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Hon. Michael Chertoff, Secretary  
Department of Homeland Security  
3801 Nebraska Ave., NW  
Washington, DC 20393

RE: LORAN

Dear Secretary Chertoff,

Nearly 10 years ago I became aware that FAA, my alma mater, was planning to rely solely on GPS for aircraft navigation, surveillance in air traffic control, and, as later emerged, communications. In the transition to use of GPS it was also planned to decommission virtually all of the ground based systems such as VOR, DME, NDB, ILS, and radars. This plan was based on a correct understanding that GPS would provide remarkable service with wide, indeed, worldwide, coverage. A second correct understanding was that most existing ground based aviation systems were technically obsolete, and were very expensive to operate.

Splendid though GPS was and is, however, it has its limitations. The principal limitation is its vulnerability.

#### GPS VULNERABILITIES

Accordingly I have spent the last 10 years talking about the folly of relying solely on GPS, or other satellite P-N-T systems, for safety of life applications or for uses where great economic harm can result from loss of the GPS signal. I have given at least 25 papers to professional conferences in the US, Europe, and the Orient on this subject and on the best mitigation for this problem. I am pleased to say that there is now worldwide recognition of this problem and that the best mitigation is a backup by modern enhanced LORAN.

There are two types of GPS interference: unintentional and intentional. Unintentional interference is from natural ionospheric causes such as sunspots and from stray RF transmissions such as out of tolerance TV transmitters and receivers. These are real but relatively short term or predictable and can probably be managed.

Intentional interference is much more threatening. There are two types of intentional interferences: jammers and attacks on satellites.

Jammers come in two forms: noise jammers and spoofers. Noise jammers can be made from parts from Radio Shack and simply transmit a blanking signal on the GPS frequency. They can be very effective on civil receivers and have a range out to 200 kilometers. Source: USG report on noise jammers for sale at the Paris Air Show by the Russian company Aviaconversia.

Spoofers are more effective and a bit more complicated to produce. A spoofer transmits a GPS-like signal but with incorrect data. This confuses the receiver and the receiver indicates an incorrect position. A one watt spoofer on Logan Airport, Boston, can disrupt GPS reception out to 350 miles line of sight. Source: Lincoln Labs.



Attacks on satellites were described, and predicted, by the Commission on Space Warfare chaired by DOD Secretary-to-be Donald Rumsfeld. Under separate cover I am sending an artists impression of a GPS satellite after an attack by a Chinese satellite killer.

### THE VOLPE CENTER REPORT & SECRETARY MINETA

All this was described in the famous Volpe Center report of 2001 on GPS vulnerabilities. This report was directed by the 1996 White House Presidential Decision Directive, drafted by The National Security Council. Conclusion: GPS needs a backup. Best backup: modernized enhanced LORAN. The Volpe Center Report is the most important document ever written about satellite P-N-T and is required reading for all professional users and policy makers in the safety and homeland security of GPS navigation and timing.

Secretary Mineta endorsed the report and directed the DOT modal administrations to comment on it. Virtually all elements of DOT, including the Coast Guard, concurred, although the specifics of the Coast Guard's comments are unknown because the document has been hidden.

Also recently the Department of Homeland Security did its own report of GPS vulnerability. It is understood that this report confirmed the findings of the Volpe Center Report although little is known about the report because DHS has hidden it.

### LORAN IN EUROPE

Very recently the European Commission published a proposed European Radio Navigation Plan (ERNP) which agreed with virtually all of the Volpe Center's conclusions about satellite P-N-T vulnerability. The ERNP also listed 135 specific uses of GPS in Europe. It concluded that only about 40 would continue effectively after loss of GPS. LORAN was designated as a "core" technology element of the ERNP- obviously for reasons of European security.

### LORAN BEFORE THE INTERNATIONAL MARITIME ORGANIZATION

In the maritime world there is growing concern about sole dependency on GPS since GPS is the only source of radio navigation for large vessels carrying petroleum, toxic chemicals, and cruise passengers. A leading group of maritime nations- Britain, Singapore, the Netherlands, and Norway-introduced before the International Maritime Organization (IMO) a sweeping safety proposal for electronic navigation. Fundamental to the e-navigation safety proposal is the need for a backup radio navigation to GPS and later Galileo. A close reading of the proposal reveals that the only available alternate radio navigation system to GPS/Galileo is LORAN, so at heart the proposal is an endorsement of LORAN. Co-sponsor of the e-navigation safety proposal before the IMO: the US Coast Guard.

