

# Missile Defense: From Space to the Gulf

By

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October 1, 2013

Briefing at the  
University of West Florida  
Pensacola, Florida

(Portions adapted from our 2009 Independent Working Group Report,  
available at

<http://www.ifpa.org/pdf/IWG2009.pdf>)

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## October 21<sup>st</sup> is the 51<sup>st</sup> Anniversary of Pres. Kennedy's TV Address Advising the Nation of Soviet Nukes/Missiles on their Way to Cuba

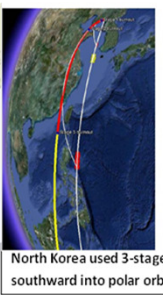
- A Sober “Duck and Cover” Moment
  - U.S. introduced a Blockade, went to DEFCON 2 and threatened retaliatory response against USSR;
  - Behind the scenes negotiations—including agreement to remove our missiles from Turkey and for the USSR not to deploy missiles/nukes in Cuba
  - The Soviet ships stopped and the construction in Cuba halted and reversed
  - Secretary of State Dean Rusk said Khrushchev “blinked” in the face of U.S. resolve
- We “dodged a bullet” but did not know how close we came to disaster
  - After the Cold War, we learned there were already ~100 nukes in Cuba and Castro wanted them to stay
  - Khrushchev refused; nukes removed by the end of 1962
  - Had we understood Khrushchev's deception, there might have been no deal
  - Your guess is as good as mine if they had not been removed
  - Between being lucky and smart, rather be “lucky” every time!



**Today, we are again courting disaster by ignoring an existential threat  
from the South—again from distant powers! How lucky will we be?**

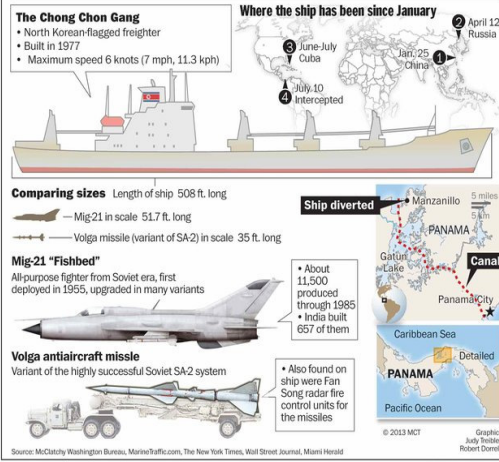
## Today, we are on the brink of another threat “from the South” . . . To which we seem just as oblivious as we were in 1962!

- *A Wake Up Call: Last June’s intercept of a North Korean ship carrying from Cuba to & through the Panama Canal nuclear capable SA-2s and other technology illustrates the “Cacophony of Proliferation”*
- *Of greater concern, Iranian (or terrorist) missiles could be launched from ships off our coasts, especially in the Gulf of Mexico and/or from Latin America, e.g., Venezuela*
- *North Korean or Iranian Satellites could carry nukes over the South Pole to attack the U.S.*



### MILITARY CARGO HIDDEN UNDER SUGAR ON FREIGHTER

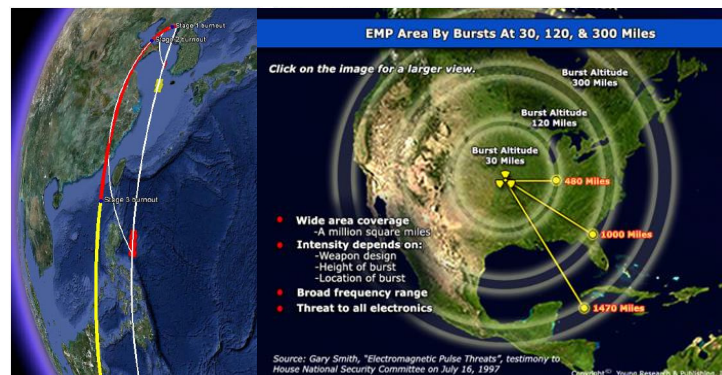
Tracked by U.S. satellites, a North Korean freighter was intercepted on July 15 by Panamanian forces as it approached the Panama Canal. After resistance by the crew, the ship was boarded and searched. In its holds, under bags of brown sugar, were decades-old aircraft, engines and missile components.



