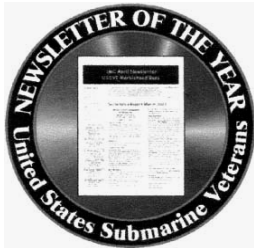


American Submariners Inc.
4370 Twain Ave.
San Diego, CA 92120-3404



The Silent Sentinel October 2013



Our Creed and Purpose

To perpetuate the memory of our shipmates who gave their lives in the pursuit of their duties while serving their country. That their dedication, deeds, and supreme sacrifice be a constant source of motivation toward greater accomplishments. Pledge loyalty and patriotism to the United States of America and its Constitution.

In addition to perpetuating the memory of departed shipmates, we shall provide a way for all Submariners to gather for the mutual benefit and enjoyment. Our common heritage as Submariners shall be Strengthened by camaraderie. We support a strong U.S. Submarine Force.

The organization will engage in various projects and deeds that will bring about the perpetual remembrance of those shipmates who have given the supreme sacrifice. The organization will also endeavor to educate all third parties it comes in contact with about the services our submarine brothers performed and how their sacrifices made possible the freedom and lifestyle we enjoy today.

Court Clears Navy to Build Undersea Training Range **Kate Brumback, The Associated Press, Oct 1**

ATLANTA—A U.S. appeals court on Tuesday cleared the way for the Navy to build a \$100 million undersea training range off Georgia and Florida.

The Southern Environmental Law Center, which represents about a dozen conservation groups, had challenged the Navy's plans, saying war games in that area would pose a risk to right whales, which migrate each winter to the coasts of Georgia and Florida to give birth to their calves. Experts say only about 400 of the whales remain, and each death brings the species a significant step closer to extinction.

The 11th U.S. Circuit Court of Appeals on Tuesday issued an opinion upholding a lower court ruling that said the Navy had appropriately studied whether the location of the range posed a risk to whales. The three-judge panel also agreed that further studies to determine whether certain activities on the range might be harmful to endangered animals could be completed later.

"We're disappointed that the court endorsed construction of a \$127 million training range without full consideration of its impacts on the highly endangered North Atlantic right whale and its only known calving grounds," Catherine Wannamaker, senior attorney at the law center, said of the 11th Circuit's ruling.

The conservationists sued in 2010, hoping to halt the Navy's plans to install a web of cables on the ocean floor about 50 miles (80 kilometers) offshore to allow sailors from nearby bases in both Georgia and Florida to train with a mix of submarines, surface ships and aircraft. The undersea infrastructure would include about 300 sensors covering an area of about 500 square miles (1,300 sq. kilometers).

The Navy has said it wants to begin installation of the undersea range next year and has agreed to suspend construction during the calving season from November to April. However, the military refused a request to halt training at the site during the same months, saying it would undermine readiness. The lower court judge had ruled the Navy considered and "rationally rejected" the precautions requested by conservationists.

After the lower court ruling in September 2012, the Navy said evaluations conducted since the lawsuit was filed only reinforced its conclusion that right whales would be at minimal risk.

□

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The Silent Sentinel via Email

To all of my Shipmates and families who currently receive our Great newsletter via the mail who would like it sent via email or continue to receive it via mail, please fill out the form and mail it to the base or myself. We are trying to cut the cost of the newsletter down from \$3700 to about \$1900 a year. By receiving the Silent Sentinel via email will cut down the printing and mailing cost. The other plus to receiving it via email is you can save it on your computer and not have the paper lying around the house.

A subscription to the Silent Sentinel newsletter will be available to surviving family members via internet email, at no charge, upon notification of the Membership Chairman. If a printed hard-copy is preferred, via US Post Office delivery, an annual donation of \$5.00 will be requested to cover costs.

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*DUE TO LOGISTICS CONSTRAINTS, ALL INPUTS FOR THE SILENT SENTINEL MUST BE IN MY HAND NO LATER THAN **ONE WEEK** AFTER THE MONTHLY MEETING. IF I DO NOT RECEIVE IT BY THIS TIME, THE ITEM WILL NOT GET IN. NO EXCEPTIONS! MIKE*

October Meeting

Our monthly meeting is held on the second Tuesday of the month at VFW Post 3787, 4370 Twain Ave., San Diego. Our next meeting will be on October 8, 2013. The post is located one-half block West of Mission Gorge Road, just north of I-8. The meeting begins at 7 p.m. The E-Board meets one hour earlier at 6 p.m.

***Check us out on the World Wide Web
www.ussvisandiego.org***

BINNACLE LIST

Al Strunk

ETERNAL PATROL

Bob Coates

Submarine Losses in September

Originally Compiled by C J Glassford



GRAYLING (SS 209) - 76 Men on Board:
Probably Rammed and Sunk, on 9 September 1943, by Japanese Transport in South
China Sea, West of Luzon :
“ ALL HANDS LOST “

CISCO (SS 290) - 76 Men on Board:
Sunk, on 28 September 1943, by Japanese Observation Seaplane, and Gunboat (ex – US
River Gunboat “Luzon “ (PR#7) in the Sulu Sea, off Panay Island :
“ ALL HANDS LOST “



Minutes for Submarine Veterans San Diego 10 September, 2013

1900 – Meeting of the Submarine Veterans Inc., San Diego Base was called to order by Vice Commander Manny Burciaga.

Conducted Opening Exercises:

Reading of Our Creed:

Pledge of Allegiance: Lead by David Ball

Chaplain Jack Lester lead us in prayer

Conducted Tolling of the boats for September

Observed a moment of Silent Prayer

Vice Commander Burciaga recognized past E-Board members and Past Officers.

Secretary Ferguson announced 28 members and 1 guest present.

Treasurer Report: \$2038 in Checking \$193 in Scholarship Fund, \$15,240 Base Savings.

The minutes of 13 August 2013 were approved.

Call for Committee Reports:

Binnacle List: Al Strunk, Tommy Cox.

The following members are on Eternal Patrol:

Robert Medina, Phil Phillips, Robert Coates, and Reverend Captain Ned Kellogg who was XO on USS Scamp, CO USS Narwhal, and Chief of Staff ComSubRon5.

Parade Committee: Jack Kane reminded the members of the Borrego Parade on October 26th starting at 1000 and the Veterans Parade on November 11th starting at 1100.

Membership: Ray Ferbrache announced 301 members in the National Data Base..

Scholarship: Paul Hitchcock - No report.

Storekeeper Report: Phill Richeson - Things to sell and things to order.

Breakfast: Fred Fomby – Next breakfast 29th of September, 0800-1200, \$7, Volunteers needed.

Float Committee: David Kauppinen - No report

1919 Vice Commander called for a break.

1926 Vice Commander called the meeting back to order.

Unfinished Business:

Disposal of old float.

Chula Vista Veterans Walk – October 12 Team Rally, the walk on November 2nd.

Christmas Party 21 December 1330 to 1730 with dinner at 1400. \$20 per person.

