Archived Content

Information identified as archived on the Web is for reference, research or record-keeping purposes. It has not been altered or updated after the date of archiving. Web pages that are archived on the Web are not subject to the Government of Canada Web Standards.

As per the Communications Policy of the Government of Canada, you can request alternate formats on the "Contact Us" page.

Information archivée dans le Web

Information archivée dans le Web à des fins de consultation, de recherche ou de tenue de documents. Cette dernière n'a aucunement été modifiée ni mise à jour depuis sa date de mise en archive. Les pages archivées dans le Web ne sont pas assujetties aux normes qui s'appliquent aux sites Web du gouvernement du Canada.

Conformément à la Politique de communication du gouvernement du Canada, vous pouvez demander de recevoir cette information dans tout autre format de rechange à la page « Contactez-nous ».

CANADIAN FORCES COLLEGE / COLLÈGE DES FORCES CANADIENNES
JCSP 34 / PCEMI 34

MDS RESEARCH PROJECT/PROJET DE RECHERCHE DE LA MED

Diesel Submarines:
Stability to Instability - A Question of Control

By /par

Lieutenant Commander J.A. Hawrylak

This paper was written by a student attending the Canadian Forces College in fulfilment of one of the requirements of the Course of Studies. The paper is a scholastic document, and thus contains facts and opinions, which the author alone considered appropriate and correct for the subject. It does not necessarily reflect the policy or the opinion of any agency, including the Government of Canada and the Canadian Department of National Defence. This paper may not be released, quoted or copied, except with the express permission of the Canadian Department of National Defence.

La présente étude a été rédigée par un stagiaire du Collège des Forces canadiennes pour satisfaire à l'une des exigences du cours. L'étude est un document qui se rapporte au cours et contient donc des faits et des opinions que seul l'auteur considère appropriés et convenables au sujet. Elle ne reflète pas nécessairement la politique ou l'opinion d'un organisme quelconque, y compris le gouvernement du Canada et le ministère de la Défense nationale du Canada. Il est défendu de diffuser, de citer ou de reproduire cette étude sans la permission expresse du ministère de la Défense nationale

Diesel Submarines:
Stability to Instability - A Question of Control

Abstract

Although not in the glare of publicity, diesel submarines have raised concern in many circles, both political and military. History demonstrates that this weapon is extremely lethal and potent in a nation's campaign for regional or global dominance. The SSK permits countries to protect their sovereignty, but what they also contribute is a state of regional instability. Nations that pursue the quest for acquisition of a submarine are enabled that ability through a market environment without control. Iran and East and Southeast Asia are examples of that instability. Iran's unhindered acquisition of three diesel submarines from Russia has tipped the scales towards Iran now being considered a credible foe when threatening to close the vital Strait of Hormuz causing regional instability. In East and Southeast Asia, an immense regional military build-up has occurred that has included the attainment and establishment of submarine fleets that also resulted in a shift from regional stability to instability. These situations were enabled as a consequence of no international control mechanism and if proliferation is allowed to continue unchecked, unwanted and unintended conflict will occur. These examples illustrate the necessity for an international oversight process that would regulate proliferation of diesel submarines thus providing stability to those regions.

Table of Contents

Lists of Figures and Tables

List of Figures

List of Tables

Introduction

> "*Diesel-electric submarines constitute a growing threat, one that can be difficult to detect and defend against in shallow water. Uncountered, these submarines can disrupt shipping and shut down vital sea lanes in littoral areas. Many navies now operate diesel submarines, and additional countries could well follow suit."*[1]
>
> William J. Perry, Secretary of Defense Annual Report to the President and Congress March 1996

The ongoing wars in Iraq and Afghanistan have focused international attention on counter-insurgency and the growing problems of the asymmetric threat. Headlines throughout the world repeatedly report on unconventional warfare and the methods currently being employed such as suicide bombings. Consequently, the spotlight has shone brightly on one aspect of warfare while other areas have slipped out of the limelight or almost completely forgotten.

The diesel powered submarine is a subject unlikely to perk the interest of most people, even that of military personnel. Diesel submarines do not possess the aura that their larger nuclear powered brethren command, however, like their very nature; they are quiet and unassuming, but quite powerful weapons. Although not in the glare of publicity, diesel submarines have raised concern in many circles, both political and military. Most notably is the emphasis the United States Navy (USN) is placing on the threat posed by this platform. In a 2003 statement by USN Rear Admiral Robert Moeller, then Deputy Chief of Staff for Operations Pacific Fleet said,

> "As we enter the 21st century, the global submarine threat is becoming increasingly more diverse, regional, and challenging... Diesel submarines are deemed a cost-effective platform for the delivery of several types of weapons,

[1] "Littoral Anti-Submarine Warfare Concept," http://www.fas.org/man/dod-101/sys/ship/docs/aswcncpt.htm#fig4; Internet; accessed 13 April 2008.

> including torpedoes, anti-ship cruise missiles, anti-ship mines and nuclear weapons."[2]

He further added,

> "Submarine quieting technology continues to proliferate, making submarines, operating in their quietest mode, difficult to detect even with the most capable passive sonar. The inability to detect a hostile submarine at long-range - in other words, at a sufficient "stand-off" distance before it can launch a missile or a torpedo - is a critical vulnerability that puts ships and our Sailors at risk."[3]

The USN, as the preeminent navy in the world, has realized the potential of the diesel submarine and has adopted "Littoral Anti-Submarine Warfare"[4] into their doctrine. Within this concept, it states,

> "Although a submarine threat could come from any country that possesses at least one submarine and a desire to disrupt shipping, the growing threat is that more countries can readily acquire diesel-electric submarines... The future threat will increasingly include diesel-electric or air independent propulsion submarine designs operated by potential adversaries for coastal defense and regional influence."[5]

So serious is the submarine threat that the USN opened the Fleet Anti-Submarine Warfare Command in 2004 to focus on the skills required to combat the new underwater battle.[6]

Clearly, diesel submarines are a threat to naval forces and other shipping. History demonstrates that this weapon is extremely lethal and potent in a nation's campaign for regional or global dominance. Why is it that diesel submarines, a weapon that garnered little attention previously, has now raised significant concern within the world's leading navy and other western

---

[2] Moeller, Rear Admiral Robert T., "Statement before the House Committee on Resources," http://www.navy.mil/navydata/testimony/readiness/moeller030506.txt; Internet; accessed 13 April 2008.

[3] *Ibid*.

[4] *Littoral Anti-Submarine Warfare Concept*

[5] *Ibid*.

[6] Sonja Barisic, "New Command Renews Navy Focus on Hunting Submarine," The Associated Press, http://www.globalsecurity.org/org/news/2004/040407-navy-command.htm; Internet; accessed 13 April 2008.

nations? This paper will define the characteristics of the diesel submarine and argue how the lack of international control on proliferation of this weapon has led to regional destabilization using Iran and East Asia as illustrative examples and conclude that an oversight mechanism for proliferation must be established.

Chapter One - Defining the Threat

General

What does the submarine offer to a navy that is different from other platforms? Why the submarine? These are common questions that are asked by many regardless of their occupation or interests. For those seeking to find answers, it is important to understand what the submarine can offer to a nation that is in possession of such a weapon. Karl Lautenschlager in his article *The Submarine in Naval Warfare: 1901-2001,*[7] summarizes six generic capabilities that modern submarines may provide as a result of technological development. These capabilities are "coast defence, naval attrition, commerce warfare, projection ashore, fleet engagement, and assured destruction"[8] and will be defined in broad terms to provide an understanding of the potential that submarines possess. It is important to note that a submarine does not necessarily possess all of these capabilities but rather may have one or a few and in reality only ever be employed to fulfill a specific role that a certain capability implies.

Lautenschlager first states that submarines provide a nation the capability to defend their coasts. Early submarines with their limited range were well suited for this role and although the capabilities have improved drastically, their prominence in this role remains the same now as it did then. Consequently, the smaller submarine with reduced range can still execute the task of coast defence[9] and no matter the size or type of submarine, they can all in some manner contribute to coast defence. However, it must be recognized that the characteristics of specific

---

[7] Karl Lautenschlager, "The Submarine in Naval Warfare, 1901-2001," *International Security* 11, no. 3 (Winter, 1986), 94-140; http://links.jstor.org/; Internet; accessed 17 January 2008.