***We are currently defenseless against these threats from the South!***

## High Altitude EMP Poses an Existential Threat

- *The electromagnetic pulse (EMP) from nuclear explosions high over the United States*
  - Would have little immediate effect—except possibly extending the Northern Lights all the way to Florida
  - But could shut down the electric power grid—within a year, leading to death of several hundred million Americans
- *Might deter North Korea, but should not count on deterring Iran—the Mullahs want to hasten the return of the Mahdi and might not shrink from the risk of retaliation to create a US holocaust*
- *And we are doing little to nothing to protect against this threat*
  - Need effective ballistic missile defenses, and to harden the electric power grid!



***We need effective defenses and a hardened electric power grid!***

## The EMP Threat well understood from Cold War tests: 1962 Starfish Prime High Altitude Test

- A “wake-up call”
- 1.5 megaton explosion, 240 miles above Johnston Island in the South Pacific
- Damaged test instrumentation
- Killed three satellites immediately, and 7 more died in the next few months
- Electrical damage 900 miles away in Hawaii
- Today’s electronics would have experienced much more catastrophic damage
- Weapon designs can be more lethal, too—and at much lower yields



*Led to a major effort to harden our strategic systems—but we did little or nothing to harden our civil critical infrastructure*

## Hardened our Strategic Systems and their Supporting Command, Control and Communications Systems to EMP

- Major hardening of our strategic retaliatory systems
  - ICBMs and SLBMs, Strategic Bombers, and Supporting BMC3 systems
  - But not civil critical infrastructure
- Associated classification constraints kept info closeted—at least to most
- Key 2008 release by Congressionally appointed EMP Commission (Reports on High Frontier webpage)
  - Included Soviet testing info, which was in some ways more revealing than our own
- Key Bottom Line Conclusion:
  - EMP from a single burst 200-300 miles over the US could shut down most if not all US electrical systems, possibly indefinitely
  - Return US just-in-time economy to 19<sup>th</sup> century operations without agrarian support



E-4B Airborne Command Post

*Up to 60-90-percent of all Americans could perish within a year—for an idea of that existence, see Bill Forstchen’s “One Second After”*

## Most Concerned if Iran mates Nuclear Weapons to any of its many Ballistic Missiles

- *Iranian authorities—the Mullahs—say they intend to destroy the US (the “Great Satan”) and Israel (the “Little Satan”) and kill as many of us as possible*
  - *This is a theological goal for all Jihadists, suggesting scenarios involving collaboration with terrorists*
- *Our missile defense efforts have focused on threats from North Korea over the North Pole*
  - *Ground-based sites in Alaska and California*
  - *Congress considering an East Coast Missile defense site to improve defense against Iran*
- *Two other EMP attack scenarios are even more troublesome—Iran (or North Korea) could launch:*
  - *Short or medium range missiles from vessels off our coast and detonate warheads 200-300 miles over the U.S.—EMP would kill no one immediately, but within a year several hundred million Americans could die*
  - *A nuclear armed satellite over the South Pole to be detonates over the US at 200-300 miles altitude*
  - *Iran has practiced both scenarios*
- *The “Red Line” is if/when Iran gets nuclear missiles*



Ballistic Missile on Container Ship Ready to Launch

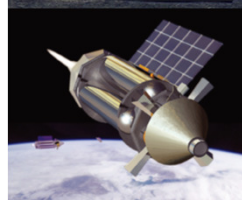
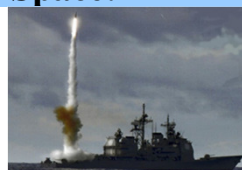


Iran has launched satellites into orbit to the South, over the South Pole

**Americans need to wake up to this well known (even to terrorists) threat & demand that their Representatives provide for the common defense!**

