Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C.

In the Matter of	
Revision of the Commission's Rules to Ensure Compatibility With Enhanced 911 Emergency Calling Systems	CC Docket No. 94-102
Amendment of Parts 2 and 25 to Implement the Global Mobile Personal Communications by Satellite (GMPCS) Memorandum of Understanding and Arrangements; Petition of the National Telecommunications and Information Administration to Amend Part 25 of the Commission's Rules to Establish Emissions Limits for Mobile and Portable Earth Stations Operating in the 1610-1660.5 MHz Band	IB Docket No. 99-67

COMMENTS OF SKYBITZ, INC.

Mobile Satellite Service ("MSS"), by its very existence, offers significant public safety benefits. It provides a communications link to those otherwise without one. This allows people in remote and rural areas to contact emergency services – a capability that might not be otherwise available. As a public safety matter, therefore, MSS systems are demonstrably in the public interest, and the Commission should do what it can to encourage their deployment.

Yet the very attribute allowing MSS systems to provide these pubic safety benefits – their global footprints – makes it difficult for these systems to offer Enhanced 911 ("E-911") service. More specifically, MSS systems cannot provide Automatic Location Information ("ALI") on their own, at least not within terrestrial wireless

accuracy standards.[1] This leaves the Global Positioning System ("GPS") as the best potential solution. MSS operators, however, have identified serious problems integrating GPS with their systems.

SkyBitz, Inc. ("SkyBitz") takes no position on whether MSS operators should be required to implement E-911 (except to observe that they certainly should *not* be required to do so where it would be impossible or impracticable). It submits these comments only to make the Commission aware of technology that it believes solves some of the problems associated with the use of GPS devices and data in MSS systems.

I. DIFFICULTIES IN COMBINING GPS RECEIVERS WITH MSS HANDSETS

To SkyBitz's knowledge, no existing MSS system employs GPS technology. GPS systems, however, have been used for remote monitoring (of vehicles, for example), which has many similarities to ALI. Generally, such offerings simply combine a GPS receiver with a communications radio, so that the calculated position results can be relayed to a remote facility for storage and dissemination.

MSS operators are exploring similar solutions for ALI. These typically involve combining a standard GPS receiver with an MSS handset. Under such a configuration: (1) when prompted, the GPS receiver downloads data from GPS satellites if needed; (2) the receiver calculates location information based on GPS data; (3) the handset transmits that information via the MSS satellite to the Gateway/MSS switch; and (4) the MSS

[1] *See Revision of the Commission's Rules to Ensure Compatibility With Enhanced 911 Emergency Calling Systems*, Further Notice of Proposed Rulemaking, FCC 02-326, CC Docket No. 94-102 at ¶¶ 16-17 (rel. Dec. 20, 2002) ("*Further Notice*") (citing Inmarsat, ICO, Motient, GlobalStar, Iridium, and Orbcomm comments).

switch redirects the information to either a call center or directly to the appropriate Public Safety Answering Point ("PSAP").[2]

Because such solutions involve standard GPS receivers, all the GPS functionality is in the receiver itself. In other words, as with any standard GPS receiver, a "GPS/MSS" handset would *itself* download information from GPS satellites, and then process that information using complex algorithms to calculate location information.

Keeping GPS functionality in the handset makes sense for many applications. But it causes significant problems for MSS applications:

- ***Delay.*** If a standard GPS receiver is operated continuously, it keeps constant track of satellite location and time data. It can then typically calculate location every second. If, however, a GPS receiver is not operated continuously (as with MSS use), each time it is powered up it must search and reacquire satellite data before calculating location.[3] "Warm starts," in which the receiver can make use of some recent data, typically take 20-30 seconds. "Cold starts," in which the receiver must undertake a completely new search because the data on hand is too old to be useful, can take two minutes or even longer.[4] Moreover, the MSS handset cannot transmit while the GPS receiver is acquiring data (which could be several minutes for a cold start), because of interference from the transmitter into the GPS receiver. This results in unacceptable delays in establishing emergency calls.[5]

---

[2] *See Further Notice* at ¶¶ 19-27 (discussing MSS emergency call centers).

