



LOCATA CORPORATION

Technology Brief

1. Locata Technology Overview

Since 1991, when it really proved its utility in the First Gulf War, GPS has become the “Gold Standard” for positioning. Notwithstanding this obvious success, GPS is now beginning to reveal significant limitations when it is relied upon by modern applications. Its signals are generally very badly degraded or completely unavailable in cities, urban canyons and especially indoors – essentially all of the places where most people live, work and play. Locata Corporation has solved this problem.

Locata has invented a completely new positioning technology. It creates terrestrial networks that function as a “local ground-based replica” of GPS. Locata is not designed to replace GPS; it is a local extension and expansion of GPS. It works with GPS, but can also operate independently when GPS is not sufficient. Instead of orbiting satellites, Locata utilizes a network of small, ground-based transmitters that blanket a chosen area with strong radio-positioning signals. Because it is terrestrially based and provides strong signals, Locata can work in any internal or external environment.

A Locata receiver, almost identical to a standard, low cost GPS receiver, will acquire and track both GPS *and* Locata signals. This functionality provides an optimum positioning solution by providing a seamless transition between environments where a user can utilize Locata signals, GPS signals, or both. A Locata receiver therefore exploits the strong heritage and design of GPS, yet evolves the technology to a higher level. Locata provides precise range measurements and accurate position solutions, while maintaining the elements of simplicity and low cost that have made GPS so successful.

The synchronization of transmitters is a core, fundamental requirement for radio-positioning systems. Locata’s pivotal technological advance is a patented synchronization method which is called **TimeLoc**. This trademark clearly indicates that the Locata transmitters are chronologically “locked” together.

TimeLoc allows Locata to replicate GPS on the ground. There is no other system that can do this.

TimeLoc synchronization also enables Locata to give accurate position solutions with simple receivers only utilizing one-way ranging signals - *a technology description which is exactly the same as GPS*. Without a synchronous network like Locata, all competing methods must resort to additional complex hardware, plus some form of reference system and a communications back-channel which attempts to externally correct the time errors inherent in their unsynchronized signals. Such externally corrected technologies are intrinsically more complex, are far less reliable, require additional infrastructure, do not provide sufficient accuracy and do not scale to areas of varying size.

Locata’s terrestrial design provides both local control and regional coverage. The Locata system encompasses both the transmitting *and* receiving sides of the positioning network, allowing the system to be **configured** to meet specific, localized demands for availability, accuracy, and reliability. This flexibility ensures that signal integrity can be guaranteed in even the most demanding environments. The ability to modify the availability and reliability of signals is beyond the reach of GPS, or any other technology that lacks native control of the transmitters generating the location signal.

1.1 Core Components

The Locata system is composed of two core unique and proprietary devices:

- A transmitter/receiver (transceiver) unit, called a **LocataLite** that provides signals that enable highly accurate range measurements; and
- A standalone receiver, called a **Locata**, which is an enhanced GPS receiver with capability added to track the LocataLite signals.