## Need Effective Ballistic Missile Defenses ASAP—First from the Sea and then from Space!

- *Aegis BMD Ships, now deployed around the world*
  - *16 in the Pacific—to have a similar number in the Atlantic*
  - *Have about 80 seaworthy, available for upgrades if needed*
  - *Excellent test record—28 out of 34 attempts*
  - *System chosen to shoot down a dying satellite in 2008*
  - *With preparation can shoot down satellites coming at the US from over the South Pole—if they are not too high*
- *Aegis ships usually do not go into Gulf of Mexico*
  - *But system components can be deployed on land—just move the radar, launchers, and command & control to a pad*
  - *Just like “Aegis Ashore” being deployed in Romania (2015) and Poland (2018)—why not at military bases on the Gulf?*
  - *Took message to Mississippi last year, this year to Florida*
- *The most effective defense would be deployed in space*
  - *Was most effective defense system developed during SDI era against missiles of all ranges greater than a few hundred miles*
  - *But was killed by Clinton administration in 1993 & not revived*
  - *“Clementine” mission to the Moon “space qualified” the essential technology; now have more advanced technology*



**These missile defense systems would defend against southern attack scenarios—and be inter-netted into a global defense capability**



## Ballistic Missiles from Ships: Not a new Threat

*“Countries have placed ballistic missiles in ships – dime a dozen – all over the world. At any given time, there’s any number off our coasts – coming, going. On transporter-erector-launchers, they simply erect it, fire off a ballistic missile, put it down, cover it up. Their radar signature’s not any different than 50 others in close proximity.”*

*Defense Secretary Don Rumsfeld*

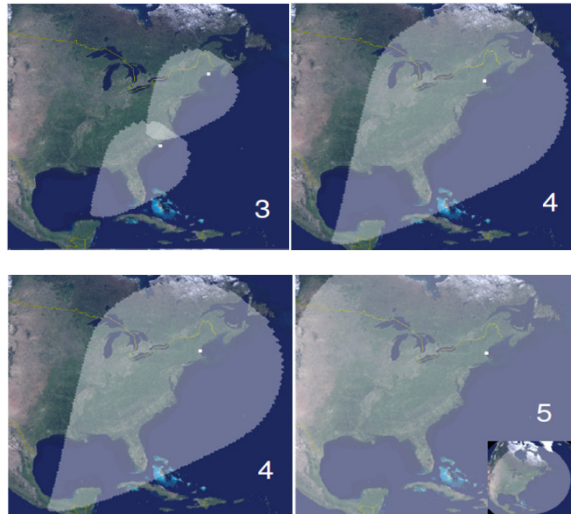
*Pentagon Press Briefing—September 16, 2002*

- **Actually this threat was well known by the late 1990s**
  - But nothing has been done to protect against it
  - Now even more profound, especially when coupled to the EMP threat
- **We have near-term countermeasure options—we should use them**
  - Deploy sensors to provide needed warning and cueing information
  - Make use of currently deployed assets, and improve them ASAP
  - Sea-Based Aegis Ballistic Missile Defense (BMD) key to early response
- **Space-based defenses ultimately will provide the best defense**
  - Ironically, the most cost-effective global defense, but not politically correct

*We have relatively inexpensive options to make significant improvements quickly, if the powers that be acknowledge the problem and take immediate actions!*

## SecDef should consider Aegis Capabilities Against ICBMs from the North in 2014 Report to Congress

- S. 1197 directs SecDef to report in 2014 on how sea-based defenses can help counter:
  - ICBMs from the North,
  - Threats from vessels off our coasts,
  - Other threats from the South
- **With SM-3 IA&B and TYP-2 radars in MA & NC**
  - Potential coverage of Eastern Seaboard
  - Single TYP-2 in MA would enable North East to DC defense
- **SM-3 IIA (planned to be ready to deploy by 2018)**
  - Single TYP-2 would enable defense of US East of Mississippi
- **Future faster SM-3 (with lighter KKV) could defend entire US**