New Business: None

Good of the Order:

Discussion of the “Rubber Duck” emblem that was previously worn on uniforms.

Fred Fomby brought up the E-Pharmacy APP available for smart phones.

David Kauppinen suggested recycling old printer cartridges as a fundraiser.

Jack Kane has stacks of photos taken at various events available for the members to take.

Vice Commander Burciaga adjourned the meeting at 1935.

Jack Ferguson, Secretary

Sailing List for September 10, 2013

Fred Fomby	Jim Pope	Joe Sasser
Paul Hitchcock	David Ball	M. Burciaga
Jack Ferguson	Jim Harer	David Kauppinen
John Fox	Robert Chapman	Richard Smith
Chris Stafford	Bud Rollison	Jack Kane
Jack Lester	Bob Farrell	Tony Dack
Bud Wedge	Ray Ferbrache	Tom Polen
Bob Welch	Ed Farley	Glenn Gerbrand
Don Mathiowetz	Nihil D. Smith	Phil Richeson
Phillip Richeson	Jessie Chang Farley (Guest)	

Current News

**“Plataginet, I will; and like thee, Nero,
Play on the lute, beholding the towns burn” (Henry VI, Shakespeare)**

**750 Civilian Workers Furloughed at Connecticut Sub Base
The Associated Press, Norwich Bulletin, Oct 1**

GROTON – Hundreds of employees at the Navy’s submarine base in Connecticut and National Guard facilities around the state were sent home Tuesday by a partial government shutdown that forced furloughs for 800,000 workers nationwide.

At the base in Groton, where 750 workers were forced off the job, commanding officer Capt. Carl Lahti said it will continue to carry out its missions despite the stress caused by the shutdown.

“We recognize the angst and uncertainty this creates for our civilians, sailors, and their families,” he said.

A dispute in Congress over President Barack Obama’s signature health care law led to the first partial government shutdown in nearly two decades. In Connecticut, some 9,000 federal workers were expected to be out of work indefinitely.

Col. John Whitford, a spokesman for the Connecticut National Guard, said 540 of its employees around the state were furloughed.

“We’re hoping this is a very short shutdown. The longer this goes, this will endure hardships,” he said.

The Submarine Force Library and Museum in Groton was also closed. Other Connecticut attractions affected by the shutdown include Weir Farm, a national historic site in Ridgefield and Wilton; the Stewart B. McKinney National Wildlife Refuge in Westbrook; and the Silvio O. Conte National Fish and Wildlife Refuge.

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Only ‘Excepted Work’ Allowed at Navy Public Shipyards During Shutdown Olga Belegolova, Inside the Navy, Oct 1

The Navy’s public shipyards are feeling the effects of the government shutdown today, with all but essential “excepted work” taking a hit and thousands of civilian employees facing furloughs, according to the service.

The government was shut down at midnight on Monday, forcing the Navy to furlough more than 75,000 civilian employees, according to service spokeswoman Lt. Cmdr. Rebecca Rebarich.

“For public yards, essential excepted work would continue while non-essential excepted work will be delayed until there is funding,”

Naval Sea Systems Command spokeswoman Colleen O’Rourke wrote in an email. “It’s emphasized that this authority is to be exercised only when necessary, where delay in contracting would endanger national security or create risk to human life or property.”

Ship maintenance availabilities at public shipyards will continue during the shutdown if they are within 90 days of deployment or if deemed strategic assets for national security, such as nuclear aircraft carriers and ballistic missile submarines, O’Rourke said. In addition, work

on deployable ships, submarines “in voyage repair periods” and already deployed ships undergoing repairs will be protected during the government shutdown, she added.

Private shipyard work, meanwhile, will continue with ongoing availabilities because funding for it has already been authorized and contracted for the jobs being performed. But no new contracts will be let and no new work will be added, O’Rourke said.

Approximately 1,520 civilian workers are furloughed at the Portsmouth Naval Shipyard in Maine, according to Portsmouth spokesman Gary Hildreth. Portsmouth employs approximately 4,600 civilian employees, not including civilian employees and service members of tenant commands located at the shipyard. That leaves about 3,080 civilian employees exempted from furlough.

“Those being furloughed provide necessary support to the shipyard’s mission of overhauling, repairing and modernizing the U.S. Navy’s nuclear-powered submarine fleet,” Hildreth wrote in an email.

Portsmouth Naval Shipyard, located in Kittery, ME, is primarily focused on the service’s submarines, including Los Angeles-class submarines and the Navy’s newer Virginia-class submarines.

“A government shutdown would place significant additional hardships on our workforce, which has already been strained by recent administrative furloughs,” Hildreth wrote in an email, noting that civilian employees who support excepted activities and emergency services would be paid retroactively “once the lapse of appropriations ends.”

Norfolk Naval Shipyard in Virginia, which employs approximately 9,000 civilians, is also facing furloughs. Of those 9,000, 40 percent are furloughed during the shutdown, shipyard spokesman Jeff Cunningham told Inside the Navy today. Cunningham said the shipyard is receiving guidance from U.S. Fleet Forces Command that identifies those projects and platforms deemed “critical assets.”

Employees working on what the Navy considers “critical assets” are not furloughed during a government shutdown, Cunningham added. If needed, procedures exist for the shipyard to add employees if there is a need or to furlough employees once a project is completed, he said.

Puget Sound Naval Shipyard and Intermediate Maintenance Facility in Washington furloughed approximately 3,500 of its personnel, Capt. James Lee, acting commander of the shipyard, wrote Sept. 30 on the facility’s Facebook page. Puget Sound, like Portsmouth, works on the Navy’s nuclear platforms. “Those placed on furlough are expected to watch the news and return to work on their next regular workday following approval of an appropriation for DOD or a continuing resolution,” Lee wrote.

Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility in Hawaii, responsible for maintenance work on submarines and surface vessels, employs approximately 4,370 civilians. Two-thirds of those civilian workers have been furloughed, said Jensin Sommer, the shipyard’s spokeswoman.

Submarine work at the shipyard has been affected, Sommer added, noting that three submarines in dry docks undergoing long-term maintenance are not excepted. But the shipyard has been permitted to continue work on ships slated for deployment within 90 days, she added. Work at the surface ship maintenance dry dock at Pearl Harbor will not be impacted by the shutdown either, as this work is on contract to BAE Systems.

At a reception on Capitol Hill last week, Navy Secretary Ray Mabus chided Congress for what he called its “annual inability to pass a budget,” noting the detrimental effects on the Navy and Marine Corps.

But beyond the government shutdown, Mabus emphasized that the Navy will still be facing “two very critical things — sequestration and continuing resolutions,” which continue to put undue pressure on the Navy’s maintenance accounts as well.

China’s Fear Of US May Tempt Them to Preempt: Sinologists Sydney J. Freedberg Jr., BreakingDefense.com, Oct 1

Sun Tzu said: Whoever is first in the field and awaits the coming of the enemy will be fresh for the fight; whoever is second in the field and has to hasten to battle will arrive exhausted.