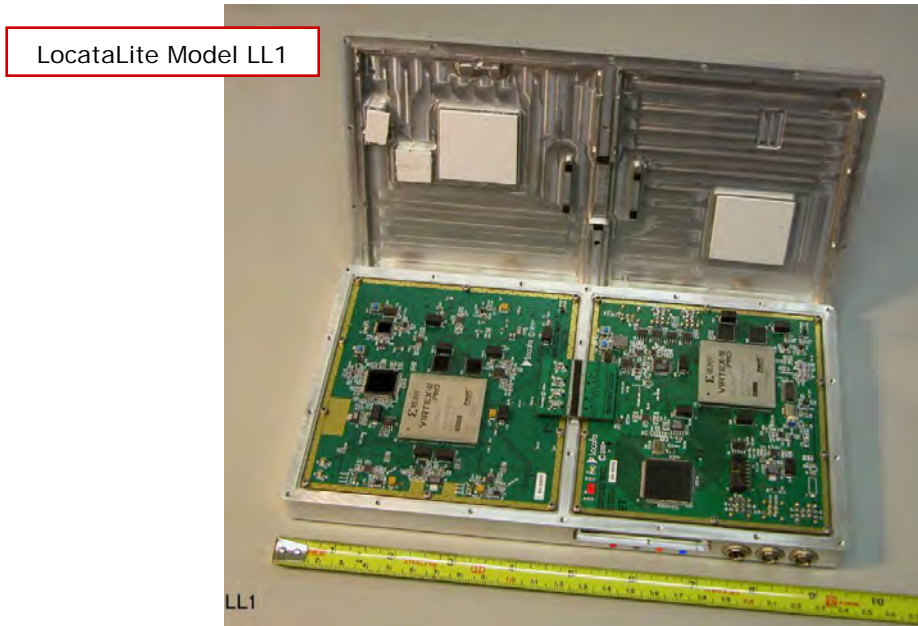


Fig 1: Current Form Factor of a LocataLite Transceiver.
Locata receivers contain only the circuit board on the RHS of the picture.

1.2 The Locata Network

Time synchronization is the bedrock of the GPS system, as it enables an independent user's receiver to compute its position without any additional support or information. This powerful characteristic of GPS is known as a **single-point position**, and it is an essential attribute for a radio-location system.

Using the new TimeLoc methodology, a group of 3 or more LocataLites autonomously synchronize their signals and therefore "co-operate" to form a network termed a **LocataNet**.

TimeLoc's autonomous synchronization of terrestrial transceivers is a **critical technological advance that is unique to Locata**. TimeLoc synchronization gives a LocataNet the ability to supply highly accurate single-point position solutions, independent of GPS radio signals. There is no other positioning system that can do this.

Currently, TimeLoc synchronizes Locata transmitters and receivers to an accuracy of **3 nanoseconds**, which is a level substantially more accurate than can be attained using the multiple atomic clocks on board the GPS satellites.

In fact, LocataLites achieve this extremely high-accuracy synchronization **without atomic clocks, without external control, without cables, and without needing a reference network for time correction.** This represents a quantum leap in positioning technology. It also results in an inherently elegant system that's far more reliable and with fewer "moving parts" than competing technologies.

In addition to autonomous synchronization, LocataLites can autonomously survey and initialize themselves into a network. The initial self-survey reference point can come from GPS or from an existing LocataNet. This capability makes a LocataNet easily expandable to provide increased coverage, with LocataLites autonomously joining (or departing) networks. LocataNet's built-in auto-networking capability saves on maintenance and installation, and allows for ad hoc, custom-deployable networks that no other location technology can supply.

The GPS constellation's broadcast signal strength is limited by the physics of flying satellites more than 20,000 km in space. In comparison, LocataLite signals are orders of magnitude stronger. The transmitted signal strength from a LocataLite is limited only by local regulatory restrictions on the use of 2.4 GHz wireless spectrum. Even this constraint is simply an arbitrary one, as Locata signals can be moved to any suitable frequency band in the future, transmitting at any approved power level.

LocataLite signals are designed "to act like GPS signals", but are "tailored" to provide increased accuracy in situations where signals are reflected and blocked, as in urban and industrial environments. The result of these innovations is strong, synchronized signals that can provide accurate ranging in all environments – including "aggressive/hostile" operational environments.