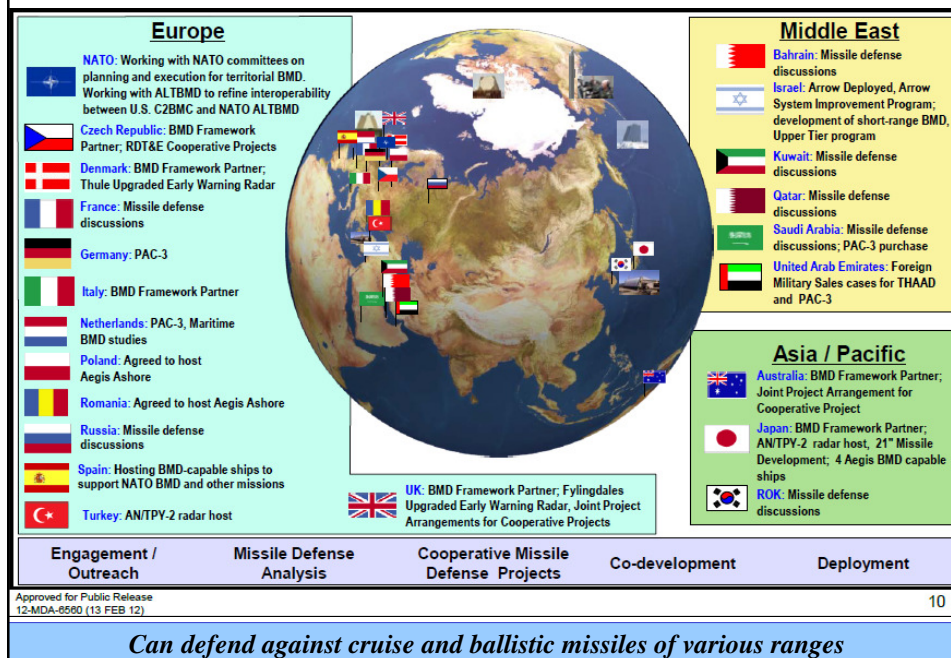
*Charts from Ret. VADM J.D. Williams, who helped me begin Aegis BMD in 1992*

## Could Quickly Have Very Capable Aegis for US Homeland Defense

- **Impressive test record – 28-successes-out-of-34-attempts**
  - With operational crews under ever more complex conditions
  - Including concurrent intercepts of cruise and ballistic missiles
  - Against short to medium range ballistic missiles in ascent phase
  - Now interconnected with global sensor and command & control networks
  - Tested against a wide range of missiles from SRBMs to a 3700+ km IRBM
  - Shot down a satellite moving faster than an ICBM
- **Some 28 Aegis cruisers and destroyers are currently deployed world-wide to defend our overseas troops, allies and friends—growing to ~35 by 2015**
- **These same systems can be used to defend the US Homeland—For example:**
  - With relatively inexpensive improvements, ships in Sea of Japan can shoot down North Korean missiles in ascent phase – before Alaskan interceptors have a shot
  - With an inexpensive Northeastern (e.g., in Maine) radar, ships operating near the East Coast can shoot down ICBMs headed to the Southeastern US
  - Even without such a radar, Aegis ships near our coasts can defend against Scuds and longer range missiles fired from nearby vessels
  - To protect areas where Aegis does not patrol, shipboard systems can be deployed ashore—as is being done in an approved “Aegis Ashore” program to help defend our NATO allies
- **Relatively inexpensive defense**
  - About \$100 million to modify and deploy a cruiser/destroyer, with 8 SM-3s
  - An Aegis Ashore system in Panama City would cost less than ~\$1 Billion
  - Several sites can defend the entire Gulf Coast—including from Venezuela

**Why doesn't Florida take a lead in advocating such a defensive system?**

## Our Allies get it . . . and are joining the Aegis Team



## **If this is so smart, why wasn't it built long ago?**

- ***ABM capability was “illegal” for 30 years under ABM Treaty***
  - *Even Theater Defense was limited – ship-based radar could not “look up” to see ballistic missiles*
- ***Ronald Reagan revived interest with SDI--by 1991, SDI/GPALS***
  - *Made mid-1990s operations possible, but . . .*
- ***Clinton administration scuttled 1993 plans, some not yet revived***
  - *Cut budget, limited velocity, reduced sensor capability, provided no “cooperative engagement,” and established firing protocol constraints*
  - *Bi-partisan support in Congress kept Aegis BMD program going*
- ***Treaty constraints removed in 2002, but progress was still limited***
  - *2002 Crawford directive included short/medium-range sea-based defense*
  - *Development options were still constrained – including for anti-ICBM role capability*

***The Navy has demonstrated its ability to deliver. They should be given their head (with needed funds, under the Aegis Program Office) to make the sea-based defense all it can be, and as soon as possible!***