[8] *Ibid*., 102.

[9] *Ibid*., 104.

coastlines would see one type of submarine more aptly suited to perform this role than another especially when looking at water depths.

Naval attrition is the second capability mentioned and in this manner the submarine is used against the enemy's fleet. The purpose is to destroy as many platforms of the opponent as possible thus wearing down their fleet strength and overall naval capability. This capability was evident in the two world wars and most recently during the Falklands Island crisis in 1982, where the British submarine HMS CONQUEROR sank the Argentinean cruiser GENERAL BELGRANO.[10] Further, complicating the issue, navies today have to consider what the impact would be on the political will and public support if a submarine sank a large capital ship such as an aircraft carrier. The repercussions would be hard to predict but the effect of losing such a ship could sway from one end of the pendulum to another when looking at the possibilities for response. Finally, when talking about naval attrition, the method has developed to include the submarine versus submarine scenario where in fact the best anti-submarine option is the submarine itself.[11] When looking solely at the environment in which submarines operate, it is only logical that the only counter that can also reach these areas is another submarine.

The history of War World One and World War Two especially highlight the third submarine capability, commerce warfare. Utilizing the most simplistic description, commerce warfare is the use of submarines to cripple the commercial capability of a nation through the destruction of maritime commercial traffic.[12] The effects of commerce warfare can be debated on the overall impact achieved, however, there is no doubt that the repeated destruction of

---

[10] Geoffrey Till, *Modern Seapower*, Vol. One (London, England: Brassey's Defence Publishers, 1987), 59.

[11] Lautenschlager, *The Submarine in Naval Warfare, 1901-2001*, 109.

[12] *Ibid*., 110.

merchant vessels does have a cumulative effect.[13] Today, such a campaign to conduct commerce warfare through the use of the submarine would undoubtedly have a global impact and is the subject for further discussion later in this paper.

Submarines possessed these initial three capabilities from early in the twentieth century until the period just after the end of World War Two. The next three capabilities came about after the end of World War Two as a result of yet further technological development. Advances in weaponry provided the ability to project ashore, adding a new and fourth capability to the submarine platform. These weapons have evolved considerably and revolve around the land-attack missile. The submarine with its inherent stealth attributes provide an excellent vehicle to launch a cruise missile attack.[14] Unlike aircraft that are more susceptible to detection, the submarine can launch attacks submerged giving no prior indication of launch. Many recent events such as the Gulf War and operations in Afghanistan have highlighted the significance of this capability.[15]

The fifth capability came to fruition as a result of the increase in speed. Early submarines had a significant problem with speed and this precluded effective engagement with or against a fleet. However, the evolution of the submarine with the advent of nuclear propulsion addressed this problem with submarines able to achieve speeds comparable to that of their surface opponents enabling fleet engagement thus establishing this capability.[16] Conventionally powered submarines were viewed as less effective against manoeuvring fleets in open ocean due

---

[13] *Ibid*., 111.

[14] *Ibid*., 125.

[15] Till, *Modern Seapower,* 263.

[16] Lautenschlager, *The Submarine in Naval Warfare, 1901-2001*, 128.

to their inability to maintain high speeds for a sustained duration of time leading to pre-positioning as the method used for fleet engagement. Notwithstanding the advances in speed, improvements in tactics and countermeasures against the submarine also improved that once again put an equal emphasis on stealth in addition to speed.

Finally, Lautenschlager identifies assured destruction as the last capability that a submarine provides. This capability arose with the advent of the submarine-launched ballistic missile and their deployment on nuclear powered submarines that provided nations a powerful contribution to their nuclear deterrence strategy. The stealth aspect of the submarine provided a greater aspect of security for these strategic weapons thus leading to a lower risk of nuclear war.[17] Submarines were invaluable to the nuclear deterrence problem and are an integral to nuclear strategies.

Sea Control and Sea Denial

The capabilities as outlined above give a general idea of what a submarine, regardless of type, can offer to a nation and respective navy. This base knowledge of submarines can be complemented with two further concepts: Sea Control and Sea Denial. Naval forces when developing strategies where submarines and their resident capabilities are viewed as significant contributors extensively employ these concepts.

Geoffrey Till in his book *Modern Sea Power: An Introduction,*[18] defines Sea Control as "in a position where one can use the sea for one's own purposes, and at the same time prevent an

---

[17] *Ibid*., 130.

[18] Till, *Modern Seapower*, 179

enemy from using it for his."[19] What he is stating is that for any navy that has sea control they are free to use that area of the ocean exclusively for themselves while concurrently preventing the enemy or enemies from using that same area. The task of achieving sea control is quite extensive and would prove to be quite difficult. It would require a vast amount of maritime resources in all respects, surface, sub-surface and air, to effectively establish sea control. Submarines would be vital to the execution of this task, as their inherent capabilities would allow them to aid in contributing the control of the surface and sub-surface realm.

The problem of sea control is the effort required to not only use the area exclusively for oneself but also deny it to others. This resource problem has led to the concept of Sea Denial, which Till describes, as "the objective is not to use the sea oneself, but to prevent the enemy from doing so."[20] This task is half that of the sea control problem. All that is required is to deny the enemy the use of that area of water. Till notes that cheaper weapon systems such as mines or the threat of a few submarines may be all that is required to achieve effective denial and further states "denying the sea has become relatively easier than keeping or holding it, a factor which may narrow the gap between small sea-denial navies and large control ones."[21] This is crucial to remember later on when looking at the Iranian situation and the countries of Southeast Asia, as they are all considered smaller navies. Sea denial can become critical to a smaller navy's strategy and once again underscores the contributions that submarines offer.

---

[19] *Ibid*., 57.

[20] *Ibid*., 57.

[21] *Ibid*., 58.

Types of Submarines

Jane's Underwater Warfare Systems classifies submarines into 4 distinct groups. These groups are the strategic submarine (SSBN), the nuclear-powered attack submarine (SSN), the non-nuclear or diesel powered submarine (SSK) and the midget submarine.[22] Each type of submarine brings a cache of capabilities to fulfill specific roles that they were designed to achieve.

The SSBN, as a strategic asset, is designed to carry long and medium-range nuclear missiles.[23] These submarines are extremely large in both size and cost and as with the SSN, only a few nations have the capacity to develop, maintain and afford such complex vessels. The SSN has the potential to fulfill a myriad of roles but is mainly known for its hunter-killer capability. It can launch anti-ship or land-attack missiles and also fire conventional torpedoes. Due to the virtual unlimited capacity of fuel and ability to travel at high speed, it is ideally suited to counter other submarine forces and operate within the task group construct. As stated, an extremely capable platform of course comes with a high cost and for this reason only a few select countries have been able to develop and maintain a nuclear SSN capability.[24]

The next type of submarine and of most concern to this paper is the SSK. *Jane's* defines the SSK as a non-nuclear submarine or more commonly referred to as a conventionally diesel-powered submarine. "Because of its smaller size and greater stealth, the SSK is much more suited to very shallow operations than the SSN."[25] SSKs are designed to perform a wide range

---

[22] Anthony J. Watts, ed., *Janes's: Underwater Warfare Systems*, 15th 2003-2004 ed. (Surrey, England: Jane's Information Group Limited, 2003)., 3.

[23] *Ibid*., 3.

[24] *Ibid*., 3.

[25] *Ibid*., 3.

of tasks that include countering hostile surface forces, conducting economic warfare, executing clandestine operations, carry out minelaying missions and surveillance tasks.[26] This list, however, is not exhaustive, with the range of SSK missions and tasks only limited by the constraints of conceptual thought.

Lastly, the final group that *Jane's* categorizes is that of the midget submarine. These submarines are highly specialized and specific to the tasks they are designed to accomplish. Consequently, midget submarines perform tasks that revolve around clandestine operations where stealth is of the utmost importance resulting in minimal equipment on a very small platform.[27]

> *"If you know the enemy and know yourself, you need not fear the result of a hundred battles. If you know yourself but not the enemy, for every victory gained you will also suffer a defeat." - Sun Tzu*

The Diesel Submarine (SSK)

"Threat, threat, threat. It is all about knowing your threat." The Canadian Forces Naval Operations School Tactics Team Trainers repeatedly speak these words during the preparation and evaluation periods of Canadian ship's combat teams and use the wisdom of Sun Tzu that directs modern war fighters to critically analyze their enemies' capabilities.[28] Keeping this methodology in mind, numerous aspects of the modern diesel submarine will be explored providing further insight into the potential of this vessel.