WASHINGTON: Because China believes it is much weaker than the United States, they are more likely to launch a massive preemptive strike in a crisis. Here’s the other bad news: The current US concept for high-tech warfare, known as Air-Sea Battle, might escalate the conflict even further towards a “limited” nuclear war, says one of the top American experts on the Chinese military.

[This is one in an occasional series on the crucial strategic relationship and the military capabilities of the US, its allies and China.]

What US analysts call an “anti-access/area denial” strategy is what China calls “counter-intervention” and “active defense,” and the Chinese approach is born of a deep sense of vulnerability that dates back 200 years, China analyst Larry Wortzel said at the Institute of World Politics: “The People’s Liberation Army still sees themselves as an inferior force to the American military, and that’s who they think their most likely enemy is.”

That’s fine as long as it deters China from attacking its neighbors. But if deterrence fails, the Chinese are likely to go big or go home. Chinese military history from the Korean War in 1950 to the Chinese invasion of Vietnam in 1979 to more recent, albeit vigorous but non-violent, grabs for the disputed Scarborough Shoal suggests a preference for a sudden use of overwhelming force at a crucial point, what Clausewitz would call the enemy’s “center of gravity.”

“What they do is very heavily built on preemption,” Wortzel said. “The problem with the striking the enemy’s center of gravity is, for the United States, they see it as being in Japan, Hawaii, and the West Coast....That’s very escalatory.”

(Students of the American military will nod sagely, of course, as we remind everyone that President George Bush made preemption a centerpiece of American strategy after the terror attacks of 2001.)

Wortzel argued that the current version of US Air-Sea Battle concept is also likely to lead to escalation. “China’s dependent on these ballistic missiles and anti-ship missiles and satellite links,” he said. Since those are almost all land-based, any attack on them “involves striking the Chinese mainland, which is pretty escalatory.”

“You don’t know how they’re going to react,” he said. “They do have nuclear missiles. They actually think we’re more allergic to nuclear missiles landing on our soil than they are on their soil. They think they can withstand a limited nuclear attack, or even a big nuclear attack, and retaliate.”

What War Would Look Like

So how would China’s preemptive attack unfold?

First would come weeks of escalating rhetoric and cyberattacks. There’s no evidence the Chinese favor a “bolt out of the blue” without giving the adversary what they believe is a chance to back down, agreed retired Rear Adm. Michael McDevitt and Dennis Blasko, former Army defense attache in Beijing, speaking on a recent Wilson Center panel on Chinese strategy where they agreed on almost nothing else. That’s not much comfort, though, considering that Imperial Japan showed clear signs they might attack and still caught the US flat-footed at Pearl Harbor.

When the blow does fall, the experts believe it would be sudden. Stuxnet-style viruses, electronic jamming, and Israeli-designed Harpy radar-seeking cruise missiles (similar to the American HARM but slower and longer-ranged) would try to blind every land-based and shipborne radar. Long-range anti-aircraft missiles like the Russian-built S-300 would go for every plane currently in the air within 125 miles of China’s coast, a

radius that covers all of Taiwan and some of Japan. Salvos of ballistic missiles would strike every airfield within 1,250 miles. That's enough range to hit the four US airbases in Japan and South Korea – which are, after all, static targets you can look up on Google Maps – to destroy aircraft on the ground, crater the runways, and scatter the airfield with unexploded cluster bomblets to defeat repair attempts. Long-range cruise missiles launched from shore, ships, and submarines then go after naval vessels. And if the Chinese get really good and really lucky, they just might get a solid enough fix on a US Navy aircraft carrier to lob a precision-guided ballistic missile at it.

But would this work? Maybe. “This is fundamentally terra incognita,” Heritage Foundation research fellow Dean Cheng told me. There has been no direct conventional clash between major powers since Korea in the 1950s, no large-scale use of anti-ship missiles since the Falklands in 1982, and no war ever where both sides possessed today's space, cyber, electronic warfare, and precision-guided missile capabilities.

Perhaps the least obvious but most critical uncertainty in a Pacific war would be invisible.

“I don't think we've seen electronic warfare on a scale that we'd see in a US-China confrontation,” said Cheng. “I doubt very much they are behind us when it comes to electronic warfare, [and] the Chinese are training every day on cyber: all those pings, all those attacks, all those attempts to penetrate.”

While the US has invested heavily in jamming and spoofing over the last decade, much of the focus has been on how to disable insurgents' roadside bombs, not on how to counter a high-tech nation-state. China, however, has focused its electronic warfare and cyber attack efforts on the United States. Conceptually, China may well be ahead of us in linking the two. (F-35 supporters may well disagree with this conclusion.) Traditional radar jammers, for example, can also be used to insert viruses into the highly computerized AESA radars (active electronically scanned array) that are increasingly common in the US military.

“Where there has been a fundamental difference, and perhaps the Chinese are better than we are at this, is the Chinese seem to have kept cyber and electronic warfare as a single integrated thing,” Cheng said. “We are only now coming round to the idea that electronic warfare is linked to computer network operations.”

In a battle for the electromagnetic spectrum, Cheng said, the worst case “is that you thought your jammers, your sensors, everything was working great, and the next thing you know missiles are penetrating [your defenses], planes are being shot out of the sky.”

China's Untested Military

For all the unpredictability of high-tech warfare, though, the US has extensive experience using most of its systems in combat, albeit against much weaker enemies. The PLA has operated along its border with India and other neighbors and at sea in aggressive efforts to convince the US and its allies to back off of areas China claims, but none of those was a significant combat operation.

“The first difficulty here is simply getting a sense of how good the PLA is if and when things go pear shaped,” said Cheng. “The PLA hasn't fought a war since 1979,” when it invaded Vietnam and got badly bloodied. (There was also a naval skirmish with Vietnam in 1988). By contrast, said Cheng, “we have been at war for almost 25 years” – at least, on the ground and in the air.

“Arguably our naval forces have the least experience,” Navy strike pilots excepted, Cheng said. “There it's almost even between us and the Chinese.”

The naval balance is the big question mark in the Sino-US military balance, agreed Norman Polmar, a leading naval analyst.

“The [PLA] ground forces are very powerful but they can't go very far. They can't even get to Taiwan if they wanted to,” Polmar told me. “They have amphibious troops and they have paratroopers,” he said, but China has very little capacity to move them across the 100-mile wide Taiwan Strait against serious opposition. Taiwanese troops can overwhelm whatever PLA troops get through: “They can land and they'll be destroyed.”

“The Air Force is very large but not very sophisticated or advanced, despite several interesting prototypes that have been flown in the last decade,” Polmar went on. China has bought a large number of advanced Russian aircraft, primarily the Sukhoi SU-30MK series, but their pilots train much less and in less challenging exercises than do their US counterparts — only about 100 to 150 hours a month.