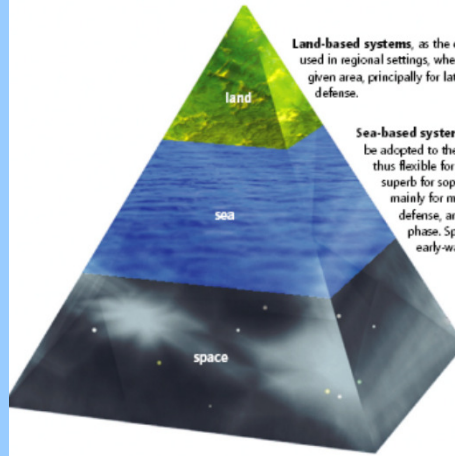
## **Illustrates General Lessons Considered by IWG**

- ***Political, rather than technical considerations, have constrained ballistic missile development (See Chapters 4 and 5 of the IWG Report.)***
  - *Since early 1960s DARPA studies, we have known how to achieve effective defenses*
    - *Space-based defenses were key in effective defense concepts from the beginning*
    - *Current technology can today underwrite cost-effective deployments*
  - *To realize these technical benefits, must overcome over 40-years during which defenses were extremely limited to support a mutual deterrence doctrine*
  - *Eliminating the ABM Treaty was a necessary, but not sufficient condition*
    - *It was no accident that the Treaty permitted development, testing and limited deployment of only ground-based defenses; there are obvious preferences for other basing modes, if technically feasible – and they are!*
- ***Mutual Assured Destruction (MAD) is alive and well – as illustrated by***
  - *Continuing U.S. reluctance to defend against Russian and Chinese missiles*
  - *Preferences for defenses that alone cannot meet cost-effectiveness conditions*
- ***If the United States and its allies and friends are ever to have effective defenses, we must go back to basics***
  - *Continuously present, layered global, defense of all basing modes – especially space*
  - *Need educational campaign to capitalize on inherent public support*

***Key problems are ideology and politics, not technology***

# Technology vs. Politics & Effective Defenses

- *Paradigm consistent with 1960s understanding of technology illustrated by pyramid*
- *Mutual Deterrence policy disrupted this correct technological paradigm*
- *ABM Treaty blocked all effective defenses and permitted only development, testing and limited ground-based defense deployments*
- *Ronald Reagan's SDI reopened the question*
- *The 1983-93 SDI era reinvented Project Defender paradigm*
- *Clinton administration again turned the pyramid on its head in 1993 – where it remains today*



**Land-based systems**, as the concept evolved, are most logically used in regional settings, where they are vectored to cover a given area, principally for late-midcourse and terminal-phase defense.

**Sea-based systems**, as the concept evolved, would be adopted to the *Agis* cruisers and/or picket ships, thus flexible for surface deployment, and could be superb for sophisticated regional operations mainly for midcourse- and terminal-phase defense, and some limited use for boost-phase. Space-based systems would give it early-warning and tracking data.

**Space-based systems**, as the concept evolved, would rely on 1,000-2,000 small, autonomous interceptors (SBIs) orbiting 290 kilometers up in one or more constellations and acting ("talking together") in concert could: (1) be on 24-hour "alert"; (2) "see" across a 360-degree space-earth horizon to spot firings globally; (3) dispatch the nearest SBIs to strike the ballistic missile while still in boost-or-early-midcourse phase; (4) issue instantaneous warnings throughout all other defense systems and – in case the missile gets through – provide long-range tracking data to guide sea-or-land-based interceptors to engage the incoming warhead in its midcourse-or-terminal phase.