---

[26] *Ibid*., 3.

[27] *Ibid*., 3.

[28] Canadian Forces Naval Operations School Tactics Team Training division are mandated with teaching and validating tactics at both the individual and team level. Canadian ship combat teams are required to conduct team training at regular intervals to ensure tactical currency and proficiency. Aspects of validation include Anti-submarine warfare tactics.

Noting the capabilities that submarines can perform, SSKs can arguably be employed in coast defence, naval attrition, commerce warfare, projection ashore and to some extent fleet engagement. Perhaps the greatest attribute that SSKs offer when looking at the range of capabilities, is their ability to work inshore. As previously stated by *Jane's,* SSKs are more ideally suited to operate inshore as a result of their increased stealth and smaller size. Captain J.E. Moore and Commander R. Compton-Hall in their book, *Submarine Warfare: Today and Tomorrow*, add that SSKs prefer to operate inshore since they at some point have to expose themselves to re-charge their batteries and this environment provides better protection from detection.[29] Nevertheless, this is a preference and does not preclude operations in the open-ocean, although it must be noted that the likelihood of being detected will increase as the masking properties such as small land features will not exist. Understanding this is important, as it is a driving factor in the design elements of the SSK that will now be covered.

Design of the SSK

When looking at the overall requirements of the SSK, it is important to remember that the smaller the submarine, the better. Less is more when it comes to submarines, namely in that the smaller platform will present the smallest target. Also with any vehicle, the larger it is the more cumbersome it is to manoeuvre.[30] However, there is a compromise that has to occur in size, as the SSK must house sensors, propulsion, crew, weapons and fuel. Nations must adequately define the capabilities that they want their respective SSKs to perform, as this will dictate the design of the SSK that would be most suited for their purposes. Noting the requirements criteria,

---

[29] Captain J. E. Moore and Commander R. Compton-Hall, *Submarine Warfare: Today and Tomorrow* (London, England: Michael Joseph Ltd, 1986), 30.

[30] Watts, *Janes's: Underwater Warfare Systems*, 21.

the areas of the SSK that will be explored are hull design, propulsion, weapons and sensors and communications.

Hull Design

Submarines by virtue of the medium in which they operate must be able to withstand substantial amounts of pressure and the early concept of two hulls is still valid in the construction of modern SSKs. The pressure hull or inner hull is normally constructed in the shape of a sphere with minimal hull penetrations as possible and is welded together in sections made of "high grade, high tensile steel."[31] The entire process of assembly is performed under rigorous quality assurance with the strictest of documentation requirements.[32] Three essential factors are required for the construction of the inner hull and pertain to the operators of the submarine. These are the crush depth, safe depth and working depth. Crush depth or collapse depth is exactly what the term infers. It is the depth at which the pressure is such that the inner hull and submarine as a whole will implode.[33] Safe depth is a factor of crush depth and is a depth that the submarine may safely approach, however, each time the submarine submerges to this depth, the hull prematurely ages due to the excess pressure.[34] Working depth is the depth at which the submarine is capable to submerging without causing premature aging to the hull.[35]

---

[31] J. B. Hervey, *Submarines* (London, England: Brassey's Ltd, 1994), 16.

[32] *Ibid*., 17.

[33] *Ibid*., 19.

[34] *Ibid*., 19.

[35] *Ibid*., 19.

Inner hulls can be single in construction, or there can be multiple inner hulls. Multiple, smaller inner hulls provide greater strength and allow for operations at increased depths.[36] Prominent in recent designs are the location of the Main Ballast Tanks (MBT) outside of the inner hull and encapsulated within the free-flooding outer hull. The MBTs are what permit a submarine to surface, dive and maintain neutral buoyancy. When flooded, the submarine can dive and to surface pressurized air is blown through the tanks to expel water that allows this condition to occur.[37] The space between the hulls can also be used to house many different things from weapons to various sensors.

The outer hull of modern SSKs can range in size and shape but for the most part are designed for high underwater speed and stealth with the term "Tear-drop" used commonly to describe SSK hull shape. A primary consideration when designing the shape of the outer hull is to reduce drag. Just like aircraft are designed to be aerodynamic, submarine hull shape is designed to be hydrodynamic. Submarines that are made to operate beneath the surface of the ocean resultantly need to have a design that allows them to travel at high underwater speeds while conserving power and making the least noise possible.[38] Another critical aspect of the overall design and part of the outer hull is the fin or sail, which must also be hydrodynamic and capable of housing the various masts for sensors and snorkel. Proper shape and placement of the fin are crucial for the success of the overall SSK hull design.

---

[36] *Ibid*., 23.

[37] *Ibid*., 24.

[38] *Ibid*., 26.

Propulsion

In the most simplistic explanation, the SSK uses diesel-electric propulsion meaning when surfaced diesel machinery generates power for propulsion or to generators that charge the batteries. When submerged, the SSK uses the stored energy within the batteries to provide both propulsion and run the auxiliary equipment.[39] This mode of propulsion offers both advantages and disadvantages. When submerged and running on batteries, the SSK is extremely quiet making it very hard to detect not only by surface forces but also by other submarines.[40] Also, this mode of propulsion enables the SSK to be smaller in size making it more suitable for shallow water compared to a nuclear submarine.

However, at some point the batteries must be recharged and for this to occur the SSK will be exposed through the snorting process. It is at this period where the SSK is most vulnerable to detection from other forces. *Jane's* states that although unfortunate for the SSK, methods of detecting SSKs on the surface through noise, fumes or the snorkel head are improving and for these reasons, the period of re-charging the batteries is the "most critical operational situation for submarines on patrol."[41] Further, unlike nuclear-powered submarines, SSKs possess a finite quantity of fuel and are limited in their range and endurance in addition to speed. SSKs have increased their capability to travel at higher speeds but doing this submerged quickly depletes stored battery capacity.

The diesel-electric propulsion systems of modern SSKs use high capacity batteries that can be significantly charged in a relatively short period of time (15-20 minutes). Engines now

---

[39] Moore and Compton-Hall, *Submarine Warfare: Today and Tomorrow*, 30.

[40] Till, *Modern Seapower*, 67.

[41] Watts, *Janes's: Underwater Warfare Systems*, 65.

operate at higher speeds and frequencies reducing the range noise propagates through the water adding to the stealth attribute of this platform. Propeller arrangements are no longer direct drive with the batteries providing power adding better noise insulation for the diesel engines and providing for more hydrodynamic propeller placements.[42] Fuel capacity and range has increased significantly and differs between platform types with the endurance of many SSKs easily enabling trans-oceanic passage and potential global reach.[43]

One of the most significant advances of SSK design relating to propulsion was the introduction of the snorting capability towards the end World War Two. Prior to snorting capability, the SSK would have to completely surface to charge batteries making it extremely visible and vulnerable especially to aircraft. Snorting allows SSKs to provide air to the submarine for both crew and engines through the use of a pipe while another pipe is used to bring combustion gases to the surface. The snorting system in modern SSKs are periscopic, meaning they can be raised and lowered and are housed within the submarine mast. As mentioned, snorting is the period where the SSK is most vulnerable to detection and diligent crews practice this procedure to minimize that vulnerability.[44]

The last component of propulsion to discuss is the propeller. Submarines have incorporated both single and dual propeller designs. Modern SSKs however, have been more apt to use a single propeller design as a direct result of increased speed. The challenge with higher speeds is moving the hull through water while making as little radiated noise as possible with no

---

[42] Hervey, *Submarines*, 53.

[43] Commodore Stephen Saunders, ed., *Jane's: Fighting Ships*, 110th 2007-2008 ed. (Surrey, England: Jane's Information Group Limited, 2007). Jane's lists the range of platforms in Fighting Ships. For example, the Canadian Victoria class SSK has a published range of 8000 nautical miles at 8 knots. This does not factor in a combined snort/submerged passage that could increase over range.

[44] Hervey, *Submarines*, 56.

cavitation.[45] The single propeller design is superior in setting these conditions vice the dual propeller design although there is a disadvantage since propeller redundancy is sacrificed.