“The 2nd Artillery Force, which controls their ICBMs and their intermediate range missiles, has a very capable force,” he said, and the conventional-warhead weapons they control (but not their nuclear ones, one prays) would play a major role in any conflict.

“The navy is much harder to determine,” Polmar said. “They are building and acquiring from Russia more sophisticated ships,” he told me, as well as a refurbished ex-Soviet aircraft carrier. More survivable in an all-out war would be China's numerous submarines: According to the 2012-2013 edition of Strategic Asia, the PLA Navy also now has 50 to 60 quiet but short-range diesel submarines, and five less quiet but longer-range nuclear-powered attack submarines. Compared to America's 54 attack subs (all nuclear-powered), “they spend very little time at sea,” Polmar said. What's more, he added, “Japan has an excellent anti-submarine forces and we have one that's pretty good.”

The PLA's biggest problem, however, is not about buying hardware or even training to use it. It's something much subtler.

The Achilles' Heel of the PLA

The secret to America's battlefield success since 1990, despite all our geostrategic errors, is what we call “joint operations”: the ability to get air, land, sea, space and cyber forces to work together effectively. That takes decades of often painful practice that the PLA has only just begun.

“Today their military doctrine is ‘integrated joint warfare,’” said Wortzel. “They're not there yet.”

In fact, said Wortzel, “they're just beginning to get people from other services than the ground forces commanding their air force, their Navy, and their Second Artillery [missile force]. For 50 years, the navy and the air force were commanded by soldiers.”

The Chinese are painfully aware that their planes can't beat US or Japanese planes head-on, their ships can't beat our ships, their submarines can't beat our subs. But that kind of “symmetrical” warfare is not the way either the US or China plans to fight. A typical anti-submarine warfare (ASW) operation, for example, requires surface ships, aircraft from both carriers and land bases, satellites, and often friendly submarines to work together to hunt down and destroy the enemy sub.

For the Chinese in particular, they are betting heavily on land-based missiles to take out enemy airbases and ships at sea, with China's own air and naval forces in a supporting and largely defensive role. But they have two big hurdles to get over to make that work.

First of all, while China's missile force fired lots of warning shots into the waters off Taiwan in 1995-1996, there's evidence that it has never conducted “a synchronized launch of more than a half-dozen missiles at one time,” Mark Stokes wrote in Strategic Asia. That's not enough incoming rounds at once to swamp US and allied missile defenses or electronic countermeasures.

That's purely a Second Artillery problem, however. The bigger issue is ensuring the Second Artillery can operate relatively seamlessly with the Chinese air force and navy. So far, the three forces rarely train together in peacetime and they have no real-world combat experience fighting together.

“Their military was always separated really into a ground force, a navy, and an air force, and since about '63 a missile force, that never operated together, never,” said Wortzel. “They planned independent campaigns.”

But the Chinese are getting better, in the use of joint command structures in disaster relief operations and, most notably, with their “Vanguard 2009” exercises in the Jinan Military District, Dean Cheng notes. It's well worth noting that the officer who commanded both those exercises and much of the response to the 2008 Sichuan earthquake, Gen. Fan Changlong, has since been promoted two ranks to become senior

vice-chairman of the Central Military Commission, sort of China's equivalent of the Joint Staff and the National Security Council rolled into one. That makes Gen. Fan senior to China's defense minister and second on the CMC only to Chinese president Xi Jinping himself.

While not conclusive, Fan's rapid rise to such an influential position "suggests that joint operations is really important," Cheng said. Chinese doctrine has called for joint operations on paper since 1999, Cheng said, but "it appears he really lit a fire underneath [the PLA]: 'Listen up, people, we're going to take this to the next level.'"

Cheng declined to guess how good the Chinese had gotten at coordinating all their armed services in joint operations. "Is it a shortfall? Probably, but it's a lot less of a shortfall than in 1999," he said.

The Underlying Logic of Nuclear Deterrence Remains Valid **Constance Baroudos, Lexington Institute, Sep 19**

Nuclear deterrence dominated U.S. national security strategy during the Cold War. The word deterrence is a product of the nuclear age and is not found in international relations literature or strategic theory prior to World War II. However, the concept was successful in preventing nuclear war between the U.S. and Soviet Russia. Although the global landscape has evolved since the collapse of the Soviet Union, the U.S. still requires a robust nuclear deterrent.

The main purpose of strategic deterrence is to prevent nuclear war by ensuring that costs and risks associated with an attack outweigh potential benefits. Nuclear deterrence is dependent on the perceptions and evaluations of potential aggressors, and if successful persuades possible adversaries that an advantage could never be gained by a first strike.

Cold War critics did not expect nuclear deterrence to last forever. Due to its heavy reliance on rational actors, it was expected to eventually break down as a result of irrational behavior, miscalculation, misinterpretation of intelligence data, subconscious psychological needs of the challenger and defender, or other factors. Furthermore, policymakers have to make important decisions under stress, possibly without adequate sleep, and in compressed time frames, which may diminish the rationality of their thought processes.

Effective deterrence is a function of real capabilities and the perception of a credible national will to respond to aggression. A nation must respond to an attacker before its weapons are destroyed or by making sure it has a second-strike capability. A second-strike capability means enough of the deterrer's forces have survived attack and are capable of damaging the aggressor in retaliation. The U.S. and Russia possess nuclear triads to ensure a frightening second-strike capability that includes long-range bombers like the B-52, intercontinental ballistic missiles (ICBMs) like the Minuteman, and submarine-launched ballistic missiles (SLBMs) like the Trident II.

Today's nuclear deterrence is different from the strategy used during the Cold War. During the Cold War strategic deterrence focused almost exclusively on two nations, the U.S. and the Soviet Union. Today, a group of states, and possibly eventually non-state actors, possess nuclear and other weapons of mass destruction. More players in the nuclear weapons game complicate the task of sustaining deterrence. Now, even more potential aggressors must be convinced that the threatened nation will follow through with its threat of retaliation - a complex balancing act.

The U.S. should not expect other states to respond to deterrence in the same way as the Soviet Union in the past. The U.S. must become familiar with multiple potential opponents and understand their individual concepts of rationality, value structures, and varying opinions about the credibility of U.S. policy. This will allow Washington to tailor deterrence to various actors and to the specific circumstances of the deterrence situation.

As Henry Kissinger wrote, "Deterrence requires a combination of power, the will to use it, and the assessment of these by the potential aggressor. If any one of them is zero, the deterrence fails." Any proposal to reduce the size of the nuclear arsenal must take these realities into account. At some point, the reduction in nuclear capabilities could put America at greater risk as adversaries begin to doubt the credibility of its deterrent.

Billionaire Yachts are Passe as Monaco Peddles Luxury Submarines **Tara Patel, Bloomberg, Sep 26**

Graham Hawkes, inventor of the "underwater plane," made his debut at the Monaco Yacht Show this week in a bid to entice billionaire boat owners to take the plunge.