## Key Features of Brilliant Pebbles Space Vehicles: A 1990-93 Prime Contractor Perspective

- *Detailed Contractor designs were developed during the BP pre-EMD program (1991-93)*
- *All required subsystems examined for both the MicroSat Lifejacket and the light weight KKV*
- *No show stoppers or technology limitations found*
- *All 1990 technology space qualified in 1994*
- *Technology advances during the last 20-years offer:*
  - Lower mass
  - Lower cost
  - Higher performance

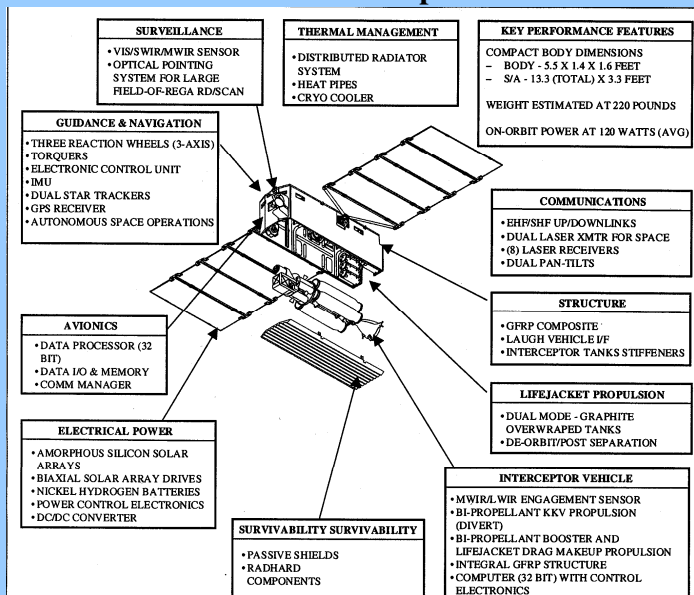


Image Courtesy of TRW



## Clementine - in good company

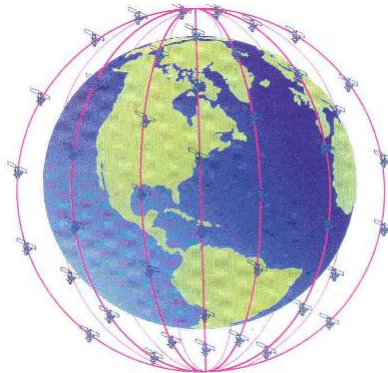


The  
Clementine  
spacecraft  
in the  
National Air  
and  
Space Museum  
March 21, 2002

*Space Qualified First Generation Brilliant Pebbles Technology in 1994*

### Motorola's Iridium Global Communications System Example of a Distributed Constellation

- Motorola's initial Iridium 66-satellite constellation completed in 1998, though not very successful as a commercial global cell phone system, proved out assembly line satellite construction and automated on-orbit management concepts that originated in the BP program -- ~\$5 billion for development and deployment
  - Has provided very effective operations support for US military missions—now being replaced
- From the outset, Iridium operated a complex space-based constellation with a very small team (< 6) of satellite operators using highly automated expert system control software
  - System included cross-links and the ability to hand-off phone calls from one spacecraft to the next, which required the knowledge of all platform locations and attitudes



Iridium Constellation 6 rings x 11 platforms



Iridium Cell Phone RF Footprints

*The private sector demonstrated how to do this job!*

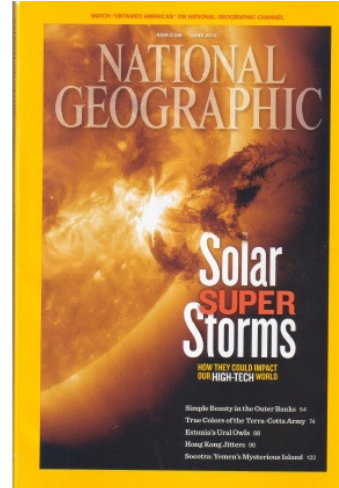
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# Summary of Missile Defense Discussion