Weapons

Weaponry enables the SSK to produce kinetic effects against targets through a range of ordinance options. Torpedoes, submarine launched surface-to-surface missiles (SLSSM), submarine launched cruise missiles (SLCM) and mines are the conventional weaponry SSKs could employ. Unmanned underwater vehicles (UUV) are viewed as an emerging capability that could be considered an extension of SSK weaponry. National doctrine and tactics, mission and platform limitations determine what the weapon payload is for a deploying SSK.

Torpedoes are extremely potent and powerful. Examples of their potency are readily available to view with a simple Internet search.[46] Modern torpedoes deployed on SSKs now have the capability to travel at high speeds (60 knots)[47] with extended ranges (30 nautical miles)[48] thereby broadening the types of targets that may be engaged.[49] Torpedo counter-measures are still lacking throughout most of the navies and this adds to the viability of this weapon. Further, torpedoes can be used as both an anti-surface and anti-submarine weapon with no change to the configuration.[50] Where space is limited on the SSK, this provides two

---

[45] *Ibid*., 58.

[46] Using the website "Youtube" and entering "Torpedo hits" for the search criteria results in numerous links to torpedo firings. One such video is at http://www.youtube.com/watch?v=BSBNG7IFyKU.

[47] Knot (kt) is the nautical references for speed. 1 knot = 1.852kph.

[48] Nautical Mile (NM) is the common measure of distance for navigation. 1 NM=1852 metres

[49] Massimo Annati, "Arming Submarines: Torpedoes and/or Missiles ?" *Military Technology* 31, no. 4 (Apr, 2007), 108; http://proquest.umi.com/; Internet; accessed 17 January 2008, 2.

[50] *Ibid*. ,1.

capabilities without having to sacrifice one or the other to find out the wrong choice was made far away from a replenishment area. Speed and cost, on the other hand are two disadvantages of the torpedo. They are costly to purchase and maintain with only limited suppliers available. Further, in comparison to missiles that travel at speeds close to the speed of sound (approx 600kts), the overall time it takes to consummate a target engagement is slow. However, notwithstanding these disadvantages, it cannot be argued that the effect this single weapon can have is unparalleled by any of the other weapons an SSK can employ.

Submarine launched surface-to-surface missiles are another option of weaponry that an SSK may choose to employ. Like the torpedo a limited variety of these missiles exist from a few suppliers.[51] These missiles have the ability to strike a surface target close to ranges of 70NM and with most variants travelling at speeds close to that of sound (approx 600kts).[52] The greater speed allows for a shortened detect-to-engage sequence complicating the targets defences to defeat the incoming missile and in this respect provides an advantage over the torpedo. However, there are numerous disadvantages to the SLSSM that are causing navies to question their overall viability. First, the SLSSM when launched gives away the submarines position compromising the single most important strength it has - stealth.[53] Further, unlike the torpedo, modern warships have multiple weapon systems capable of defeating the anti-ship missile threat[54] and as the name infers, the SLSSM is only designed to engage a surface target.

---

[51] *Ibid*., 3.

[52] Jane's Naval Weapons Systems, "Exocet SM-39", "UGM-84 Harpoon", "SS-N-21 Sampson/SS-N-27 Sizzler," http://www4.janes.com/subscribe/jnws/; Internet; accessed 1 March 2008. Speeds defined are Mach 0.9 for Exocet, Mach 0.85 for Harpoon and Mach 0.8 for Sampson/Sizzler. Mach or the speed of sound is 661.5 kts at sea level.

[53] Annati, *Arming Submarines: Torpedoes and/or Missiles ?*, 4.

[54] Jane's Fighting Ships, "Halifax Class (FFGHM)," http://www4.janes.com/subscribe/jfs/; Internet, accessed 1 March 2008. Using the Canadian Halifax class frigate as an example the following systems are directly related to defeating the SSM threat: RIM-162 Evolved Sea Sparrow SAM, Bofors 57mm AA gun, 20mm Vulcan Phalanx,

The mission of the SSK would determine the employment of submarine launched cruise missiles. This weapon would provide an SSK the capability to strike land targets and project force ashore. SLCMs range from modifications to certain SLSSMs through to purpose built missiles such as the American UGM-109 B/C Tomahawk.[55] The stealth aspect of the SSK places this platform as an ideal choice for delivery of this weapon against targets in pre-emptive and selective strikes.[56]

Mines are the last traditional weapon SSKs have the ability to use. Viewed as a relatively cheap weapon that is very effective, mines are produced globally in many variants and are readily available. They can deployed from the torpedo tubes of an SSK or mounted externally to the hull, however, the latter method will obviously affect hydrodynamics and noise.[57] Once again, the mission to be fulfilled would determine whether or not the SSK would deploy with mines. An extension of mining and new capability that is being developed by many nations is that of UUVs. UUVs may be used to forward deploy mines into areas that SSKs are unable to navigate and in a reverse role UUVs could be used for mine detection and destruction.[58]

Sensors and Communications

Sensors and communications are essential to any military platform regardless of element or environment of operations and provides situational awareness for operators and the necessary

---

Plessey Shield Decoys (chaff/IR), RAMSES Jammer, two Signaal SPG-503 Fire Control radars, Raytheon SPS-49 Air Search Radar, Ericsson Sea Giraffe HC 150 Air/Surface Search Radar.

[55] Jane's Naval Weapons Systems, "Tomahawk/Affordable Weapon System UGM-109 B/C," http://www4.janes.com/subscribe/jnws/; Internet; accessed 1 March 2008.

[56] Annati, *Arming Submarines: Torpedoes and/or Missiles ?*, 5.

[57] *Ibid*., 5.

[58] *Ibid*., 5.

link for command and control. In all these respects, the SSK is no different than any other platform in that it requires situation awareness and the ability to communicate. With the exception of sonar, passive arrays and VLF towed buoys, sensor and communication equipment are located on various periscopic masts.

SSKs are normally constructed with both a search and attack periscope that provide the visual capability. The radar is located on a separate mast and is used to locate surface contacts with the electronic support measures (ESM) on another mast, used to intercept and direction find (DF) other vessel radar emissions. Usually co-located with ESM on this mast is a high-frequency (HF) communication intercept capability that also provides DF. SSK designs vary but most have in some respect the above mentioned sensors providing a visual, radar and emission intercept capability that are all used on the surface.[59]

Sensors used while submerged are basically limited to that of sonar, which can be further sub-categorized as either active or passive systems. Active systems produce sound waves that travel through water and when they come into contact echo back to a transducer with a range and bearing.[60] However, when an SSK uses active sonar, other vessels will be alerted to its presence and this may contribute to compromising its position. Passive systems entail using a series a hydrophones arranged in arrays to receive the one way transmission of radiated noise from other vessels.[61] All vessels emit noise and the challenge in using passive systems is in determining the source of noise, classifying and then tracking contacts. Many different types of arrays and configurations are currently present on SSKs including bow, flank and towed arrays. Effective

---

[59] Hervey, *Submarines*, 289, 66-68.

[60] *Ibid*., 92.

[61] *Ibid*., 92.

use of these systems requires extensive training with a comprehensive knowledge of sound propagation to exploit the water column to the operator's advantage.

Communications provide the SSK the ability to communicate with other forces or command elements ashore. Most of the communication methods are located on a communications mast and cannot be used submerged. These include HF, UHF and VHF systems that can all be used for either voice or data.[62] Technology has led many navies to develop net-centric warfare communication strategies and for the most part, submarines as a whole are lacking in this realm. Rectification of this communication gap has been identified as an area of emphasis for technological advancement in the SHF/EHF spectrum.[63]

SSKs also possess the ability to receive one-way communications while submerged through the use of the Very Low Frequency (VLF) spectrum. VLF transmission has the ability to penetrate the water column down to depths of approx 20 metres. SSKs while submerged at greater depths can deploy either a VLF buoy or wire.[64] These enable the submarine to receive messages without having to expose themselves thus compromising stealth.

This chapter has discussed the capabilities that submarines provide to possessing nations, looked at the different types of submarines and analyzed the SSK in detail. Now that the characteristics and capabilities of the SSK threat are defined and understood, how does one obtain an SSK and who has them?

---

[62] *Ibid*., 174.

[63] Watts, *Janes's: Underwater Warfare Systems*, 23.