"This is literally like flying underwater," Hawkes, a U.K.-born ocean engineer who has spent decades designing cutting-edge diving suits and submarines, said in an interview. "Once you've done that, you don't want to do anything else."

Hawkes is one of four submarine vendors who for the first time are all at the Monaco show — one of the world's top yacht gatherings — to display multimillion-dollar high-tech wizardry they say makes perfect accessories for the wealthy.

U-Boat Worx, Triton Submarines LLC and Seamagine Hydrospace Corporation, along with Hawkes Ocean Technologies are betting the superrich will want to go beyond cruising on luxury boats worth tens of millions of dollars. They see annual sales of private, small luxury submarines going double-digit over the coming decade from a few now.

As the yacht size has stretched — this year saw the launch of a record-holding 590-footer called the Azzam — so has the list of distractions onboard. Soaking in a jacuzzi, shooting hoops on a floating court or playing a baby grand Steinway piano no longer cut it.

"There is a change in attitude of super-yacht owners," said Bert Houtman, founder and chairman of the Netherlands-based U-Boat Worx, surveying two of his submarine models on display quai-side in Monaco. "They're fed up with drinking white wine and riding jet skis so they're looking for another thrill."

Price Tags

The submersibles on offer cost from around \$1.5 million to \$4.2 million depending on their size and underwater range. The current global fleet is estimated at under a couple dozen including on private yachts such as Octopus, owned by Microsoft Corp. co-founder Paul Allen.

There's one on Necker Island owned by Richard Branson, founder of Virgin Group Ltd., and another on a tourist island off Costa Rica, where a 300-meter dive costs \$1,800 per person.

U-Boat's five models equipped with bubble-shaped acrylic windows can hold between two and five people and sink to between 100 meters and 1,000 meters underwater. Rival Triton, which is based at Vero Beach in Florida, is pushing the depth limit to 1,650 meters for similar battery-powered technology.

Storing an 18,000-pound submarine elegantly on a designer yacht can be a challenge. Makers urge owners to have bespoke boats conceived with subs in mind or, alternatively, invest in a "shadow" vessel to transport these types of toys and tenders, smaller speedboats that accompany super-sized yachts.

'Need Depth'

Private submersibles are "a way of exploring for things that no human has ever seen," Marc Deppe, Triton vice-president of sales and marketing, said in an interview. "For that you need depth."

Sharks, hydrothermal vents and sea mounts are among the wonders the more jaded wealthy could admire from an air conditioned capsule complete with panoramic views and a sound system, according to Deppe.

There are also man-made attractions. U-Boat in July took Russian President Vladimir Putin 60 meters underwater in the Gulf of Finland to see The Oleg, a 19th-century shipwreck.

One of Triton's subs was used in an oceanographic research campaign to film the elusive giant squid. The company is using the feat to develop relationships between rich submarine owners and research institutes too poor to acquire the hardware.

"A lot of guys who are billionaires have profound financial accomplishments and are now concerned about their legacy," said Deppe.

It's 'Magic'

Super-yacht professionals are guarded about the identity of their clients so without revealing names, Deppe says this is already happening.

The companies themselves train and grant submarine pilot licenses through in-house-designed courses. Safety features include a "dead man" signal that has to be sounded by the pilot every 10 minutes or the submarine automatically returns to the surface.

Hawkes's underwater flying machines differ from the others. While his resemble soft-edged airplanes with bubble-shaped cockpits, the others are more like UFOs.

"They're like a helicopter, we're like a Lear jet," he said at his stand in Monaco, which faces million-dollar yachts on display for sale or charter. The backdrop is a poster of him and Branson cruising in an underwater plane snapped just before they crossed paths with a Great White shark.

"Our goal is to fly and play with the big animals," he said. "Now that's magic."

Ohio Replacement Subs to Shift to Electric Drive Kris Osborn, DefenseTech.org, Sep 27

The U.S. Navy's successors to Ohio-class submarines will feature an electric propulsion system, making them quieter and stealthier than today's versions.

The technology for the ballistic-missile subs is being developed by the Navy and General Dynamics Corp. as part of the Ohio Replacement Program, Rear Adm. Richard Breckenridge told Military.com in an interview. Construction of the boats is set to begin in 2021, he said.

Unlike existing versions, which use mechanical propulsion technology, the replacement subs are designed to have an electric-drive system, Navy officials said. The technology still relies on a nuclear reactor to generate heat and create steam to power turbines, they said. However, the electricity produced is transferred to an electric motor rather than so-called reduction gears to spin the boat's propellers, they said.

"We just take the electricity from those high-speed turbines and use that electricity to drive an electric motor that propels the ship," Breckenridge said. "It is quieter than a mechanical drive system."

Evolving global threats require ever more quiet submarines, Navy officials said. The Navy decided to invest in the technology after reaching the limits of trying to silence mechanical propulsion, they said.

"Great minds have figured out how to get those gears whisper quiet," one Navy expert said. "We did not have any more tools in the bag to get the stealth that we knew we needed for this national strategic imperative."

The Navy has experimented with electric drive in the past, but it took 15 years for the service to perfect the technology, officials said.

The system offers a number of potential advantages, including noise reduction, according to Bryan McGrath, managing director at FerryBridge Group LLC, a defense consulting firm based in Easton, Md.

"When you have the motor tied directly to the propulsion shaft, that should eliminate some of the noise," he said.

Electric propulsion can also help ships generate more on-board power for electronics, sensors and weapons systems, McGrath said.

"Electric drive makes a lot of sense for submarines," he said. "There is some technical risk in moving from mechanical to electric drive, but electric drive has been around for decades. The DDG 1000 (Zumwalt-class destroyer) surface ship is also electric drive – so you have two very big important ships are moving to electric drive."

Other innovations in the submarine program include an X-shaped stern to improve maneuverability and stealth, officials said. As subs evolved from using propellers to more quieter propulsors, they lost some surface maneuverability, they said.

"With the X-stern, the Ohio Replacement will regain some of that maneuverability and, as a side effect, will have improved flow characteristics in the stern area while submerged," the Navy expert said. "This will improve quieting and it simplifies the hydraulic control layout in the engine room."

Similar to the current Ohio-class submarines, the replacements will be equipped to fire the Trident II nuclear missile, Breckenridge said. The missile, designated D5, has proven reliable in testing, with all but one of its 149 test shots successful, he said.

"Last week we did another round of successful firings of that missile," he said.

"The performance of that strategic missile is just incredible. As we look to deter bad behavior from other countries, we've got this kind of reliability."

The new subs will eventually be fielded with the successor to the D5, Breckenridge said. The program office is also working with officials in the United Kingdom to engineer a common missile compartment. General Dynamics' Electric Boat unit in Groton, Conn., is building prototypes under a \$770 million contract.