- *Need integrated, continuously operating, layered global defense*
  - *The ABM Treaty is no more, so we can fully develop, test and deploy sea-based, space-based, air-based and mobile ground-based defenses*
  - *We have to overcome political/bureaucratic inertia and collective amnesia since most advanced technology programs on effective defenses were killed in 1993*
- *Should fully test and deploy sea-based, air-based and space-base defenses*
  - *Upgrade existing sea-based air defense systems (Aegis)*
    - *Building on existing infrastructure, protect against SCUDS on ships*
    - *Improve ASAP to include ascent- & boost-phase defense against ICBMs*
  - *Exploit demonstrated first generation Brilliant Pebbles technology*
    - *Restart technology programs under streamlined management*
      - *Focus initially on sea-based and air-based (Raptor-Talon) defenses*
      - *Revive accelerated space-based defense program*
  - *If BP technology employed with sea-based options*
    - *Lighter KV enables 6-7 km/sec interceptor in VLS – “Rounds go where the ships go”*
      - *Lowest cost improvement to existing infrastructure – which maximizes operational flexibility*
    - *Similar advantages result for air-based options (Raptor-Talon)*
- *Revive SDI technology and approach & “Go back to the future”*
- *Integrate with Homeland Security plans and operations*
- *Educate elites and especially public to create grass roots demand*
  - *Develop local support for defending coastal areas from “Scuds-on-ships”*
    - *Including Aegis Ashore to defend the US Gulf Coastal region*
  - *Need East Coast Test Range to complement West Coast operations & infrastructure*

## Natural Existential Threat—Massive Geomagnetic Disturbance Caused by Major Solar Emissions

- *The Sun periodically emits giant clouds of electrons and gamma rays—*
  - *Some reach earth in a matter of minutes*
    - *Interaction with earth's geomagnetic field can create wide-area catastrophic effects on electronics*
  - *Solar maximum every 11 years or so . . . 2012-2014 is such a period*
- *Past maxima caused serious problems*
  - *Discussed in June 2012 National Geographic*
    - *1859 Carrington Event—caused fires in telegraph stations and shut down undersea telegraph*
    - *1989 solar storm shut down Quebec power grid serving 6-million subscribers*
    - *If 1921 event were repeated today, would turn out lights over half of North America*
- *Major International Meeting last June*
  - *Growing awareness of problems among at least 10 nations—Lloyds of London gets it!*
  - *Israel and UK most organized and prepared*
  - *USA needs to get organized—but reluctant*



*What will it take for US Leaders to take this threat seriously and undertake an effective response before a “Big One” occurs?*

## Mother Nature's Existential EMP Threat: A Rare, but Certain to Occur, Carrington Event!

*The 1859 “Carrington” event caused fires in telegraph offices & destroyed the then new undersea telegraph cable*

- *Such a major event is thought to occur about every century or so—and we're due!*
- *Today, a Carrington event could shut down most US electronic infrastructure, including the electric power grid*
- *The technology to harden the grid is available and affordable, but the U.S. powers that be are not acting to protect the American people.*
- *The Insurance Industry takes it seriously—See the Lloyds of London “risk” analysis result for North America presented at 2013 summer international meeting in Washington*



Lloyds of London estimates of risk from solar storms—red and blue represent highest and lowest risk areas, respectively

*Failure to protect the power grid, which will likely fail catastrophically in the case of a modern Carrington event, would send us back to an 18<sup>th</sup> century existence without the benefits of an agricultural society.*

## If Defended Against Ballistic Missile “EMP” Attack, Should also be Protected against Solar Storms, and . . .

- *The EMP from a high altitude nuclear explosion is more threatening*
  - *Has higher frequency components than from solar storms—these components are similar to lightning, but over a much larger area—they will burn out electronics*
    - *Millions of small computers, ubiquitous in critical infrastructure regulating flow of electricity, controlling gas pipelines, operating traffic lights, automobiles, etc.*
    - *With proper planning, they could be replaced if damaged by EMP*
  - *The low frequency components are similar to the solar storm and couple into the long lines that interconnect critical infrastructure . . . Like the electric power grid*
    - *Large Transformers in the power grid are critical elements—each is tailor made for its power station, and cannot easily be replaced*
    - *No longer built in the US—have to be shipped from Germany or South Korea*
    - *Alternative measures is a challenge for electrical engineers*
- *If the defense is effective in shooting down an attacking nuclear weapon before it detonates, then all these effects will be countered*
- *But since no defense is perfect, the critical infrastructure should be hardened to the EMP effects in case of failure—especially the power grid*
- *In that case, the solar storm threat also will be accommodated*

*Hardening the electric grid deserves top priority, as recommended by the congressionally mandated EMP Commission in 2004 and 2008, and validated by four other major reviews. Two congresses have failed to pass legislation enabling the needed initiatives—and advocates are trying again in the current Congress.*