### DEPENDENCE ON GPS FOR PRECISE TIME

The aviation and marine communities are well known safety of life users of GPS for navigation. But there is a lesser known, though possibly more significant, national security dependency on GPS: telecommunications. GPS provides a stratum I precise time signal which is now used to time cell phones, the internet, power distribution systems, financial transactions, data transfers, telephones, and...aviation and marine traffic control



and communications. Many of these systems have an independent clock meant to bridge short term interruptions but whose real world useful life, severed from a primary source of precise time, has proven to be measure in hours. If GPS time is lost to a terrorist or military attack much of the cyber-dependent economy will come to a halt.

LORAN provides a powerful megawatt stratum I signal to protect against loss of GPS precise time to terrorists or enemies.

### CONGRESSIONAL INVESTMENT IN LORAN

The Congress, recognizing the need for a backup to GPS, has had the foresight to invest \$160 million in LORAN. All of the 18 LORAN stations in the continental US are largely modernized. One of the six Alaska stations is complete, with important other Alaska projects programmed, though now suspended, by the Coast Guard.

### LORAN DECISION AND PRESIDENT BUSH'S ORDER

The year 2006 is the year of decision for the continuation of LORAN for the foreseeable future. In 2002, after 9/11 and the Volpe Center Report, Secretary Mineta set out a demanding series of tests to determine the suitability of modernized LORAN for navigation and timing. The performance tests are complete, the reports are published, and the Coast Guard concurred in every one. LORAN passed every test.

Only the cost/benefit study of LORAN remains to complete Secretary Mineta's group of studies leading to an Executive Branch decision on LORAN. The Coast Guard has blocked release of this study for over a year. I urge you to direct the release of the cost/benefit study and to have it presented for public comment. P-N-T stakeholders should have the opportunity to comment on this vital issue.

The long term decision to continue LORAN was scheduled after the tests to be coordinated by Secretary Mineta with cooperation of the Secretaries of DHS, DOD, commerce, and other agency heads. The new GPS Executive Committee, order by President Bush was drafted by the National Security Council, and would also be involved. Deputy Secretary of Transportation Maria Cino is the lead official for all civil uses of GPS, including backups such as LORAN.

### THE DHS SURPRISE

In February of 2006 the unexpected happened. The Department of Homeland Security presented a budget which proposes no FY 07 operating funds for LORAN. The Coast Guard stated that there was no need for a radio navigation backup for GPS- in spite of a contrary safety proposal placed before the IMO just six weeks earlier. This unilateral decision breached the multi-agency understanding with Secretary Mineta and violated President Bush's GPS management order which placed DOT Deputy Secretary Cino in the lead role for civil GPS backups.

### THE COAST GUARD AND MARINE NAVIGATION SAFETY

Mr. Secretary, over the past eight years I have come to know many of the officers and alumni of the Coast Guard. I yield to no one in my admiration for them and for the splendid institution that is the Coast Guard. I did not need to see their superb performance during Katrina to know this.



Nevertheless, like all fine institutions, including those I have had the honor to lead, the Coast Guard can occasionally be mistaken. In the case of the need for LORAN marine navigation and safety, I believe this to be the case. Commercial and recreational mariners, along with aviation, military, telecommunications and other stakeholders now agree the Coast Guard is mistaken.

The comprehensive E-Navigation Safety Proposal-sponsored by the Coast Guard- now before the IMO is only the tip of the ice berg. As word of the excellent work on modernized LORAN-executed admirably for the most part by active and retired Coasties-has gone round the world, and as awareness of the vulnerability of GPS to terrorist and military attack has grown, nation after nation have turned to LORAN. The UK has installed a new station, France is planning an additional station, China, Japan, Russia, Saudi Arabia, and Korea have modernized their stations in harmony with US modernization. The European Commission is on record for the continuation of LORAN in Norway. And if the proposed ERNP is adopted by the EU, all of central Europe, Southern Europe, and the Mediterranean, will once again be protected by LORAN.