The Ohio Replacement Program aims to control costs in part by borrowing technology already in production on the Virginia-class attack submarine program, officials said. Examples of the technology include conformal plane array sonar, fiber-optic links between sail-mounted cameras and a control room and "fly-by-wire" digital controls that allow crews to use a joystick and touch-panel to control the boat, they said.

Sonar technology is of particular importance to a submarine platform whose mission depends upon quietness and detectability, Breckenridge said.

"The SSBN has to have a capable sonar system with hull arrays," he said. "We also stream along a towed array by putting out a string of transducers that give you that much more listening power. SSBN wants to detect an undersea adversary – if we can hear them further than they can hear us we have a tactical advantage in the undersea domain."

In addition, the new submarines are being engineered with a new nuclear-reactor core designed to power the ships for 42 years. Unlike the current Ohio-class SSBNs, which require a multi-year refueling process halfway through their service life, the new Ohio Replacement boats will be able to continue their missions without needing a refueling pause, Breckenridge said.

The technology also allows the Navy to conduct the same mission with fewer submarines, service officials and analysts said.

Eyeing Gulf Shipping, Iran's Mass Producing Submarines Zachary Keck, The Diplomat, Sep 28

An Iranian admiral says Tehran is mass producing light submarines, possibly for the Strait of Hormuz.

Iran is steadily increasing its ability to indigenously produce different kinds of submarines, some of which would likely play an important role in any Iranian effort to close down the Strait of Hormuz.

In an interview with the semi-official Fars News Agency this week, Admiral Khordad Hakimi, commander of the Iranian Army's 4th Naval Zone in the Caspian Sea, said that Iran is mass producing light submarines and has begun constructing medium submarines.

Although Iran is well known for grossly exaggerating its military advances, these statements seem on the mark.

The Islamic Republic of Iran first became interested in acquiring submarines after it had numerous surface vessels sunk by the U.S. Navy during the Tanker War in the late 1980s. Realizing the futility in taking on the USN directly, Iran embraced an asymmetric strategy. Submarines are one component of this, as are its mine-laying capabilities, anti-ship cruise missiles and fast-attack speedboats and other small craft, which it could use in swarming tactics.

With regards to submarines, in the late 1980s and early 1990s, Iran purchased three 877EKM Kilo-class (Tareq-class in Iran) diesel-electric submarines from Russia, reportedly paying US\$600 million per vessel. These were commissioned by Iran between 1992 and 1996, and have been renamed Tareq-class submarines by Iran's Navy.

Iran's Tareq-class subs displace around 3,900 tons when submerged, and were designed by Russia for anti-submarine and anti-surface ship warfare, according to Naval Technology. They reportedly have six 533-millimeter tubes, and are capable of carrying either 18 torpedoes or 24 mines.

In reality, the utility of the vessels for Iran's Persian Gulf operations is limited, as the shallow depth of the sea means they can only operate in about one-third of it. The water's high salt content also hinders their ability to use passive sonar to locate other ships without being detected.

In November 2007, Iran launched the lead ship of its Ghadir-class midget submarines. These currently form the backbone of Iran's submarine fleet in the Gulf. Iran claims that the vessel was indigenously built, although many analysts believe it is derived from North Korea's Yono-class submarine. Iran is now believed to operate about 20 of the 120-ton vessels, which are almost certainly what Hakimi was referring to when he said Iran is now capable of mass producing light submarines.

The Ghadir-class sub has two 533-mm tubes for firing torpedoes, is capable of laying mines and, according to Iranian media outlets, could be used to transport and insert special forces into enemy territory. At the time of the lead ship's launch in 2007, an Iranian naval official was quoted as saying, "If the enemy makes a mistake, he will receive such a powerful second strike that he won't be able to stand up."

This is not precisely how Iran would use the vessels according to Christopher Harmer, a senior naval analyst at the Institute for the Study of War in Washington, who previously served as an officer in the U.S. Navy for 20 years, with postings in the Fifth Fleet.

Harmer tells *The Diplomat* that by Western standards, Iran's Ghadir-class subs are "very small, very short range, with minimal capability." Nonetheless, the submarines serve Iran's purposes well, he adds, explaining:

"The quietest submarine in the world is one that rests on a sandy seabed. That is how the Iranians would use the Ghadir – get it out of port, sink to the bottom of the shallow Persian Gulf, rest on the sandy bottom, and wait for a target to come to it."

In doing so, Iran would be seeking to avoid the U.S. Navy's formidable ASW capabilities, according to Harmer.

"The Iranian submarines are very low quality, but if they put their submarines out into the Persian Gulf and put them on the bottom, just resting there, it will be very difficult for us to find them. As long as a submarine is not moving, it is not putting out any ambient noise. If it is not putting out ambient noise, the only way to find it is with an active sonar. Our best active sonar detection ranges for a static target resting on the bottom are maybe 2,500 yards."

Thus, hunting Iran's subs would require coming into close contact with them, unless they fired a torpedo, in which case they "would be immediately detected and completely vulnerable to counterattack." In light of this, Harmer points out that Iran's submarine doctrine rests on deterrence. If deterrence fails, Iran's subs would in effect become "suicide vessels."

Iran's ability to threaten shipping in the Strait of Hormuz, which 20 percent of the world's oil travels, is one of the three legs of its deterrent-based military doctrine. The midget submarines play a large role in Iran's effort to convince the U.S. and its allies that it poses a credible threat to the strait. In principle, the Ghadir-class submarines, used as Harmer explained, could be effective in disrupting shipping. Besides being able to lay mines (Iran has other ships for this), Iran could exploit the narrow shipping lanes and limited routes in the Strait of Hormuz and Persian Gulf by pre-positioning subs to attack commercial vessels.

This would require using the submarines as "suicide vessels" however, and probably could only be maintained for a limited period of time, given the likely scope of the USN's response. Were Iran's submarines to pursue offensive action, the U.S. would be able to call on its Gulf Cooperation Council and NATO allies in responding to the threat, according to Harmer.

Still, it's worth noting that the Fars News Agency article this week in which Hakimi discussed Iran's ability to mass produce light submarines concluded by reaffirming that Iran has the capability to close the strait, although many experts doubt this.

Whatever the extent of the threat of Iran's current midget submarines, Tehran is clearly playing a long game when it comes to its budding underwater fleet, as will be discussed in a post next week.

Consequences for Russian Missile Crash Will Be Harsh – Official RIA Novosti, Sep 20

MOSCOW – The people responsible for the crash of a Bulava intercontinental ballistic missile at the start of September will be held accountable and possibly fired, a Russian military official told reporters on Friday.

The solution to the problem of the Sept. 6 launch failure of a Bulava submarine-launched ballistic missile (SLBM) will be "implemented very harshly," said Oleg Bochkarev, deputy chairman of the Military-Industrial Commission, adding that personnel would not be exempt from the consequences for the launch's failure.

"Of course they'll get to the bottom of it, don't doubt it for a second," he said.