## What are these people thinking? Imagine Life Without the Following Conveniences

### Key Dependencies/Interdependences

- *Transportation needs fuel, fuel needs transportation, power needs both and everything/everyone needs power, water, food, fuel, telecommunications, etc.*
- *Because of interdependencies and resultant cascading effects, we need to ask what are the interdependencies and elements within critical infrastructures that can cause them to spiral out of control bringing other infrastructures down with them should they fail.*
- *There is a common assumption that our infrastructures are so vast and robust that there is no way, short of a direct nuclear attack, to take them down –*
- *But EMP or an extreme geomagnetic storm can do it. Cyber attacks are also an issue.*

### Key Critical Infrastructure for:

- **Power**
- **Water**
- **Food**
- **Sanitation**
- **Fuel**
- **Transportation**
- **Medical and health services**
- **Communications**
- **Government - (national security, emergency services, law enforcement)**
- **Financial Services**
- **Work Force**

**Bottom Line:** *We need informed grass roots to demand that the powers that be to “Provide for the common defense”! Countermeasures are an engineering challenge.*



## Bottom Lines and Recommended Action

- *EMP poses an existential threat from even short range nuclear-armed ballistic missiles, especially if launched from the Gulf of Mexico*
- *Another threat from the South is the possibility of a satellite launched from over the South Pole to detonate its nuclear warhead over the U.S.*
- *In case of the threat from rogue states or terrorists,*
  - *The Navy's Aegis BMD system can provide an effective defense if trained and ready crews operate it near enough to where attacking missiles are launched*
  - *Aegis ships do not normally operate in the Gulf of Mexico—leaving the US with a soft underbelly vulnerable to this threat—as well as others from the South, e.g., such as from Venezuela.*
  - *In that case, the same Aegis Ashore system American taxpayers are buying for deployment in Romania and Poland can be deployed on military bases around the Gulf of Mexico—possibly as soon as 2015 (Romania's scheduled deployment)*
- *In case of a the threat from over the South Pole, empower the Navy BMD to see what they can do—remember they shot down a dying satellite in 2008*
  - *Space-based defenses are needed to provide a comprehensive solution*
- *In case of the threat from Mother Nature (Geomagnetic Storms)*
  - *Appropriate hardening and reconstitution planning can protect our critical infrastructure—should begin with the electric power grid*
- *In both cases, a grass roots effort is needed to press the powers that be to provide for the common defense and protect our way of life.*

*The powers that be need to take these threats seriously, provide for the common defense and protect our way of life—by building truly effective defenses and hardening the electric power grid. These are important engineering and political challenges. For more information on the threat and possible responses, see [www.highfrontier.org](http://www.highfrontier.org) and its links to others who are already engaged in this important fight. Help Florida play a leading role!*

## Local and State Initiatives are Very Important

- *Maine offers an important precedent*
- *Maine owes a lot to a committed member of the state legislature*
  - *Last year, Andrea Boland (D-Sanford) became the Champion of LD-131 (An Act to Secure the Safety of Electrical Transmission Lines)—to harden to both manmade and natural EMP effects--anticipated cost is 1-3 percent of construction and expansion underway*
  - *After 6-months advocacy, LD-141 passed unanimously in the House and with only three dissenting votes in the Senate*
- *This is the first major success for those who have been fighting to get grass roots Americans to take this existential threat seriously and to deal with it.*
- *Hopefully, other states will find local authorities who also will take the initiative to follow Maine's pattern*



*LD-131 directs Maine's Public Utilities Commission (PUC) to examine how to mitigate the effects of geomagnetic disturbances from solar storms and nuclear EMP on Maine's electric power grid. The PUC is to identify the system's most vulnerable components, potential protective measures, costs, and implementation schedules.*

- *The U.S. Federal Energy Regulatory Commission (FERC) promised to provide, free of charge, a study of the most cost-effective options for protecting Maine's electric grid.*
- *The North American Electric Reliability Corporation (NERC) is supposed to ensure the reliability of the electric grid and develop/enforce reliability standards.*

*Dr. Ernest Moniz, Secretary of Energy, promised Senator Murkowski during his confirmation hearing to look seriously into what his department can do to deal effectively with both man-made and natural EMP threats—others should follow!*