

## CBIL Services

CBIL provides a comprehensive range of services covering all aspects of Global Navigation Satellite System (GNSS) positioning, navigation and timing. In effect, if you need anything that can be facilitated with GNSS satellites, it's in our portfolio!

CBIL has extensive experience in all areas of the navigation industry, spanning consultancy, system design and product supply. We have applied GNSS technology in areas of land navigation and surveying, marine navigation and off-shore surveying, airborne precise navigation and even space-based navigation.



As befits a company specialising in satellite technology, we adopt a 'blue sky thinking' approach to our clients' needs. You can benefit from our experience as we have a unique view of what works and doesn't work, as well as in-depth knowledge of which items work together.

In addition to consultancy and supply, we offer a complete after-sales service including repairs and replacements. In certain circumstances we can also provide equipment on hire or lease.

### Our solutions portfolio:

- GNSS Precision Positioning and Navigation (Location-based services)
- Dynamic Positioning of drill ships, rig support and cable laying vessels
- RF test strategies and certification methodology development
- GNSS introduction and training, from basic to advanced applications
- GNSS Surveying systems, both static and kinematic (moving)
- Inertial measurement system
- Frequency spectrum management systems and applications
- Reference networks
- Precision timing for synchronisation and time recording (range instrumentation)
- Consulting in many aspects of positioning, navigation, timing and communications
- Bespoke project support and system design
- System integration and procurement
- Lectures and presentations
- Post Processing
- Communications Systems design aimed at Telemetry

## Precision Positioning and Navigation

The sextant and John Harrison's marine chronometer are no longer essential to identify your position anywhere in the world, on land, sea or in the air. We provide expertise and consultancy in Global Navigation Satellite System (GNSS) precision navigation so that you know where you are and, more importantly, how to get to where you want to be.

In certain configurations our systems will provide you with real time position fixes measured at one to two centimetre level; our so-called 'sugar cube' navigation.

We work in partnership with [JAVAD GNSS](#) navigation, probably the precision GNSS industry's leading innovator. This enables us to supply reliable and highly flexible solutions that can be integrated into your current systems or deployed as independent, autonomous units.



Over the last 40 years we have gained much experience in specifying, designing and procuring advanced navigation and positioning systems for a large number of international, blue chip clients. Our list of applications for precision navigation and positioning is ever expanding and has included ship docking systems, dynamic positioning of ships, aeronautical missions, unmanned aerial vehicle (UAV) control and many more.

### The systems we work with include:

- Supply of Javad GNSS receivers
- Multi constellation, all in view, designs
- Both OEM and fully packaged receivers
- Capable of positioning in DGPS, WADGPS (SBAS), RTK and Network RTK modes
- Accuracy to 1cm level in real time
- Capable of position generation up to 100Hz together with high accuracy velocity in three planes (x,y & z)
- Triumph-1 and Triumph-VS systems for precision survey primarily on land
- Various high quality multi-GNSS antenna systems designed for land, sea and air use
- ArWest digital signal processor-based data communications systems plus L-band satellite signal demodulators and IALA Beacon OEM receivers
- iMAR Inertial navigation and sensor systems for a wide range of applications

## Timing/Time coding

High precision timing is crucial in military weapons development and test ranges, where a precise time reference is required at many points on the range to coordinate firings, tracking and targeting at accuracies in the sub 1 microsecond range. CBIL has been instrumental in integrating this system with a new range management system at one of the world's largest test ranges



Precision timing is also imperative for labelling data blocks to ensure correct correlation of data at all times. This is relevant for measurement data in research as well as data blocks in big computer networks transporting security or time dependent data, such as banks or insurances, where the time tag of transactions may strongly influence the revenues. Overlaying video signals with the time and date also falls into this category.

In addition, we provide precision frequency reference oscillators and international time synchronisation GNSS receivers for the transfer of time reference around the world.

CBIL offers bespoke precision timing systems through our partnership with [Lange Electronic](#) of Munich. Lange has many years' experience in the timing industry and has a highly innovative development laboratory for telemetry and data acquisition systems. Our partnership gives us access to a great depth of experience for solutions tailored to the needs of our customers in the automotive, air and space industries, and the armed forces.

After more than 30 years in business Lange has extended the range of timing and frequency sources such as the IRIG standards, time distribution and time monitoring system products. The company also distributes products for manufacturers from the UK, USA and Australia.

### Precise Timing Systems

- Central Timing Systems
- Timing distribution
- Range instrumentation systems
- Time display systems
- Network precision timing for financial applications

### Technology and time codes

- Rubidium
- Caesium
- GNSS timing sources

### Time codes produced include

- IRIG A,B,D,E,G,H
- HaveQuick
- Pulse signals

## Consultancy

CBIL has been at the forefront of the Global Navigation Satellite System (GNSS) industry for more than 40 years and has established a reputation as one of the world's leading authorities in navigation and positioning technologies.

Managing Director, Colin Beatty is currently President of the Royal Institute of Navigation and has chaired the Institute's Technical Committee responsible for steering the vision of GNSS in the United Kingdom.



Our experience includes consultancy for insurance cases in the Admiralty Court; Colin was retained by Hutchinson 3G as a Location Technology consultant during the development and build up of the 3G system "3"; and he led a test team to Japan to look at Assisted GPS in operation in mobile phones available in the Japanese market. Colin also worked with Yeoman on their VoxNav product, which now belongs to Trafficmaster.