[3] The GPS receiver must always obtain satellite code timings. Depending on the time since it last operated, it might also need to reacquire parameters from the GPS data downlink (time information, clock errors, satellite position information, ionospheric data, etc.).

[4] It may be possible for an MSS/GPS handset to change a cold start into a warm start by using coarse position information generated as part of the MSS call itself. This would, however, require a handset to (1) establish a connection with an MSS central facility; (2) coarse-position itself; (3) download relevant information; (4) switch to GPS operation to obtain satellite data; and (5) revert to MSS communications to report the result. This process is similar to network-aided GPS developed for use with terrestrial PCS systems. However, the relatively large MSS beam coverage areas complicate, and may preclude, delivering the quality of aiding information available in terrestrial systems. As this quality (i.e., Doppler and timing precision) degrades, acquisition time and power consumption increase.

[5] *See*, *e.g.*, Joint Supplemental Comments of GlobalStar USA, Inc., *et al.* in IB Docket No. 99-67 at 19 (filed Feb. 20, 2001) ("GlobalStar Supp. Comments") (claiming that GPS position fix could take "several minutes").

- ***Battery Power.*** GPS calculations drain batteries quickly. Today's standard GPS receivers, when operating continuously, typically drain small (AA-sized) battery packs in less than a day. Even if a GPS/MSS receiver is not operating continuously, obtaining satellite data and performing calculations during a cold start also drains batteries. (One would expect MSS/GPS handsets to obtain satellite data at least periodically to avoid cold-start delays in emergency situations.) ICO calculates that, "[i]f a GPS chip is incorporated into the ICO MSS handset . . . the handset's stand-by battery life (between charges) would be reduced from approximately 180-200 hours to approximately 20 hours . . .."[6]

- ***Expense.*** ICO calculates that it would cost $30.00 per handset to combine an MSS receiver with its handsets.[7]

Because of these problems, MSS operators uniformly indicate that it would be difficult, if not impossible, to provide ALI using GPS receivers.[8]

II. GLS TECHNOLOGY ADDRESSES MANY OF THESE DIFFICULTIES

A. How GLS Works

SkyBitz provides remote tracking using its proprietary "Global Locating System" ("GLS") technology. Using this technology, SkyBitz currently offers remote tracking services to several thousand customers in the trucking and shipping industries, who can track their products with an average accuracy of 15 meters. This is well within the Commission's E-911 standards for terrestrial wireless phones.

For purposes of this discussion, the key difference between SkyBitz's GLS technology and standard GPS operation is that SkyBitz has moved much of the GPS functions – and the vast majority of the complexity – out of the GPS receiver and into a

---

[6] Supplemental Comments of ICO Global Communications in IB Docket No. 99-67 at 4 (filed Feb. 20, 2001) ("ICO Supp. Comments"). ICO describes this as "an unacceptable result if ICO is to retain competitive with its intended customer base." *Id.*

[7] ICO Supp. Comments at 4-5.

[8] *See* Inmarsat Supp. Comments at 3-4; ICO Supp. Comments at 4-5; GlobalStar Supp. Comments at 19-20

centralized "operations center." By doing so, GLS technology can calculate location information quickly, *without* the need for continuous receiver operation.