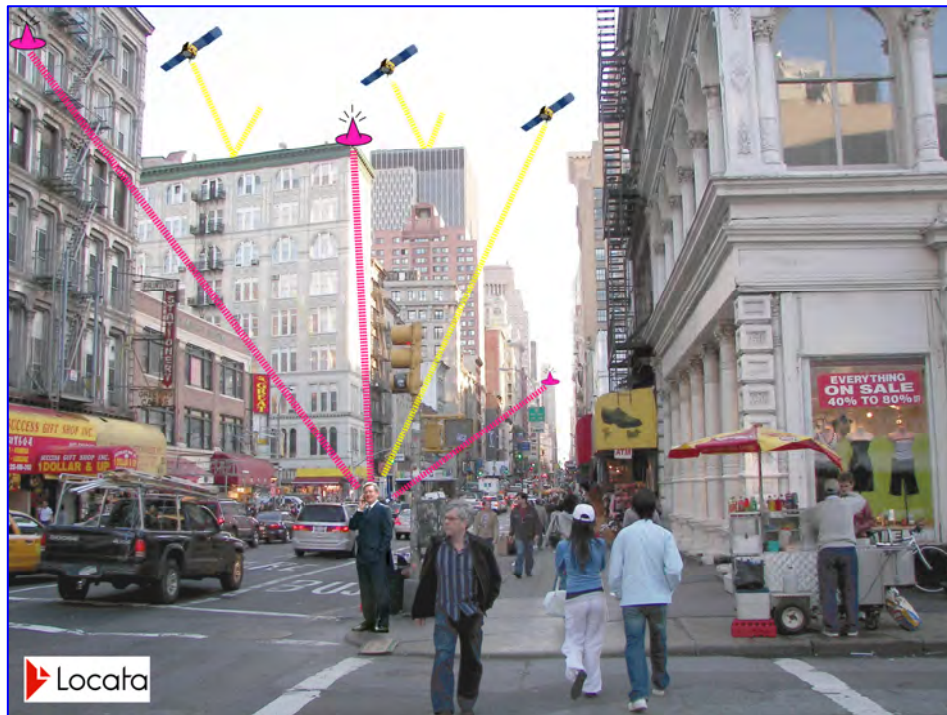


Fig 2: New York.

A typical city "canyon" where high rise buildings obscure line of sight to the minimum requirement of 4 GPS satellites needed to achieve 3-D positioning. A LocataNet will operate seamlessly with GPS to give positioning to mobile receivers in environments where multi-path, low power and other problems make standard GPS wildly inaccurate, or completely unusable.

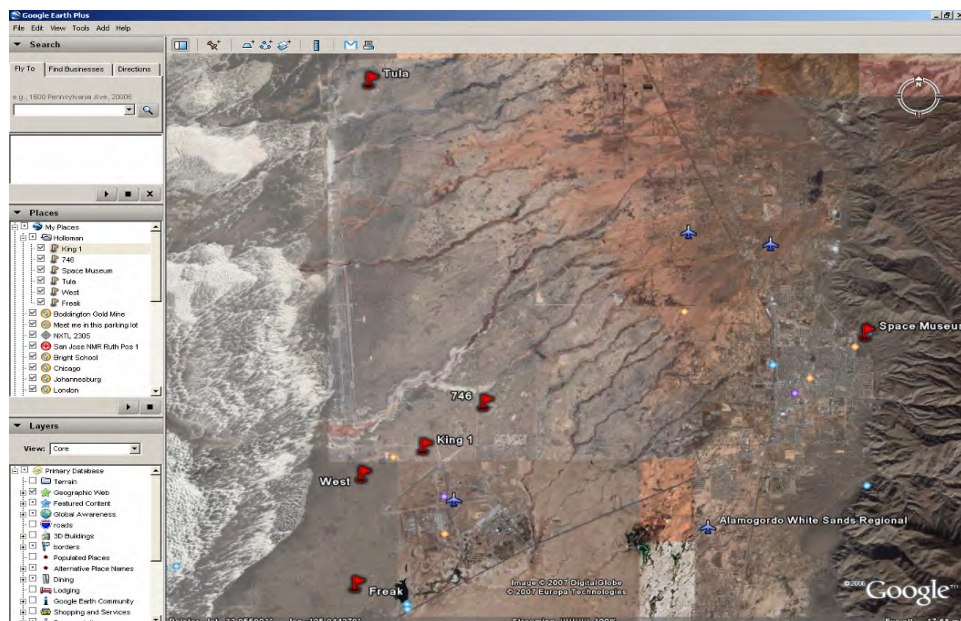
1.3 Multi-Functionality & Scalability

A Locata “combined receiver” will function as a GPS receiver in situations where GPS satellite signals are available, with the added capability to also track LocataLite signals. Therefore, the receivers function just like any other GPS receiver when they are operating outside a LocataNet’s coverage area. However, as soon as the receiver is located *within* a LocataNet, all of the Locata advantages are available for position determination. These Locata receivers will be designed to provide the best of all worlds: **they can use signals from GPS, from LocataLites, or from both.**

The LocataNet is, in effect, “a Local Constellation”.