[64] *Ibid*., 166.

Chapter Two - Arms Control and SSK World Status

General

Diesel submarines are a weapon for sale to anyone who can afford one. If a nation does not have the indigenous industrial capability to build a diesel submarine, a market exists for both used and new SSKs. Surprisingly, it makes no difference as to the ideology of a state, the status of their political situation or a track record of international disturbances; any nation can purchase an SSK simply because there are no controls or regulations to prevent such a transaction. The lack of control has led to a varied and wide distribution of SSKs worldwide and in cases such as Iran and East Asia, their proliferation to that region has led to a state of instability. This chapter will focus on the current situation regarding international regulation and how the absence of control enabled major proliferators to export SSKs to virtually any country including Iran and those of East Asia.

The military business is one of extreme wealth and importance in the context of the global community. In 2006 alone, military expenditures accounted for 1.158 trillion US dollars[65] with the top fifteen countries accounting for 83 percent of that figure.[66] Arms deliveries or actual sales with items transferred accounted for only a portion but still significant share of this overall number at 27 billion US dollars.[67] From the period 1999-2006, 265.5 billion US dollars of arms deliveries occurred globally[68] with almost two thirds of that total (64 percent)

---

[65] Stockholm International Peace Research Institute, "World and Regional Military Expenditure Estimates 1988-2006," http://www.sipri.org/contents/milap/milex/mex_wnr_table.html; Internet; accessed 18 March 2008).

[66] Stockholm International Peace Research Institute , "The 15 Major Spender Countries in 2006," http://www.sipri.org/contents/milap/milex/mex_major_spenders.pdf; Internet; accessed 18 March 2008. Canada was ranked 13 by SIPRI.

[67] Richard F. Grimmett, "CRS Report for Congress. Conventional Arms Transfers to Developing Nations, 1999-2006," http://assets.opencrs.com/rpts/RL34187_20070926.pdf; Internet; accessed 18 March 2008, 78.

[68] *Ibid*., 79.

going to developing nations.[69] The top five suppliers (exporters) during this same period were the United States, Russia, France, United Kingdom and Germany respectively accounting for 75 percent of all arms deliveries.[70] Embedded within the historical data of arms deliveries are the transfers of conventionally powered diesel submarines that during specific years of transfer account for a substantial percentage of the gross yearly value.

Arms Control

These staggering numbers regarding arms sales would lead someone to think a control mechanism is in place to regulate the vast transfers of military hardware that most certainly occurs. William Keller and Janne Nolan in their 1997 article *The Arms Trade: Business as Usual*[71] suggest otherwise. That reality over ten years ago was "there is no clear policy toward global arms exports and the transfer of military technology, any rhetoric to the contrary notwithstanding."[72] Eleven years later the world is essentially in the same place regarding enforceable international regulation; none. The United Nations though, are making strides to move in the right direction by adopting a Resolution in 2006 towards an Arms Trade Treaty that "represented a first step towards establishing international standards in the trade on conventional arms."[73] Nevertheless, the forty-four current treaties and agreements listed in the Report for

---

[69] *Ibid*., 58.

[70] *Ibid*., 80. During period 1999-2006 United States accounted for 39 % of overall sales, Russia 17 %, France 8 %, United Kingdom 6 % and Germany 5%.

[71] William W. Keller and Janne E. Nolan, "The Arms Trade: Business as Usual?" *Foreign Policy*, no. 109 (Winter, 1997): 113-125; http://links.jstor.org/; Internet; accessed 17 March 2008.

[72] *Ibid*., 113.

[73] United Nations General Assembly, *United Nations General Assembly Resolution A/Res/61/89*, http://www.un.org/News/Press/docs/2006/ga10547.doc.htm; Internet; accessed 18 March 2008. The draft was approved by a vote of 153 in favour to 1 against (United States), with 24 abstentions.

Congress titled *Arms Control and Nonproliferation: A Catalog of Treaties and Agreements*[74] do nothing to prevent the proliferation of conventionally powered diesel submarines permitting 'pariah states' such as Iran or developing countries (Indonesia, Malaysia, Singapore, Thailand) to obtain these powerful weapons.

There is however, one international document in existence that could be related to the nonproliferation of SSKs; the Wassenaar Arrangement. In July 1996, the Wassenaar Arrangement was "established in order to contribute to regional and international security and stability, by promoting transparency and greater responsibility in transfers of conventional arms and dual-use goods and technologies, thus preventing destabilising accumulations."[75] Dual-use goods are those products, practices or technologies that are primarily used for civilian use but may also be used to increase military capability.[76] The Arrangement further states that "Participating States seek, through their national policies, to ensure that transfers of these items do not contribute to the development or enhancement of military capabilities which undermine these goals, and are not diverted to support such capabilities."[77]

The Wassenaar Arrangement appears to be a well intentioned international effort to control and confront the issue of conventional weapons proliferation with forty signatories.

---

[74] Amy F. Woolf, Steve Bowman and Sharon Squassoni, *CRS Report for Congress. Arms Control and Nonproliferation: A Catalog of Treaties and Agreements,* http://www.fas.org/sgp/crs/nuke/RL33865.pdf; Internet; accessed 12 March 2008, 51-55.

[75] "Wassenaar Arrangement," http://www.wassenaar.org/index.html; Internet; accessed 12 March 2008.

[76] Woolf, Bowman and Squassoni, *CRS Report for Congress. Arms Control and Nonproliferation: A Catalog of Treaties and Agreements*, 41.

[77] *Wassenaar Arrangement*. Participating states are: Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Poland, Portugal, Republic of Korea, Romania, Russian Federation, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, United States.

However, it has a significant weakness; as the arrangement states, "the decision to transfer or deny transfer of any item is the sole responsibility of each Participating State. All measures with respect to the Arrangement are taken in accordance with national legislation and policies and are implemented on the basis of national discretion."[78] Essentially it is up to each signatory whether to export or not. There is no enforcement body or process to be followed if states feel that a participating state is in contravention to the Arrangement. Further, if one participating states denies transfer of dual-use goods to a non-member state, nothing within the Arrangement prevents another participating state from conducting the same transfer.[79] The Report for Congress also states, "current participants are expected to have national policies banning arms and related exports to Iran, Iraq, and North Korea."[80] The language itself in this statement could be perceived as weak as it uses the word 'expected' vice 'demands' or 'shall'. Also, if this Arrangement came into effect twenty years ago, Iraq would not be on that list demonstrating that your ally today will not necessarily be your ally tomorrow. These cumulative points suggest that the Wassenaar Arrangement is noble in its cause but its efficacy is questionable.

The lack of an international treaty or agreement on the nonproliferation of SSKs and the highlighted weaknesses of the Wassanaar Arrangement points to one thing; if you have the money you can buy a conventional diesel submarine. Countries such as Iran and those of Far East Asia have the monetary clout to purchase SSKs and consequently they have been successful in their endeavours. Twenty-seven submarines were sold to developing nations during the 1999-

---

[78] *Ibid*.

[79] Woolf, Bowman and Squassoni, *CRS Report for Congress. Arms Control and Nonproliferation: A Catalog of Treaties and Agreements*, 43.

[80] *Ibid*., 42.

2006 period[81] illustrating how just one of the major weapon systems in the arms industry has been effectively sold with no control. Now that it is understood there is no effective control on the proliferation of the SSK, status regarding overall numbers, models, concentrations and production capability will be reviewed.

SSK World Status

Looking holistically at the world status of submarines, currently 43 nations possess or are in the process of attaining this weapon. China, France, United Kingdom, United States and Russia are the five states that currently operate nuclear submarines totaling 142 SSBNs and SSNs. India is pursuing an SSN capability with a planned delivery of the first vessel in 2012. Of most interest is the statistic that 37 countries are operating SSKs with 285 in active service, a number doubling that of the nuclear variety.[82] Table 2.1 below outlines the countries operating SSKs, the class and numbers they possess.

Country	Class	Total in Operation
Algeria	Kilo 877E	2
Argentina	TR 1700 Type 209/1200	2 1
Australia	Collins	6
Brazil	Type 209/1400 Tikuna	4 1
Bulgaria	Romeo	1
Canada	Victoria Type 2400	4
Chile	Type 209/1300 Scorpene	2 2
China	Yuan	1

[81] Grimmett, *CRS Report for Congress. Conventional Arms Transfers to Developing Nations, 1999-2006*, 72-76.