Bochkarev said that the commission is still investigating what caused the missile to malfunction in the second minute of its flight during state trials of the Alexander Nevsky nuclear-powered submarine in the White Sea.

He told RIA Novosti earlier this week that all Bulava missiles from the same batch as the one that failed on Sept. 6 will undergo additional tests by their manufacturer.

Russia's Defense Minister Sergei Shoigu also ordered that trials of two nuclear submarines be halted as a result of the crash.

Including this latest failure, eight out of 19 or 20 test launches of the troubled Bulava have been officially declared unsuccessful.

U.S. Military Could Not Handle One Major Theater Operation If Sequester Sticks Colin Clark, Breaking Defense, Sep 18

CAPITOL HILL – Even the cameras stopped clicking in a hushed Armed Services hearing room today as Rep. Jim Cooper told the Joint Chiefs of Staff and his colleagues on the biggest committee in Congress today that America's lawmakers had failed the country.

"You gentlemen make life and death decisions in the Tank almost every day," a somber Cooper said at a House Armed Services Committee hearing on the automatic budget cuts known as sequestration, looking straight at Army Gen. Ray Odierno, Adm. Jonathan Greenert, Air Force Gen. Mark Welsh and Marine Gen. James Amos. "We are unwilling to even come up with a budget for America."

Even the usually partisan HASC Chairman Buck McKeon, after offering a very short defense of the House and GOP's actions on sequestration, spoke the truth to the Joint Chiefs and the packed hearing room: "It's not your fault. It is us."

How bad will it get if the United States Congress does not reverse the Budget Control Act, the foundation of sequestration?

Three of the four Joint Chiefs told the HASC that they would not be able to execute the most basic strategic requirement of the U.S. military: defeating an enemy in a single major theater operation. Only Gen. Amos, Marine Commandant, said his self-sufficient force could handle one MTO, but could not handle more than that.

“It’s my opinion we would struggle to meet even one major theater contingency,” Odierno testified early in the hearing. Later, each of the Joint Chiefs was asked by Rep. Randy Forbes, chairman of the HASC seapower and power projection forces subcommittee, if they could execute the military’s basic Strategic Planning Guidance, which requires that U.S. forces be able to handle one enemy and to deter another. Down the line he went. Odierno: no; Greenert: no; Welsh: no. Amos, yes, but.

To be clear, this does not mean that America’s forces are unready now to handle its most important jobs. But if sequestration continues into 2014, the pressure on readiness and procurement funds will gradually squeeze the capabilities out of the four services.

Here’s a list of what the military could not buy or would have to defer if sequestration continues in fiscal 2014:

Navy

This is drawn from Adm. Greenert’s statement to the HASC.

- One Virginia class submarine would be canceled.
- Work on the first replacement for the Ohio-class nuclear missile submarines – SSBN-X – would be delayed fiscal from 2021 by one year, leaving the United States with a gap in the most crucial part of the nuclear triad.
- One Littoral Combat Ship would not be bought.
- Some 11 tactical aircraft – four EA-18Gs, one F-35C, one E-2D, two P-8As, three MH-60s and “about 400 weapons.”
- One Afloat Forward Staging Base (AFSB) would not be bought.
- Delivery of the USS GERALD R. FORD (CVN-78) would be delayed by two years, raising questions about whether the Navy could keep the requisite number of carriers at sea as needed.

Army

Gen. Odierno emphasized what he hasn’t been able to do already: “The Army deferred maintenance on 172 aircraft, more than 900 vehicles, almost 2,000 weapons, and over 10,000 pieces of communications equipment.”

In terms of procurement affected should sequestration continue to 2014, Odierno said combat vehicle development will slow. “In our aviation program, we cannot afford to procure a new Armed Aerial Scout program and we will be forced to reduce the production and modernization of 25 helicopters. We will reduce system upgrades for unmanned aerial vehicles. We will delay the modernization of Air Defense Command and Control systems,” he said in his statement. If things keep going to fiscal 2015, “every acquisition program will be affected.”

Air Force

While the blue suiters have not made any final decisions, Gen. Mike Hostage, head of Air Combat Command, told the Air Force Association annual conference this week that he could accept elimination of the entire 340-plane A-10 close air support fleet. Among the other options on the table: eliminating the 59-aircraft KC-10 tanker fleet; eliminating the F-15C fleet and scrapping plans to build a new \$6.8 billion combat search and rescue fleet, one used by all the services.

The head of Air Force Space Command, Gen. William Shelton, captured the sense of the services yesterday when he told the AFA conference that sequestration “probably represents a bigger threat to our capabilities than anything an enemy is thinking up.”

The most eloquent expression of the military’s deepening unease and frustration with Congress’ inability to scrap sequestration did not involve any words. I asked Gen. Hostage yesterday if he believed Congress understood how much sequestration is affecting the American military’s ability to be ready and to do its job. The enormous sigh he uttered said it all.

Is there hope that Congress is getting the message and may break the sequestration mold when the debt ceiling negotiations finally happen? One GOP staffer believes there is now a chance. Until the last few days, this person did not believe there was much of a chance.

The Writer Who Built the World’s First Engine-Powered Submarine Narcis Monturiol Loved The Ocean’s Corals So Much, That He Built A Machine So He Could Better Enjoy Them Rob Dunn, Smithsonian.com, Sep 18

A man cannot one day just decide to build a submarine, much less the first powered submarine, much less if that man is a writer. Yet that is just what Narcis Monturiol did.

As a young firebrand of the mid-19th century, Monturiol flirted with inflammatory subjects including feminism and Communism, placing him under the watchful eye of an oppressive regime. When he fled to Cadaqués, an isolated town on the Mediterranean coast of Spain, he found a peaceful fishing village where he could expand on his ideas of a Utopian world. It turned out that Cadaqués would also be the inspiration for his biggest idea.

In Cadaqués, the few locals mostly fished from the shore or from boats. Others dove for coral and returned with a magical diversity of things—fish, crabs, snails and, of course, great and wondrous corals, sold as decoration for local homes. Monturiol became transfixed by these treasures, seeing them as baubles befitting a Utopia. He admired the coral divers for their quest—a quest for discovery in an the unknown realm beneath the waters that he called “the new continent”—but was troubled by an accident in 1857 that left one diver dead by drowning.

He was so affected by the sight that he wanted to do something to make the life of coral divers easier. As Robert Roberts, one of Monturiol’s later collaborators put it, “The harvesting of valuable coral and the relatively scarce fruits born to those that dedicate their livelihood to this miserable industry...incited Narcis Monturiol.”

Monturiol had always been a dreamer. He was born in 1819 in Figueres, a town in Catalonia, the region that would later give birth to eminent artists including Salvador Dali, Antony Gaudi, Pablo Picasso and Joan Miro.