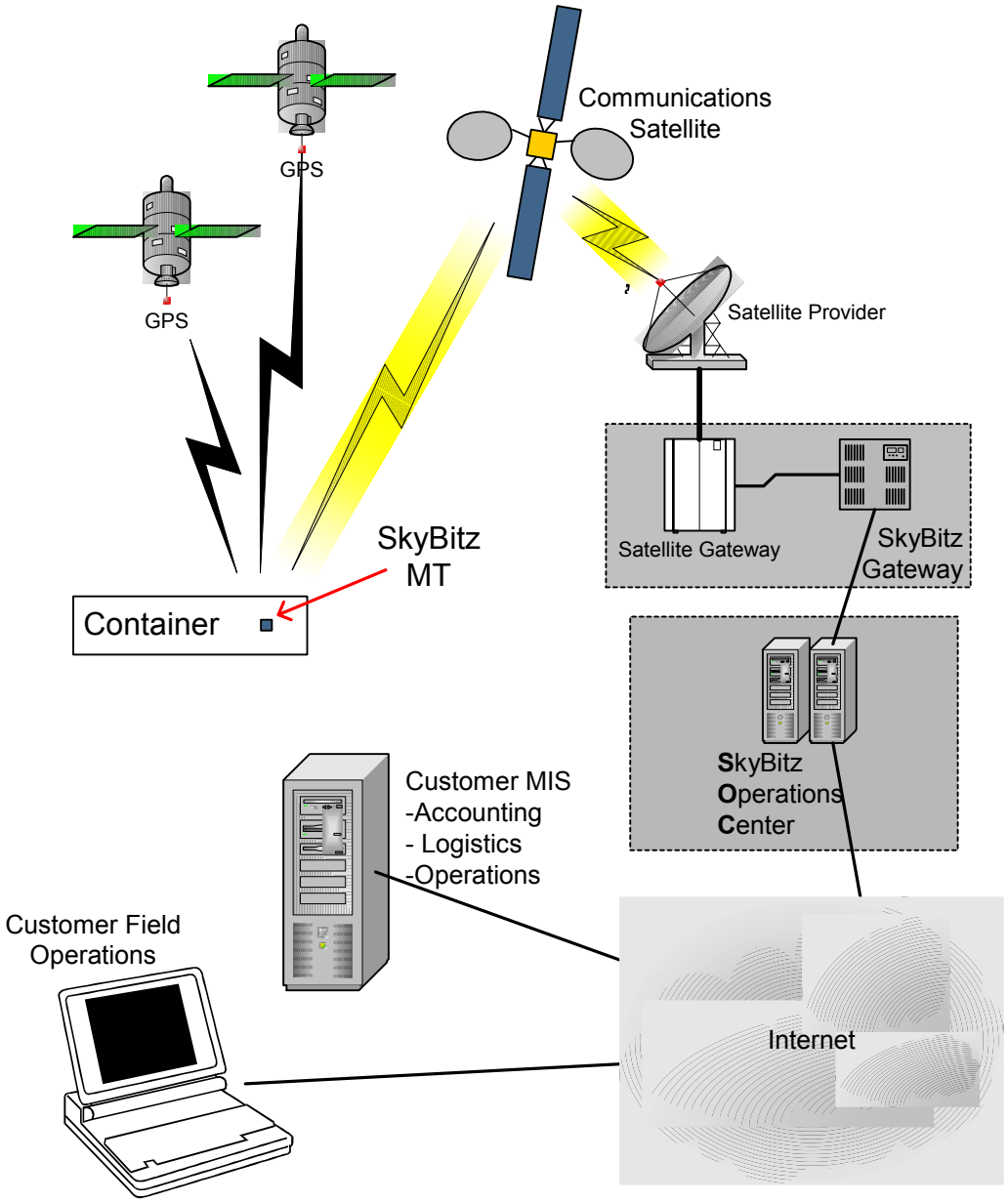

Figure 1. Global Locating System Architecture

As shown in Figure 1, a GLS Mobile Terminal ("MT") receives GPS signals much as would any other GPS receiver. Thereafter, GLS and GPS differ substantially.

First, the GLS MT spends most of its time on "standby" status, during which all circuits (other than a timekeeping device) are powered down in order to conserve power. According to a predetermined "event" (such as a certain time of day, or a request from the system for position), the GLS MT enters into active mode. It captures several milliseconds of the GPS signal environment, and then powers down the receiver. It distills position parameters and other data from the GPS signal (which takes less than four seconds), and then immediately transmits that data to a communications satellite, which in turn retransmits the data to its earth station and gateway. From there, the data is sent to a collocated SkyBitz gateway, and then via dedicated terrestrial link to a SkyBitz operations center.

It is at the GLS operations center – not in the GLS MT itself – that position is calculated. Since the GLS operations center is in continuous operation, it constantly tracks data for all GPS satellites, *permitting the GLS MT to obtain satellite data within a fraction of a second*. This contrasts with the delay from the cold start (or even the warm start) caused by a typical GPS receiver. SkyBitz then posts the results in its database for delivery to its customers (either through SkyBitz's website or through a customized arrangement).