[82] Jane's Information Group, "Jane's Underwater Warfare Systems - the Submarine," http://www4.janes.com/subscribe/juws/; Internet; accessed 11 February 2008. Jane's Information Group, "Jane's Fighting Ships," http://jfs.janes.com/public/jfs/index.shtml; Internet; accessed 13 March 2008. JUWS and JFS were primary references used to illustrate the world status of submarines. Figures presented do not include midget or auxiliary submarines.

	Song Kilo 877 EKM Ming Modified Romeo Romeo	13 12 19 1 7
Columbia	Type 209/1200	2
Ecuador	Type 209/1300	2
Egypt	Romeo	4
Germany	Type 212A Type 206A	4 8
Greece	Type 209/1100/1200 Type 214	8 1
India	Kilo 877 EM/636 Type 209/1500	10 4
Indonesia	Type 209/1300	2
Iran	Kilo 877 EKM	3
Israel	Dolphin Type 800	3
Italy	Improve Sauro Sauro Type 212A	4 1 2
Japan	Oyashio Harushio Yuushio	10 7 1
North Korea	Romeo Sang-O	23 32
South Korea	Type 209/1200 KSS-2	9 1
Libya	Foxtrot	2
Netherlands	Walrus	4
Norway	Ula (Type 210)	6
Pakistan	Agosta Agosta 90B	2 2
Peru	Type 209/1200	6
Poland	Sokol Kilo	4 1
Portugal	Albacora	1
Russian Federation	Kilo Lada	19 1
Singapore	Challenger	4
South Africa	Manthatisi (Type 209/1400)	2
Spain	Galernia	4
Sweden	Gotland Sodermanland	3 2
Taiwan	Hai Lung Guppy II	2 2

Turkey	Preveze Type 209/1400 Atilay Type 209/1200	8 6
Ukraine	Foxtrot	1
Venezuela	Sabalo Type 209/1300	2
Totals: 37		**285**

Table 2.1[83]

This table underlines a couple of striking facts. First and most apparent is that the German Type 209 SSK has been exported to thirteen countries and is by far the most popular choice with the Russian designed Kilo SSK coming second being used by six countries. Of all 285 SSKs currently operational, Type 209 accounts for 60 of these or 21 percent and the Kilo numbers at 47 operational or 16 percent. These two models of SSKs produced or licensed by Germany and Russia alone account for 37 percent of all operational SSKs and are exported to 19 states, exactly 50 percent of all nations operating SSKs. Additionally, looking at other models, Germany has also exported the Dolphin Type 800, TR 1700, Type 207, Type 210, Type 212A and Type 214 that increase the totals to 76 SSKs or 27 percent while raising the country count to seventeen. Applying this to Russia, Foxtrot, Romeo and Modified Romeo SSKs have all been exported increasing Russia's numbers to 86 or 30 percent of all operational SSKs used by 11 states.

From this table regional concentrations of SSKs can also be determined. Almost half of all operational SSKs totaling 134 belong to Far East states that border on the South China Sea and Pacific Ocean. This area possesses an extremely complex environment when looking solely at its geographical features and oceanographic considerations. European nations bordering on the Atlantic Ocean and North Sea have the second highest concentration of operational SSKs with 57. The third highest concentration of 43 operational SSKs is located amongst states

[83] *Jane's Underwater Warfare Systems - the Submarine*; *Jane's Fighting Ships*.

bordering on the Mediterranean Sea including Ukraine and Bulgaria who each have access to the Mediterranean through the Baltic Sea. South American states surprisingly have a substantial concentration with 24 SSKs followed closely by Middle Eastern states that border on the Arabian Gulf and Arabian Sea possessing 21 operational SSKs. North American states, namely that of Canada operate 4 with African concentration of 2 SSKs being provided by South Africa.

Builders

Out of all operational SSKs, there are 36 different models that were constructed by 28 major shipyards throughout the world.[84] Table 2.2 presents shipbuilding company, SSK model constructed at that facility and countries that operate SSKs from those companies.

Shipbuilding Company	SSK Class Constructed	Countries Operated/ Exported
Admiralty Yard, Russia	Kilo Lada	Algeria Iran China Russia
Sudomekh, Russia	Kilo Foxtrot	India Ukraine Poland Libya
Komsomolsk Shipyard, Russia	Kilo	Russia
Nizhny Novograd, Russia	Kilo	China Russia
Thyssen Nordseewerke, Germany	Dolphin Type 800 Sokol TR 1700 Type 206A Type 209 (1400) Type 210 Type 212A	Argentina Germany Norway South Africa Israel Poland
Howaldtswerke-Deutsche Werft, Germany	Dolphin Type 800 Type 206A Type 209 (1100/1200/1300/	Argentina Brazil Chile

[84] *Jane's Underwater Warfare Systems - the Submarine*.

	1400/1500) Type 212A	Ecuador Germany Greece India Indonesia Israel South Korea Peru South Africa Turkey Venezuela
Aresnal de Marinha, Brazil	Type 209 (1400) Tikuna	Brazil
BAE, United Kingdom	Victoria Type 2400	Canada
DCN Cherbourg, France	Scorpene Agosta 90B	Chile Malaysia Pakistan
Dubigeon Normandie Nantes, France	Agosta Albacore (Daphne)	Pakistan Portugal
Wuhan Shipyard, China	Yuan Song Ming Romeo	China
Jiangnan Shipyard, China	Song Romeo	China
Hellenic Shipyards, Greece	Type 214	Greece
Mazagon Dock Ltd, India	Type 209 (1500)	India
Fincartieri Monfalcon, Italy	Sauro Improved Sauro	Italy
Fincantieri Muggiano, Italy	Type 212A	Italy
Kawasaki Kobe, Japan	Oyashio Harushio	Japan
Mitsubishi Kobe, Japan	Oyashio Harushio Yuushio	Japan
Singpo, North Korea	Romeo Sang-O	North Korea
Daewoo, South Korea	Type 209 (1200)	South Korea
Hyundai, South Korea	KSS-2	South Korea
Rotterdamse Droogdok Mij, Netherlands	Walrus	Netherlands
Wilton Fijinoord, Netherlands	Hai Lung	Taiwain
Karlskronavarvet, Sweden	Challenger	Singapore
Kockums, Sweden	Gotland Sodermanland	Sweden Singapore
Bazan, Spain	Galernia	Spain

Golcuk Kocaeli, Turkey	Preveze Type 209 (1400)	Turkey
Golcuk Izmit, Turkey	Atilay Tpe 209 (1200)	Turkey

Table 2.2[85]

Table 2.2 again highlights that Russia and Germany were the largest exporters of current operational SSKs and also identifies the countries that these shipbuilders from Russia and Germany have exported to. Germany has exported to numerous developing countries with the greatest number of customers in South America. The list of countries that Russia has exported SSKs to are the ones that poses the most concern as the list includes Iran, North Korea and Libya. Iran and Libya are well known for past or present terrorist activities and all have had numerous encounters with Western powers, especially the United States. President George W. Bush in his 2002 State of the Union Address, referred to Iran and North Korea as members of the "Axis of Evil"[86] and Libya was on the U.S. State Department's state sponsors of terrorism list as recently as 2006.[87] Russia's recent bid to sell Venezuela 3-9 Amur 950 Class SSKs further adds to the case that Russia eagerly proliferates SSKs to controversial countries. What one can infer from this data is that regardless of the international status or reputation of a nation, if an SSK capability is desired there is most likely a seller and if that buyer is controversial or suspect then historically that seller has been Russia.

---

[85] *Ibid*.; *Jane's Fighting Ships*.

[86] George W. Bush, "29 January 2002 State of the Union Address," http://www.whitehouse.gov/news/releases/2002/01/20020129-11.html; Internet; accessed 20 March 2008.

[87] U.S. Department of State, "Country Reports on Terrorism," http://www.state.gov/t/us/rm/9962.htm; Internet; accessed 20 March 2008.