### Consulting in all aspects of GNSS:

- GNSS performance
- Identification of equipment of suitable cost and performance
- System design and deployment
- System integration
- Testing strategies

### Other areas include:

- Vulnerability
- Legal and legislative matters
- GNSS related telemetry systems
- Satellite-based broadcast systems
- Antenna selection and design
- Inertial measurement
- Timing systems

## Bespoke support and system design

Our main area of expertise is in the design and implementation of bespoke Global Navigation Satellite System (GNSS) schemes to suit our clients' specifications and budgets. We provide unique and innovative system designs which we can take from the initial concept all the way through to a full functioning delivered solutions.

We are distributors for industry leading technical innovators in the field of precise GNSS positioning, navigation, surveying and timing. The strength of our relationship means that we can specify certain design features or developments on their product range and thus tailor off-the-shelf equipment to your particular requirement. This could include integrating the system with an existing navigation system or survey procedures and processing software. Once your system is in place we can provide a comprehensive support service to ensure that it stays operational with the minimum of down time.

### Bespoke systems to your specification:

- Selection of COTS elements
- Specification and design of bespoke elements
- Modification to COTS elements
- Software design
- System integration
- Commissioning and testing

## Imparting knowledge and context

Colin Beatty has been a respected expert in Global Navigation Satellite System (GNSS) positioning for more than 40 years. He has travelled the globe giving lectures and presentations to both academia and industry on the many aspects of precision navigation and the revolutionary new applications and markets where GNSS positioning technology has been applied.

In addition to specialist audiences, he has a knack of explaining what GNSS can do to benefit businesses, talking about the context in which it can be used; the methodology and equipment available; and the cost benefits. This form of 'executive summary' can be immensely helpful to a technical team seeking the support and approval of non-technical stakeholders, from the board of directors to shareholders.

### Knowledge via:

- Formal training sessions and courses
- Presentations at industry events
- University lectures
- White papers
- Articles in magazines and on the websites
- Media appearances

## System integration and procurement

Wouldn't life be simple for all of us if every project could be designed from scratch and specified with all-new components? It does happen but, as often as not, you need a system that will integrate with the established technologies you already have in place.

CBIL has extensive experience of integrating systems into a variety of environments for different applications in the marine, aerospace, military and civil industries.

Whether the Global Navigation Satellite System (GNSS) scheme is the major element of a programme or simply part of the bigger picture, our technicians will ensure that it will integrate as seamlessly as possible and fully interface with hardware and software platforms. These could include external sensors or display modules for a ship's bridge, stress monitoring management for large sea-going vessels, or a structure monitoring system for a dam or other large construction. We also support a number of cable-laying and rig support vessels with precision navigation linked to dynamic positioning systems. CBIL designs and builds interfaces for display units allowing the data from the GNSS system to be presented in a way that can easily be understood by a non technical operator. Once a system is in place we can provide a comprehensive support service that will ensure that your system stays operational with the minimum of down time.

### CBIL can help you by:

- Determining the required function
- Developing required system performance
- Research suitable system elements
- Design integration philosophy
- Provide system costing
- Procure system elements
- Undertake system integration and testing
- Delivery operational system to client

## Strategies for testing and certification

Every product and system that uses a Global Navigation Satellite System (GNSS) requires rigorous testing to confirm its accuracy, performance and characteristics.

Working with [Spirent Communications](#), CBIL can provide you with our 'Sky in a Box' – a simulator that provides RF signals to a GNSS receiver as if it were looking at actual, live satellites. It works with all constellations including GPS, GLONASS, Galileo, QZSS, MSAS, EGNOS, WAAS and Compass.

Using a carefully considered simulation strategy, you can reproduce the effects of the real world as a whole, or break them down into the individual elements and combine as required. The simulator can recreate positions anywhere in the world, at any time (past, present or future).



You can also overlay any three-dimensional motion that you wish to test, including high velocity, rapid acceleration and extreme levels of jerk. These variable parameters mean that you can run an infinite number of 'What If?' scenarios.

These activities demand levels of accuracy, repeatability and traceability that can only be offered by a test methodology based on precision test equipment in a well-controlled environment. A detailed strategy will maximise test effectiveness and efficiency, ensuring your product is fit for purpose whilst minimising your development cycles.

CBIL will work with you to help write your test strategies and develop sophisticated satellite radio frequency and inertial simulations that can readily be used to provide comprehensive test coverage for your product.

### CBIL can help you by:

- Advising on the design of test strategies for GNSS and inertial based systems
- Assist with the selection of simulation systems
- Advise on correct deployment of simulators for "hardware-in-the-loop" testing etc
- We can also devise GNSS RF simulator-based test scenarios

## GNSS Training

The technology behind the Global Navigation Satellite System (GNSS) can be difficult to grasp, even for people with some technical background. At CBIL we aim to speed your people along the learning curve, with bespoke, comprehensive training sessions for your systems and applications that will ensure you are up and running in minimum time. This training will also ensure that you and your team are collecting accurate data and accomplishing what you need in the most cost- and time-efficient way.

We use e-learning techniques where appropriate, allowing the training to be undertaken at your own pace.

For groups of up to 25 CBIL can offer practical in-the-field training courses. These courses are individually tailored to your training requirements based on the particular system that you are using. We can also offer more generic training sessions based around unit set-up and initial equipment orientation.

Over the next 12 months we will be launching a comprehensive suite of web based, highly interactive e-learning training modules aimed at learners of all abilities, from newcomers to seasoned surveyors and navigators. The programme will comprise product guides and 'how to' lessons, alongside more generic application and technique specific walk-through tutorials that are non manufacturer-specific. The modules will incorporate a learning tracker facility, whereby you can set up accounts for your staff and track their progress.

### Training

- Bespoke courses
- Onsite
- Offsite
- Lectures
- Written papers
- E-learning
- Webinars
- Field training
- Groups
- Equipment familiarisation
- Best practice