The Role of Emerging Countries with Nuclear-missile Carrying Capabilities on Strategic Stability

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Submarine strategic stability

• An increasing number of countries can acquire or expand sea-based capabilities.

• Violent contact between ballistic missile submarine (SSBNs) may occur even in peace time.

• Submarine stealth depends on technology and geography.

• Emerging technologies could undermine submarine-launched ballistic missiles (SLBMs) stealth and hence survivability.
Submarine-launched ballistic missiles carry about half of the US deployed strategic warheads.
Submarine modernization

“The 12 Columbia subs will eventually carry 70 percent of the nation’s nuclear weapons, so any gap between the Ohio retirements and new Columbias could have a serious impact on the nuclear triad.” Breaking Defense
Past and Current Stability

- 800 deployed and nondeployed ICBM and SLBM launchers and nondeployed heavy bombers equipped to carry nuclear armaments.
- 700 deployed ICBMs, deployed SLBMs, and deployed heavy bombers equipped to carry nuclear armaments.
- Maximum 1,550 deployed warheads on deployed ICBMs, deployed SLBMs, and deployed heavy bombers equipped for nuclear armaments (each such heavy bomber is counted as one warhead toward this limit).
Russia’s nuclear triad

- Russia is clearly determined to maintain the components of its nuclear triad
- "Although the nature of military threats is changing, it is the nuclear triad that remains a key guarantee of Russia’s military security and, if one takes a broader look, of global stability," V. Putin, Nov 10, 2020
- In April 2019, Russia launched the Project 9852 Belgorod, a submarine that can launch the Status-6 torpedo
Pakistani “credible minimum deterrence”

- The Pakistan Navy five diesel-electric submarines and three MG110 mini submarines.
- In 2016, Pakistan finalized a deal with China to loan eight attack submarines (2023).

French Agosta-70 submarine *Ouessant* at Brest in 2005

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**Pakistan fires 'first submarine-launched nuclear-capable missile'**

By Reuters Staff

ISLAMABAD (Reuters) - Pakistan fired its first submarine-launched cruise missile on Monday, the military said, a show of force for a country that sees its missile development as a deterrent against arch-foe India.
Indian Navy

- The Indian fleet includes fourteen diesel powered submarines and two nuclear powered submarines.
- In 2017, India started building six new Scorpène class vessels in partnership with a France’s Naval Group.
- The official Indian policy is to keep nuclear warheads de-mated from actual missiles.
- The INS Arihant carries 12 Sagarika (K-15) SLBMs with a range of around 700 km and nuclear-capable Nirbhay cruise missiles.
- India and Russia signed a deal in 2019 for a lease of an Akula class for 10 years to India (2025).
New missiles for the 75th party anniversary in the DPRK

North Korea Unveils New Weapons at Military Parade

North Korean leader Kim Jong Un has warned that his country would fully mobilize its nuclear force if threatened as he took center stage at a military parade that unveiled what appeared to be a new intercontinental ballistic missile and other weapons.

By Associated Press, Wire Service Content  Oct. 10, 2020, at 10:49 a.m.

- DPRK submarine fleets includes 64 to 86 submarines (one diesel-electric ballistic missile submarine known as the Gorae-class).
- North Korea’s submarines are used for espionage and infiltration.
- The Gorae relies on diesel-electric engines and lacks an Air-Independent Propulsion system, the submarine can only remain submerged for a few days.
Differences in SLBM survivability

• Permissive Action Links or 'PALs' are devices designed to prevent the unauthorized use of nuclear weapons.
  • “Whether it's India or Pakistan or China or Iran, the most important thing is that you want to make sure there is no unauthorized use. You want to make sure that the guys who have their hands on the weapons can't use them without proper authorization.” — Harold Agnew, former director of Los Alamos National Laboratory

• Adversary nuclear submarines often come very close to violent collisions by engaging in mock attacks.

• Traditional ultrasound detection would not be able to detect submarines, even if noisier than the U. S. SSBNs, as long as they do not go through chokepoints to get within range of their missiles’ targets.
Risk of conflict escalation

- “an extremely dangerous, but exhilarating, running game . . . that American and Soviet ships have been playing with each other for many years during the Cold War” Admiral Elmo Zumwalt

- Similar “exercises” may have caused several submarine accidents.

- “greatest source of loss for submarines was a flood (21%) followed closely by collision (18%)” Tingle, 2009
The most survivable nuclear weapons?

• “Silent Service” can stay submerged for months and move undetected while on patrol.

• Russian and submarines technologies are not secure from U.S. detection in the open ocean and are kept in confined areas (Bastion strategy).

• Survivability depends on technology and geography.

• Noisy submarines, while not crossing choke points to get within target range may be undetected by ultrasound systems.
Technologies enabling verification

Radiation portal monitors

Thermal and fast neutron imagers

Istvan Dioszegi, UM, 2017


#3: $^{67}\text{Ga}/^{99}\text{Tc}/\text{WGPu}$

Counts

5.10²  5.10³  5.10⁴  5.10⁵
Technologies enabling verification

Radiation portal monitors

Neutron image of the BeRP ball (right) and a plutonium oxide canister (left) 57 cm away from the detector and separated by 50 cm.


Thermal and fast neutron imagers
Conclusions

• Countries other than NATO and Russia are gaining access to nuclear-missile carrying capabilities

• The strategic stabilizing effect of nuclear submarines should be reconsidered because:
  • Availability of nuclear armed submarines could contribute to conflict escalation
  • Submarine safety greatly varies among countries
  • Stealth depends on technology and deployment location

• Technology exists that could contribute to enabling future agreements, e.g., on mutually exclusive patrol zones.
References

Physicists Coalition for Nuclear Threat Reduction

www.aps.org/policy/nuclear

Questions?