Future Construction

The last part to be examined regards planned construction. As mentioned there are 285 operational SSKs worldwide all at various stages of readiness. Submarine acquisition can be viewed in three categories: Modernization, Expansion and Establishment. Modernization is renewing existing capability that currently exists and keeping it standard within current technological capabilities. Expansion is either quantitative (more submarines) or qualitative (more capable submarines). For example Singapore acquiring several more Type 209s is a quantitative expansion, however, if they were to acquire Virginia class submarines from the U.S. that would be a qualitative expansion even if the absolute numbers were the same. Finally, Establishment creates a capability where none existed before. All of these distinctions have strategic significance in terms of regional balances and overall stability and will be examined when looking at Iran in Chapter 3 and East Asia in Chapter 4. Table 2.3 addresses SSKs that are currently under construction or will commence construction and will identify receiving navy, SSK class, country of build, Number ordered and expected delivery date(s).

Receiving Navy	Class	Build Country	Number Ordered	Delivery Date(s)
China	Type 041/Yuan	China	2-10	2006-2018
Germany	Type 212A	Germany	4	2005-2012
Greece	Type 214 AIP	Germany	4	2007-2010
India	Scorpene	India	6	2013-2025
Israel	Dolphin Batch 2	Germany	2-3	2012-2014
Italy	Type 212A	Italy	2	2016-2017
Japan	Improved Oyashio Oyashio	Japan Japan	3-4 11	2009-2001 1998-2008
South Korea	Type 214 AIP KSS-III	South Korea South Korea	9 3-4	2007-2009 2018-2021
Malaysia	Scorpene	Spain/France	2	2009-2010
Pakistan	Type 214 AIP	Pakistan	3-4	2013-2016
Portugal	SS PO 2000	Germany	2	2009-2010
Russian Federation	Lada Saratov Project 20120	Russia Russia	3-5 Unknown	2007-2012 Unknown

Saudi Arabia	Unknown	Unknown	2-3	2012-2016
South Africa	Type 209 (1400)	Germany	3	2006-2008
Spain	S-80	Spain	4	2013-2015
Sweden	Next Generation SSK	Sweden	2	2013-2015
Venezuela	Amur 950 SSK	Russia	3-9	2012-2015

Table 2.3[88]

Once again this table clearly illustrates the pervasiveness of German exportation. With the exception of Russia who is the lead contender for the Venezuelan SSK acquisition and Spain and France who are constructing SSKs for Malaysia, Germany is the only exporter. All other construction that is currently in progress or planned will be conducted by the indigenous shipbuilding companies of those countries. The table also alludes to replacement numbers for existing capability evident in numerous countries such as Israel and Sweden. What is of particular interest are Malaysia who will shortly being introducing the submarine capability to their navy and Saudi Arabia who intends on building an SSK capability.

Repeatedly Germany and Russia have been identified as the main exporters of SSKs. Russia has already provided Iran SSKs that have caused regional instability. Germany has exported to numerous countries with Venezuela being one of the notables. Germany SSK prevalence in many regions suggests that if there is a buyer, they are the seller. Although they may not openly sell to a highly controversial buyer like Russia does, their willingness to rapidly export may lead to an over-saturation of SSKs within an operating environment that in itself could lead to regional instability. For some countries exportation of SSKs has certainly been fruitful. In this quest for hard currency, Iran has been able to acquire three capable SSKs. Further, Southeast Asian countries in East Asia have been following a rapid trend to establish their maritime identity with the inclusion of SSKs into their navies. A preventative measure to

[88] *Jane's Underwater Warfare Systems - the Submarine*

address this problem would be to stand-up a regulating body whose mandate is to enforce an international treaty designed to oversee and implement measures on exportation thus avoiding SSKs from being proliferated to the wrong country. Unfortunately there is no such body or treaty in existence and for this reason we are faced with two situations: Iran and East Asia.

Chapter Three - Iran: The Rogue State

> "The annihilation of the Zionist regime will come... Israel must be wiped off the map... And God willing, with the force of God behind it, we shall soon experience a world without the United States and Zionism."[89] - Iranian President Mahmoud Ahmadinejad

General

This chapter looks at Iran as the rogue state example. Iran acquired an SSK capability in 1992 and it is this capability that will enable them to back-up their threats concerning closing the Strait of Hormuz. The chapter will examine the Iranian threat to the West, analyze geography and strategic importance of the Strait of Hormuz and argue that unlike their previous attempts to close the Strait of Hormuz, their SSKs are the tool that will now enable them to succeed in such an action.

In 1979, Iran became an Islamic republic establishing a theocratic system of government when the ruling monarchy was overthrown and sent into exile.[90] Later that same year, protesting students stormed the U.S. embassy in Tehran and held it and its staff hostage until 20 January 1981.[91] This would be the start of a tumultuous relationship between Iran and the West (primarily the U.S.) that would see military confrontations, UN sanctions and tragic incidents such as the destruction of Iranian air flight 655[92]. Relations have not improved and are in fact just as tenuous now as they were almost 30 years ago. President Ahmadinejad's statement is just

---

[89] Remarks by Iranian President Mahmoud Ahmadinejad during a meeting with protesting students at the Iranian Interior Ministry, October 25 2005.

[90] "The World Factbook - Iran," Central Intelligence Agency, https://www.cia.gov/library/publications/the-world-factbook/print/ir.html; Internet; accessed 26 March 2008.

[91] *Ibid*.

[92] "Investigation Report - Formal Investigation into the Circumstances Surrounding the Downing of Iran Air Flight 655 on 3 July 1988," http://homepage.ntlworld.com/jksonc/docs/ir655-dod-report.html; Internet; accessed 26 March 2008.

one example of the kind of rhetoric that is prevalent regarding Iran and their views towards Western society.

The Iranian Threat

The United States has taken Iranian threats seriously referring to Iran as a member of the "Axis of Evil"[93] and a strategic threat. The U.S. House of Representatives Permanent Select Committee on Intelligence is one of the many U.S. governmental and non-governmental agencies that have compiled reports and assessments on the Iranian threat. The staff report in 2006 focusing on Iran stated, "...advances in the Iranian nuclear weapons program, support for terror, and resistance to international negotiations on its nuclear program – demonstrate that Iran is a security threat to our nation."[94] These statements remain relevant and were supported as recently as February 27, 2008 by the Director of National Intelligence J. Michael McConnell who presented the Annual Threat Assessment of the Intelligence Community before the Senate Armed Services Committee.[95] In his testimonial he further expanded upon the Iranian threat stating that Iran continues to support violent groups, is advancing the capability to project military power and developing its foreign policy to inflate Tehran's influence throughout the region and Islamic world through regional, religious and anti-U.S. affiliations.[96]

---

[93] George W. Bush, "29 January 2002 State of the Union Address," http://www.whitehouse.gov/news/releases/2002/01/20020129-11.html; Internet; accessed 20 March 2008.

[94] House Permanent Select Committee on Intelligence, "*Recognizing Iran as a Strategic Threat: An Intelligence Challenge for the United States*," http://intelligence.house.gov/Media/PDFS/IranReport082206v2.pdf; Internet; accessed 27 March 2008, 4.

[95] J. Michael McConnell, "*Annual Threat Assessment of the Intelligence Community for the Senate Armed Services Committee,"* http://www.dni.gov/testimonies/20080227_testimony.pdf ; Internet; accessed 27 March 2008.

[96] *Ibid*., 21-22.

Geography

Unfortunately for the U.S. and the rest of the world, Iran's geography enables that nation to have a global strategic impact. Iran is situated within the Middle Eastern region and borders the Gulf of Oman, the Persian Gulf, and the Caspian Sea and is primarily located between Iraq to the West and Pakistan and Afghanistan to the East. Oil is synonymous with the Middle East and looking holistically at the region, countries including Bahrain, Iran, Iraq, Qatar, Saudi Arabia, and the United Arab Emirates produce almost 30 percent of the world's oil and holds an estimated 57 percent of the world's crude oil reserves.[97] Globally, 1.9 billion tons of oil products are shipped annually by maritime transport that accounts for 62 percent of all oil products with the remaining 32 percent transported through pipelines or other land methods (trains or trucks).[98] In the Persian Gulf context, maritime transport of crude oil is 16.5-17[99] million barrels per day which accounts for one fifth of the world's daily crude use of 84 million barrels per day.[100] This incredible amount of crude oil has to exit the Persian Gulf through the Strait of Hormuz, which as fate would have it has Iran located to the north of this crucial chokepoint.