Systems like GPS are global in coverage and therefore do not require any expansion. Terrestrial systems, however, are most valuable if they have the ability to grow as applications or users require larger or smaller coverage areas. Locata technology is totally scaleable and flexible - from a room to a campus to an entire city. For example, neighboring LocataNets can join together to form a “super” LocataNet, providing continuous positioning capability across originally independent LocataNets. Locata technology is specifically designed to allow the expansion of a network, with minimal effort from network operators or users. This ability to auto-configure is a key value proposition that gives Locata technology a strong commercial edge over other technologies.

Further, Locata signal strengths today are comparable to mobile phone signals. Today they are over 1,000,000 times stronger than the most sensitive standard GPS signals. In future embodiments, LocataLites will transmit much higher power than the devices designed to operate solely in the FCC-regulated ISM band. For example, the world’s biggest LocataNet was trialed by the 746th Test Squadron (<http://www.holloman.af.mil/library/factsheets/factsheet.asp?id=5922>) across a 56 x 12km area at Holloman Air Force Base in New Mexico (see below). Following these tests Locata was granted a “sole-source” contract to provide high-accuracy positioning when GPS is intentionally jammed across a vast 6,500 square kilometer area of the White Sands Missile Range in New Mexico. This is truly a **world-first capability** which illustrates Locata’s emerging presence as a new positioning technology. There is no theoretical or technical problem in scaling a LocataNet to even larger areas.



Flags mark some LocataLite positions - LocataNet at Holloman Air Force Base, NM

LOCATA TECHNOLOGY RAMIFICATIONS...

Locata has, for the first time, replicated GPS on the ground in a terrestrial network. Not only does Locata integrate seamlessly with GPS, it simultaneously eliminates many GPS deficiencies. In truth, a LocataNet could completely replace GPS locally, if need be. It must be clearly evident: there is nothing “global” about positioning in a warehouse, an open-cut mine or in a city. It is inherently a “local” problem. However, *before Locata*, the only way to provide that function was via a GPS satellite system.

Consider this... *What would the modern positioning landscape look like if the “gold standard GPS” was available anywhere and everywhere it was needed – without fail – in urban, industrial and indoor environments?* If regional and local Locata-enabled “GPS hot spots” were deployed to provide strong, controllable, reliable and accurate positioning wherever it’s required? All powering new levels of consumer, tourist, transport, emergency services, homeland security, construction, engineering and mobile phone applications? Locata is the first and the only technology that *can* enable this vision of “positioning as the next utility”. Locata’s innovations enable highly accurate positioning that can be integrated into any application or mobile device, all the while leveraging the past 40 years of GPS development. ***Locata is set to become a fundamental and important part of future positioning systems, as it takes radio-positioning technology to the next level. Locata call it “GPS 2.0”.***

Finally: the emergence of Locata technology will totally negate current assumptions that a complex mashup of technologies – A-GPS, Wi-Fi, CDMA, Bluetooth, Ultra Wide Band, terrestrial TV signals and other inappropriate signal sources – must be cobbled together to supply what are essentially “band-aid” solutions to position mobile devices. The reigning GPS gold standard signal *can*, in fact, cover it all with a new combination of **satellite+terrestrial constellations**. Locata is the new technology advance that enables this system improvement to be developed.

Now the ideas for personalized information delivery to myriad mobile devices – as proposed by Google, Apple, Microsoft, and others - can truly materialize. Locata’s positioning technology is the platform which will power numerous new applications, and finally enable development of what could become “the world’s next utility”. Locata technology will be publicly “launched” at the Institute of Navigation Conference in Portland in September 2011.

This launch marks the arrival of a critical new technology that will enable the future of high-accuracy radiopositioning in settings that lack reliable or functional GPS.

Positioning will never be the same again.

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Locata Technology Brief v3.0 (Public - July 23, 2011)

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