As for the specifics of the need for a backup to GPS marine navigation and traffic control, the International LORAN Association is scheduling a series of public sessions for expert navigators, marine pilots, and timing specialists from the US and foreign countries to discuss the propositions that modern large vessels can operate safely without radio navigation when GPS is gone.

One reason for the relative silence on the subject of GPS vulnerability in the marine world is that the Coast Guard has not held a single conference on the subject with ship-owners, boaters, masters, pilots, port captains, or shippers. They don't know about the problem and its simple solution-LORAN. This is in contrast to the FAA which, to its credit, has participated publicly in meetings before ICAO, in the US, and in many countries to discuss and debate the need for a backup to GPS navigation and timing.

### WHO USES LORAN?

In a recent conversation with a very senior Coast Guard Admiral I was asked the question "Who uses LORAN?" In the maritime world in recent years, commercial and recreational mariners and national boating organizations including the National Boating Federation (NBF) and BOAT US, representing millions of boaters have repeatedly weighed in urging support for continuation of LORAN because so many already have a LORAN receiver onboard and want to keep it as a backup to GPS. In fact, despite the two announced LORAN shut down plans by the Coast Guard over the past several years, manufacturers have also been determined to move ahead with new combined GPS/WAAS/LORAN receiver technology. Thousands of new receivers have been sold to users in the U.S. and internationally.

Absent the chilling effect brought to the marketplace by the Coast Guards' attempts to kill LORAN, enormous marketing and sales potential for numerous integrated receives would have certainly been realized and can still be realized as soon as the decision is reached to continue LORAN for the long term.

On the aviation front, the Aircraft Owners and Pilots Association (AOPA) on behalf of hundreds of thousands of its members as recently as April 2006 reminded its members that it has continued to promote LORAN and GPS because the technologies bring huge benefits to pilots and owners. And on 1 May AOPA wrote Administrator Blakey opposing the premature turn off of LORAN and endorsing an RTCA committee to update the LORAN aviation standard. Moreover, U.S. companies including Rockwell Collins and the former Trimble Avionics company now known as FreeFlight Systems are developing combined GPS/LORAN systems



for aviation and other users that will become a world standard thanks to the Congressionally funded recapitalization/technology program being guided by the Federal Aviation Administration (FAA)

In addition, millions of cell phone and telecommunications users rely on LORAN as a GPS backup, as does the military for timing and frequency backup for certain weapons, and even the national weather service for obtaining weather data. The truth is U.S. companies and universities in at least 12 states across the country are using LORAN in undertaking work for the Coast Guard, the FAA, the military and other stakeholders because of the heightened interest in the importance of this national asset as a backup.

#### THE DISCREDITED DHS TIMING STUDY

Within the last month DHS, via the Homeland Security Institute, has produced a draft study on the vulnerability of US telecommunication systems to loss of GPS timing. This study, like the DHS study on GPS vulnerability generally, has been hidden from the view of outsiders and so the ILA is unable to comment on it. But it is widely understood that the study is flawed and superficial. Nearly all the very small number of government agencies permitted to review the study are believed to have rejected it.

#### DHS: NO OUTREACH

Furthermore, since DHS was formed, the DOT has continued its ongoing work and meetings on all aspects of LORAN. DHS had boycotted these meetings in spite of pleas to attend. And DHS has excluded outsiders, including other government agencies as well as stakeholders, from its internal work on LORAN.

It is reported, Mr. Secretary, that there is a sign in your office saying “ share information”. From the very beginning this excellent standard had been ignored in respect to LORAN.

#### THE DHS INFRASTRUCTURE STUDY

Last fall DHS produced an exhaustive plan for the protection of the national infrastructure. There was not a single mention of the risk to transportation safety or to the timing-dependent US economy from a terrorist or enemy attack on the GPS signal. This is simply incomprehensible in light of the voluminous, worldwide work on the subject, and the emerging awareness of the problem in many countries.

Eight years ago I said before the Air Traffic Control Association that GPS jammers should be listed as the fourth Weapon of Mass Destruction. Considering the widespread havoc that a coordinated attack on GPS could cause, I would rank this only behind loose nukes as a threat to our national infrastructure. Remember that the ERNP study found that only about 40 of 135 GPS dependencies would continue after loss of GPS.