B. GLS and MSS

Global Locating System technology is readily adaptable to MSS service. Indeed, because MSS systems, by definition, contain a satellite link, GLS technology can work particularly well with MSS applications.

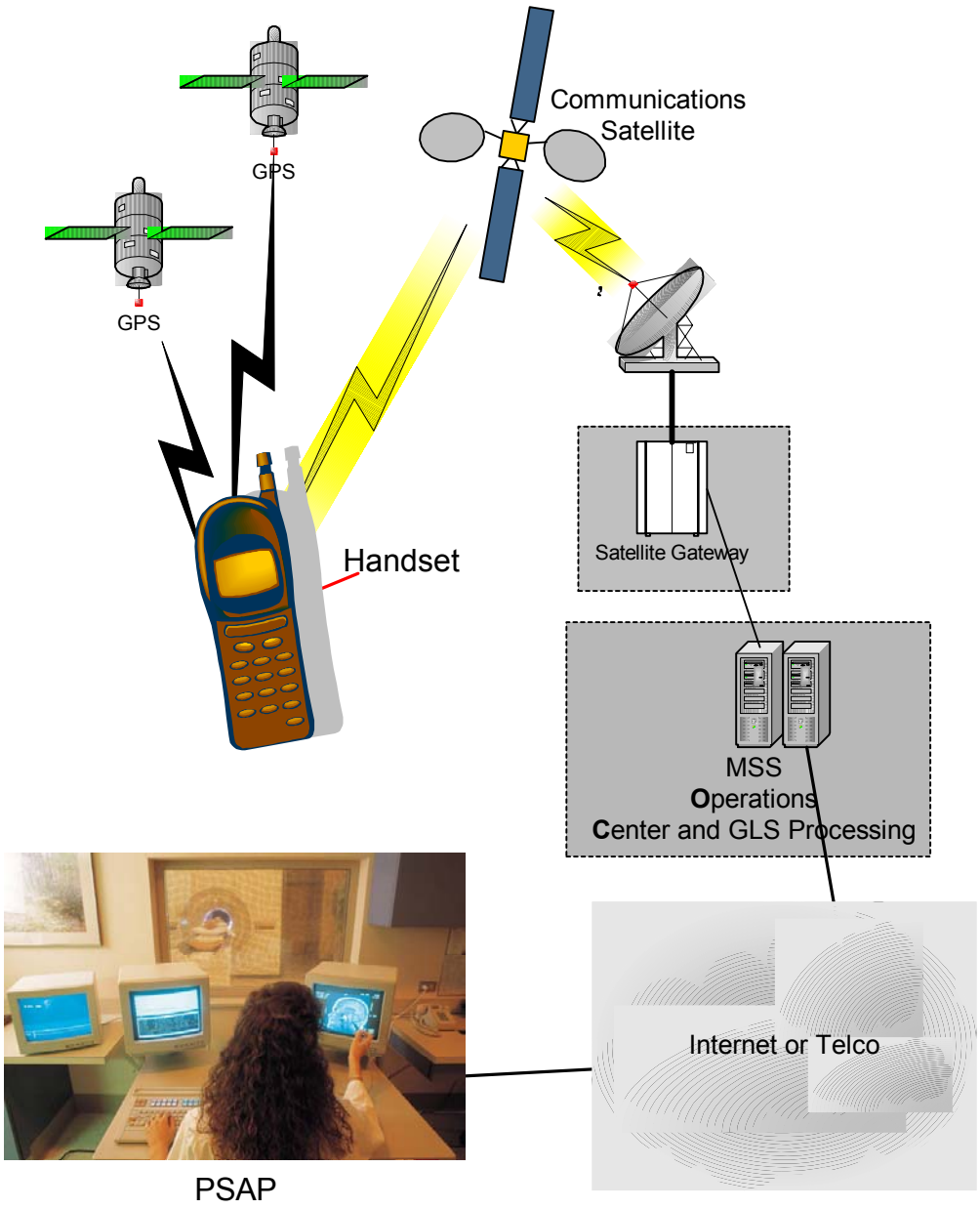

Figure 2. GLS Processing Supporting an Emergency Call

As shown in Figure 2, a GLS/MSS application could work something like this:

- When a customer dials 911 (or upon some other predetermined event), the handset's existing Digital Signal Processor (DSP) tunes the handset's RF front-end circuit (that is, its "receiver") from the MSS band to the GPS band.