Monturiol’s father was a cooper, designing and building barrels for the wine industry. Monturiol could have continued in his father’s footsteps but instead chose to become a writer and socialist revolutionary. At an early age, Monturiol began to write about feminism, pacifism, Communism and a new future for Catalonia, all of which are the sort of things that make dictatorships, such as that of then Spanish statesman Ramón María Narváez, uncomfortable for his beliefs, Monturiol fled to France for a while before returning to Spain. When his writings got in trouble again, this time in France, he came to Cadaqués, the coastal town just a few miles from Figueres.

In 1857, with visions of the new continent in his mind, his Utopia that he and his friends would create through writing and art, Monturiol went home to Figueres to begin his project. This all sounds ridiculous and quixotic, because it is.

Just how Monturiol came up with his specific plans is unclear. Perhaps thanks to his father’s influence, though Monturiol also hired a master builder of ships and a designer to help, the submarine came to look a bit like a giant wine barrel, tapered at both ends. It was at once simple and sophisticated.

Submarine technology wasn’t new to Monturiol or his contemporaries: historical mentions of “diving boats” can be traced to the time of Alexander the Great. The first real submarine – a boat capable of navigating underwater – was built by Cornelius Drebbel, a Dutch inventor who served in the court of England’s King James I during the Renaissance. Drebbel’s crafts were manually powered, requiring 12 oarsmen to row the underwater vessel whose submersion was controlled by the inflating – or deflating – of rope-tied pig’s bladders placed under each oarsmen’s seat. Into the 18th and 19th centuries, the Russians perfected Drebbel’s vision, creating the first prototype for a weaponized submarine under the patronage of Czar Peter I in June of 1720.

Submarine technology continued to pique the interest of innovators – especially in Russia and Germany – but economic and scientific constraints hindered the expansion of submarine technology into the 19th century.

By the summer of 1859, just two years after the drowning, his dream was built. The submarine was 23 feet long and equipped with appendages for gathering coral and whatever else could be found in the great and unknown abyss. Monturiol was eager to test the submarine and took it for a trial with a crew of two other men, including the boat builder, in Barcelona’s harbor—even he was not bold enough to attempt a maiden voyage in in Cadaqués’ stormy bay. The submarine, named *Ictineo*, a word Monturiol created out of the Greek words for fish and boat, was double-hulled, with each hull made of olive wood staves sheathed in copper. It moved thanks to Monturiol’s own foot power via two pedals, or at least that is how he hoped it would move.

Monturiol untied the mooring rope as a small crowd looked on, climbed in, waved and closed the hatch. The submarine began to move under human power and as it did, it disappeared into the water. It worked! Monturiol eventually completed more than 50 dives and established that the submarine was capable of diving to 60 feet and staying submerged for several hours. The submarine was able to dive deeper and for more hours than any submarine that had ever been built.

To Monturiol, the experience was at once tremendous and terrifying. As he would later write: “The silence that accompanies the dive...; the gradual absence of sunlight; the great mass of water, which sight pierces with difficulty; the pallor that light gives to the faces; the lessening movement in the *Ictineo*; the fish that pass before the portholes—all this contributes to the excitement of the imaginative faculties.”

For a while, Monturiol enjoyed the excitement and tried to drum up interest among investors for the production of more-advanced submarines. Catalonians pledged money at concerts, theatre performances, and other gatherings were held, town to town, to garner funds and support for his endeavors. Then, one day in 1862, a freighter drilled straight into the sub, which was docked in Barcelona’s Harbor, and crushed it. No one was harmed, and yet the dream splintered.

Monturiol was distraught. The *Ictineo* had taken years of his life. Now he had no choice. He would have to build the *Ictineo II*, an even larger submarine.

In 1867, the *Ictineo II* launched successfully. Monturiol descended to 98 feet and yet, to him, the endeavor still seemed clumsy. It was hard to power a submarine with nothing but one’s legs. Monturiol opted to develop a steam engine to be used inside the submarine. The steam engine, like the submarine, was not a new invention. It had been around for almost two centuries: Thomas Newcomen first patented the idea in 1705, and James Watt made innumerable improvements in 1769. In a standard steam engine, hot air is forced into a chamber with a piston, whose movement produces the power to motor practically anything, such as a submarine. For Monturiol, however, he couldn’t simply apply the technology of a standard steam engine because it would use up all of the valuable oxygen in the sub. The standard steam engine relies on combustion, using oxygen and another fuel substance (usually coal or fire) to produce the heat needed to create steam. This wouldn’t work. Instead, he used a steam engine run by a chemical reaction between potassium chlorate, zinc, and manganese dioxide that produced both heat and oxygen. It worked, making the *Ictineo II* the first submarine to use a combustion engine of any kind. No one would replicate his feat for more than 70 years.

Others tried to copy the concept of an engine-propelled submarine, but many failed to replicate the anaerobic engine Monturiol had created. It wasn’t until the 1940s that the German Navy created a submarine that ran on hydrogen peroxide, known as the *Walter Turbine*. In the modern era, the most common anaerobic form of submarine propulsion comes from nuclear power, which allows submarines to use nuclear reactions to generate heat. Since this process can occur without any oxygen, nuclear submarines can travel submerged for extended periods of time – for several months, if need be.

When Monturiol began constructing his submarine, the United States was entangled in the Civil War. Both sides in the conflict used submarine technology, though their vessels were rudimentary and often sank during missions.

When Monturiol read about the Civil War – and attempts to use submarine technology in the conflict – he wrote to Gideon Welles, the U.S. Secretary of the Navy, to offer his expertise and designs to the North. Unfortunately, by the time Welles responded to Monturiol’s solicitation, the Civil War had ended.

The submarine was an incredible innovation, but the timing was wrong. He could not sell the submarine and for whatever reason he did not choose to explore on his own. He desperately needed and wanted more funding to feed himself and, of course, produce more submarines and, at this point, would do nearly anything for it. He even installed a cannon on the submarine to interest the military—either that of Spain or, as he later tried, the United States (so much for pacifism)—all to no avail. In 1868, he sold his dream submarine for scrap. Its windows went into Spanish bathrooms and its engine—the first submarine engine in the world—became part of a device used to grind wheat. The grand machinery of his imagination would be used to make food, each bite bearing, one supposes, some taste of Monturiol’s dreams.

Monturiol died broke, and his submarines do not seem to have directly inspired any others. Yet, in Catalonia he has come to have a kind of understated fame. He was Dali before Dali, Catalonia’s first visionary artist, who worked with the tools of engineering rather than painting. The most concrete testimonies are a replica of his submarine in Barcelona harbor and a sculpture of him in the square in Figueres. In the sculpture, Monturiol is surrounded by muses. Even though the muses are naked, the statue seems to go largely unnoticed, overshadowed in the town by the more prominent legacy of Dali. But maybe the real testimony to Monturiol is that his spirit seems to have continued just beneath the surface in Catalonia. People know his story and every so often, his spirit seems to rise up like a periscope through which the visionaries—be they Dali, Picasso, Gaudi, Miro or anyone else—can see the world as he saw it, composed of nothing but dreams.