The first public confirmation of my prediction came on 21 April when CNN announced, via the US Attorney in Atlanta that the FBI had in custody two Muslims, one a student at Georgia Tech, who were planning attacks on GPS to disrupt military and civilian transportation and communications.

#### A NEW DEPARTMENT

Nearly 40 years ago, Mr. Secretary, as the chief assistant to Transportation Secretary Alan Boyd, I worked to organize the new Department of Transportation. I know from first hand experience how difficult is the task.



And launching DOT was nowhere near as difficult as launching DHS. Virtually all of us in P-N-T safety and security movement believe that this vital matter has escaped the full attention of the top leadership of DHS, preoccupied, as it has been, by other events and distracted by turnover of leadership posts. So I urge you to give the LORAN decision your full attention and to reach out to other agencies, manufacturers, and users.

### INFLATING THE COST OF LORAN

It has long been known that the solid state LORAN stations do not need to be staffed by multiple, full time uniformed personnel. Yet the Coast Guard has not chosen to take this step which has been successfully demonstrated and is supported by studies.

As a consequence the cost of continuing LORAN is held at an artificially high level and supports the argument that LORAN is too costly to operate.

### LOWERING THE COST OF LORAN

There is a way forward which will reduce the cost; free many Coast Guard billets, and continue LORAN for its present and future users. Specifically.....

- Automate and de-staff the CONUS stations. All 18 CONUS stations are modernized, have back up power, solid state internals, and are internally redundant. The LORAN stations, however, are not fully automated so that all operating personal can be withdrawn from the immediate vicinity of the site. This can be easily achieved at relatively low cost in a few years, thus permitting the shifting of uniformed personnel to higher priority assignments in the Coast Guard. De-staffing the stations would free at least 100 billets for other pressing duties.
- Relocate and automate some of the Alaska stations. More than half of the annual system cost is at the Alaska stations which are so remote as to require their own village-living quarters, food service, and special transport arrangements.
- Move Attu to Shemya. The Attu station is a relic of the Cold War. It should be moved and co-located with the USAF base at Shemya. There is an all weather runway and complete living facilities at Shemya. The LORAN station could be automated, saving 20 billets and large support costs.
- Automate and provide commercial power to Shoal Cove. Shoal cove is on an island one hour by boat and 20 minutes by float plane from Ketchikan. There is no commercial power to Shoal Cove so it is powered by diesel generator 24/7. A staff provides constant maintenance to these diesels. Commercial power should be run to Shoal cove. The diesels would be relegated to stand by service and fulltime maintenance personnel would not be required. Automation of Shoal Cove would reduce staffing to one part time person provided by contract.

### CONTRACT STATION OPERATION TO A NATIONAL US CORPORATION

Consideration of automating the LORAN stations has assumed that uniformed Coast Guard personnel must perform ongoing routine maintenance. Painstaking calculations are made for each station to determine the nearest Coast Guard facility and how long it would take to reach the station in case of need.



All this is unnecessary. The Coast Guard can contract with a national US corporation to provide routine on-site maintenance with one part time person in the immediate vicinity of the station. The individual hired for this task would likely be a retired Coast Guard person with experience with LORAN and living near the transmitter. It is widely believed that such persons are available.

All of the Conus sites have been modernized and fitted with solid state equipment so routine daily maintenance is not required.

Monitoring the entire US LORAN system would continue at the NavCenter in Alexandria and at Petaluma, CA.

### TOTAL COST REDUCTION

All of the steps outlined here, relocating Port Clarence and Attu, finishing the modernization program in Alaska, automating the stations, and contracting station operation-would reduce annual operating costs approximately 50%, to about \$13-15 million.

### RECOMMENDATIONS: THE WAY FORWARD

-Join with Secretary Mineta and Deputy Secretary Cino to endorse the continuation of LORAN for the foreseeable future. Another short term extension is completely unnecessary: LORAN has been studied enough, and yet another delay would again prevent the uptake of LORAN protection against attack.

-Establish a formal LORAN Council to guide the future development and use of LORAN. The meetings should be public, in line with your "share information" credo, and should include other USG agencies, foreign governments, international NGOs (such ICAO, IMO, and ITU), manufacturers, and users.

-Contract with a National US corporation to operate LORAN stations. This should cut the total operating costs in half.

Respectfully,

Langhorne Bond  
President