- The handset captures several milliseconds of GPS satellite signals, takes a "snapshot" of the GPS environment, and distills data from that snapshot, among

other things, to determine exactly when the GPS data arrived at the handset. This entire process takes four seconds or less.

- The handset imbeds the distilled GPS information into MSS signaling system information, which, as part of the "call" itself, is sent from the handset to the MSS satellite. The MSS satellite forwards this information, as it normally would, to the MSS earth station and operations center.

- The MSS operations center extracts the GPS information from the other signaling data, and sends it to a collocated GLS processor.[9]

- The GLS processor calculates location information.

- The GLS processor can then send the location information to the MSS Call Center (where it can be recombined with the voice portion of the call, as appropriate). If and when a National PSAP database is created, the information could also be routed there.[10]

The cost and effort of adding GLS technology to MSS handsets would not be unreasonable, because much of the necessary hardware is already in MSS handsets. First, many MSS handsets already have multi-band RF Circuits, similar to that which would be used to receive GPS as well as MSS signals.[11] Second, the DSPs already in MSS handsets can distill GPS signals and process voice communications at the same time. Finally, as described above, GPS data can be embedded in signaling system information that handsets already send to MSS satellites.

Accordingly, all that would have to be added to a handset would be a GPS front end and DSP-hosted GLS processing functions (software). Assuming sufficient design time, SkyBitz estimates the cost of including GLS capabilities in next generation MSS

---

[9] Processing of E-911 location information could take place either at SkyBitz's own operation center, or (perhaps more efficiently) at a processor co-located with MSS facilities.

[10] Location information could be transmitted to a PSAP in a number of ways. SkyBitz's technology does not address this issue.

[11] There is no practical difference between the front ends used by normal GPS adjuncts and that used by GLS.

handsets at well under the $30 per handset estimated for a traditional GPS solution – and possibly as low as $5 per handset.

GLS technology would thus address many of the concerns raised by MSS operators. Most importantly, unlike standard GPS technology, it would have virtually no effect on MSS handset battery performance. First, a GLS receiver in an MSS handset would be active far less of the time than would a standard GPS receiver, because the GLS receiver itself need not maintain updated GPS satellite data. Second, even when active, a GLS receiver would take far less time to obtain satellite data (thereby using less battery power) than would a standard GPS receiver. Finally, with GLS technology, location calculations, which themselves cause significant battery drain, would not be performed in the MSS handset. GLS software in a MSS handset would consume less than 0.25 milliamperes per hour ("mAh") for each location calculation.[12] Handset batteries are typically sized at just less than 1000 mAh, meaning that GLS could support thousands of position reports on a single charge.

GLS technology would also reduce call delays associated with standard GPS-MSS integration. First, there would also be no "cold start problem," because the GLS processor would constantly keep track of GPS satellite data, freeing the handset of this burden. Second, there would be only minimal interference (if any) between the GPS and MSS functions of the handset, because the fraction of a second required to receive GPS data means that handset transmitter deactivation would be only momentary. In all of these respects, therefore, GLS technology offers performance superior to standard GPS receivers for MSS ALI.

---

[12] This calculation does not include handset-to-satellite transmission, which would typically require less than 100 bits.

III. CONCLUSION

SkyBitz takes no position on the regulatory requirements for MSS systems. It believes, however, that some of the problems associated with MSS ALI deployment can be solved, and looks forward to working with the Commission and the MSS community to do so.

Respectfully submitted,

/s/_____
Scott Blake Harris
Michael D. Nilsson

HARRIS, WILTSHIRE & GRANNIS LLP
1200 18th Street, NW, Suite 1200
Washington, DC 20036-2560
(202) 730-1300

Counsel for SkyBitz, Inc.

Matthew Schor, President
Jay Brosius, Chief Technical Officer

SKYBITZ, INC.
45365 Vintage Park Plaza Suite 210
Dulles, Virginia 20166-6700

February 19, 2003