Reports

After completion of testing, two reports are issued:

- A signal is sent within 24 hours to the ship and national Commands giving preliminary results
- A Final Report will be issued, normally within 20 working days, which contains all the data plots, statistical analysis and any comments relating to the trial.



Data Bank

NFO and NFA, between them, maintain a data library of all the test data from the Ranges. This information is used to develop and update sensor accuracy standards for each nation, and to enable special analyses that may be requested by the users. Importantly, NATO FORACS will never share national test data with anyone except the nation concerned.

FACILITIES

NATO FORACS operates three fixed test ranges:

NATO FORACS AUTEC (NFA) based at West Palm Beach, Florida

NATO FORACS GREECE (NFG) at Souda Bay, Crete, and

NATO FORACS NORWAY (NFN) at Stavanger

With the Project Management and overall coordination executed at the **NATO FORACS Office (NFO)** at NATO Headquarters, Brussels.

The test capabilities of all three ranges are largely identical, although local topography does provide some variation (for example, NFA has access to very deep water for submerged submarine operations).

Each test range also has the capability to conduct test operations at deployed locations, although some test equipment (notably the underwater sonar transducers) are fixed and so a reduced mobile capability is used.

All ranges use the same test methodologies, geodetic and time references, analysis software and report generation systems. This ensures maximum consistency of test results from all ranges, providing improved Maritime Situational Awareness across Task Groups and enhanced interoperability of operational warships and submarines of different nations in theatre.

NFO provides the executive management function of NATO FORACS and provides strategic guidance, technical direction and oversight, scheduling and financial coordination.

Tracking

NATO FORACS ranges operate a bespoke high precision Differential GPS system that is used to measure a ship's position, heading and attitude, giving position to decimetric accuracy, heading to 0.03° and attitude to 0.3°. The ranges also operate an optical tracking system as a fallback option.

The ship's plans and technical data are used during the dockside phase to determine the location of each sensor onboard relative to the FORACS reference point.

Navigation Systems

The vessel's GPS, Inertial Navigation System and gyrocompasses are measured against the FORACS high precision reference to provide positional and heading accuracy figures.

Targets

- **Acoustic**
  Active and passive sonar systems can be tested using transducer targets in surveyed positions on the seabed and with portable transducer targets. Passive sonar portable noisemaker targets are also available. Mine-like objects laid in surveyed positions provide targets for mine hunting sonars.

- **Electro-Magnetic**
  A variety of aircraft are available for radar tracking depending on customer requirements and weather conditions. A small surface vessel, fixed radar reflectors and a radar transponder are also available.

- **Electro-Optical/Laser/IR**
  Various surveyed optical targets, including lights, towers, and other markers, are available for visual and EO tracking. Also available are fixed and deployable targets for IR sensors and laser prism reflectors.

ORGANISATION

Quality Management System

NATO FORACS is certified to the ISO 9001:2015 Quality Management Standard and takes very seriously the quality and reliability of all its activities.

Scheduling

Requests for testing are normally sent to the NATO FORACS Office. Ideally, nine to twelve months lead time is preferred to aid with resolving conflicting schedule requirements, but shorter notice requests can often be accommodated. Two to five days should be planned for each ship, depending upon test complexity.

Funding

Most capital investments have been funded through the NATO Security Investment Programme. Minor investments plus Operations and Maintenance costs are funded directly by the eight sponsoring nations: Canada, Denmark, Germany, Greece, Italy, Norway, the United Kingdom and the Unites States of America.

Other NATO nations are welcome to use the test ranges on a daily cost basis.

Non-NATO nations may use the test ranges on a daily cost basis, subject to approval by the North Atlantic Council. Any such request should be made via the NATO FORACS Office.

Additional Information

Additional information can be found in:

- The NATO FORACS Strategic Plan
- Allied FORACS Publication (AFP) 1 – NATO FORACS Range Users' Guide
- Allied FORACS Publication (AFP) 2 – Guidelines for the Interpretation of NATO FORACS Reports.

"Using the NATO FORACS test team during U.S. VIRGINIA Class accuracy trials saves the program in excess of $250,000 per event. Their expertise, professionalism and initiative significantly reduce the workload on the NUWC Code 25 national test team and have proven themselves a valuable addition to the effort necessary to certify the boat's combat system."

Mr E. Rahme

Deputy Acquisition Program Manager for Warfare Requirements and Test Virginia Class Submarine Program

ALIGNMENT WITH NATO'S AIMS

NATO FORACS aligns well with several of NATO's formal aims, including:

- Increasing interoperability
- Improving maritime situational awareness
- Supporting the maritime element of NATO's Readiness Initiative
- Reinvigorating anti-submarine warfare
- Maximising the use of resources

A BRIEF HISTORY

1974 A Memorandum of Understanding was signed to formalize the NATO FORACS Project

1977 The NATO FORACS Office was established in London and later moved to NATO Headquarters, Brussels

1978 NATO FORACS Norway near Stavanger became operational

1984 NATO FORACS Greece at Souda Bay, Crete became operational

1994 NATO FORACS AUTEC based at West Palm Beach, Florida became an affiliated NATO FORACS Range

1999 The first deployed test was conducted

2008 NATO FORACS achieved certification to the ISO 9001 Quality Management Standard

2017 Conducted the first multi-ship test to prove elements of Task Group interoperability.

OTHER TEST AND TRAINING FACILITIES NEARBY:

NFA:

- The US Navy Atlantic Undersea Test and Evaluation Center (AUTEC) is collocated with NFA, with capabilities including an in-water 3-dimensional tracking range and full weapon testing including underwater weapon firings.

NFG:

- The NATO Missile Firing Installation (NAMFI) is located a few kilometres from NFG and includes five air and sea surveillance radars and two missile-tracking radars. Tactical weapons firings can be conducted in a realistic combat environment.
- The NATO Maritime Interdiction Operations Training Centre (NMIOTC) is also located near to NFG and provides training for NATO forces in the execution of surface, sub-surface, aerial surveillance and special operations activities in support of Maritime Interdiction Operations (MIO).
- A degaussing range is situated in Souda Bay.

NFN:

- The NATO Joint Warfare Centre (JWC) in Stavanger is NATO's training focal point for full spectrum joint operational level warfare.
- Underwater noise test range north of Bergen, approximately 83 NM (95 NM by sea) north of NFN, is operated by the Royal Norwegian Navy on behalf of Germany, the Netherlands and Norway.
- A Mine Countermeasures Vessel degaussing range is located approximately 3 NM (8 NM by sea) north of NFN
- The Missile Firing Range at Vigdel is situated approximately 20 NM (36 NM by sea) south-west of NFN.

"We use FORACS as a valuable external quality review of the alignment of our ships' systems carried out by our workshops and vendors"

Commander A. Drygaard
Royal Danish Navy
Danish Ministry of Defence
Acquisition and Logistics Organisation

NATO FORACS

0013-20 NATO Graphics & Printing © 2020 NATO FORACS – All rights reserved

For further information, please contact:

NATO FORACS Office

NATO Headquarters, 1110 Brussels, Belgium
Tel +32 2 707 4244 - Fax +32 2 707 4558
Email: nfo@foracs.nato.int
webpage: https://diweb.hq.nato.int/ click «FORACS»