---

[97] Anthony H. Cordesman, "*Iran, Oil, and the Strait of Hormuz,"* Center for Strategic and International Studies, http://www.csis.org/media/csis/pubs/070326_iranoil_hormuz.pdf; Internet; accessed 26 February 2008, 2.

[98] Bassam Fattouh, "The Myth of the Iranian Oil Weapon," Oxford Institute for Energy Studies, http://www.oxfordenergy.org/pdfs/comment_0807-2.pdf; Internet; accessed 20 February 2008, 3.

[99] Energy Information Administration, "World Oil Transit Chokepoints," Department of Energy, http://www.eia.doe.gov/cabs/World_Oil_Transit_Chokepoints/Hormuz.html; Internet; accessed 21 February 2008.

[100] Energy Information Administration, "*World Petroleum Consumption,"* Department of Energy, http://www.eia.doe.gov/emeu/international/RecentPetroleumConsumptionBarrelsperDay.xls; Internet; accessed 27 March 2008.

Strait of Hormuz

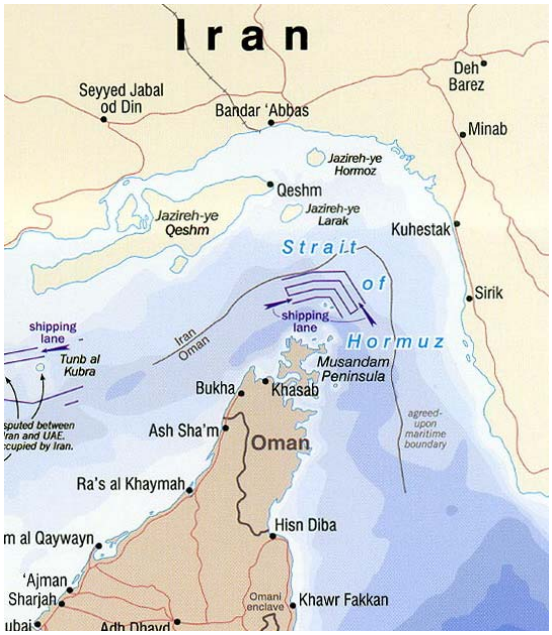
The Strait of Hormuz according to the U.S. Information Agency "is the world's most important oil chokepoint"[101] due to the vast amount of crude oil transiting daily. Most of this crude oil continues on for delivery to Asia, Western Europe and the U.S. with almost 75 percent of Japan's oil being supplied from Persian Gulf oil.[102] The Strait itself is a body of water that connects the Persian Gulf to the Gulf of Oman and separates Iran from Oman and is at its narrowest point 34 miles across. Maritime traffic passing through the strait use a traffic separation scheme with inbound and outbound traffic each following a lane 2 miles in width separated by a 2 mile buffer.[103] Figure 3.1 and 3.2 provides a geographic representation of the Strait of Hormuz. The strategic importance of this strait is something that is very hard to dispute and is evident in most if not all of the literature which addresses or makes reference to the Strait of Hormuz.

---

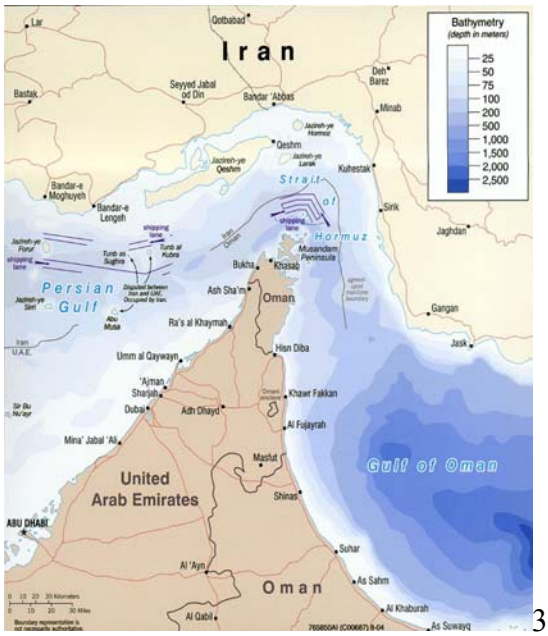
[101] Energy Information Administration, *World Oil Transit Chokepoints.*

[102] *Ibid*.

[103] "Factbox: The Strait of Hormuz, Iran and the Risk of Oil." Reuters, http://www.reuters.com/article/topN



3.1



3.2

Reuters, GlobalSecurity.org, Center for Strategic and International Studies, Institute for the Analysis of Global Security and the U.S. Department of Energy[104] are but a few of the agencies producing documents that all speak to the strategic significance of the Strait of Hormuz. Additionally, the importance is such that the Strait of Hormuz and its possible closure are used as a planning scenario by the U.S. Government Accountability Office's report to Congress in 2006 for determining the effectiveness of the U.S. Strategic Petroleum Reserve.[105] Finally, one last

---

[104] Energy Information Administration, "World Oil Transit Chokepoints," Department of Energy, http://www.eia.doe.gov/cabs/World_Oil_Transit_Chokepoints/Hormuz.html; Internet; accessed 21 February 2008; Anthony H. Cordesman, *Iran, Oil, and the Strait of Hormuz;* "Factbox: The Strait of Hormuz, Iran and the Risk of Oil." Reuters, http://www.reuters.com/article/topNews/idUSL0715889720080107?sp=true; Internet; accessed 25 March 2008; "OPLAN 1019 Arabian Gauntlet," GlobalSecurity.org, http://www.globalsecurity.org/military/ops/arabian-gauntlet.htm; Internet; accessed 25 February 2008; Gal Luft and Anne Korin, "Terror's Next Target," Institute for the Analysis of Global Security, http://www.iags.org/n0111041.html; Internet; accessed 25 February 2008.

[105] *Strategic Petroleum Reserve,* United States Government Accountability Office, http://www.gao.gov/new.items/d06872.pdf; Internet; accessed 26 March 2008, 5.

example to emphasize the strategic importance is contained within the stated U.S. Central Command mission to "assure regional access"[106] meaning keep the Strait of Hormuz open.

Iran, like the rest of the world, clearly understands the significance of the Strait of Hormuz. Historically, Iran has attempted to restrict the flow of traffic through the Strait during the 1983 "tanker war" where a significant number of attacks on shipping occurred but with limited impact resulting in no more than a 2 percent reduction to the amount of ships transiting the Strait.[107] However, that was the Iranian navy twenty-five years ago and a navy without diesel submarines. In fact, as will be discussed, Iran would not have to close-off the Straits of Hormuz for an indefinite period of time, rather they would only have to affect shipping for a limited period to have a significant impact on the macroecomony. It is Iran's submarine capability that enables their navy to now achieve this effect.

Stated Threats

President Ahmadinejad's statements towards the West are not necessarily the ramblings of one man. The sentiment towards the West and the U.S. is something that has permeated within other notable Iranian leaders and is evident in many of the statements made by top military leaders. The Iranian defence minister, Mustafa Najar, said on Al-Jazeera TV, "We say to America that if it ignites the fire of war, it will doubtless engulf the White House more than it burns others."[108] Admiral Sajjad Kouchaki, the chief of the Iranian navy stated in 2006, that U.S

---

[106] Myers, Cmdr John M., "Singular Vision: A Plan to Enable CENTCOM and State to Work Together," Armed Forces Journal, http://www.afji.com/2008/03/3190410; Internet; accessed 28 March 2008.

[107] Fattouh, *The Myth of the Iranian Oil Weapon*, 3.

[108] Steven Stalinsky, "The Iranian Military Targets American Forces," The New York Sun, http://www2.nysun.com/article/48978; Internet; accessed 28 March 2008.

presence in the Persian Gulf region "indicates the hostile nature of the U.S. policy" with Iran "completely ready to confront any possible threat."[109] He also said that "we are fully monitoring the route taken by the American" warships in the Gulf, "and because American warships are heavy, they have no manoeuverability and are easily sunk."[110] Clearly Iranian officials are taking the threat from the U.S. and the West seriously and have to look no further than Iraq to see what the consequences could be for not following the will of the U.S. and international community.

However, is this just talk or do the Iranians have the military power to back what they are saying? Iran has publicly stated that it has aspirations to become a nuclear power. This was reaffirmed when they roundly ignored United Nations Security Council Resolution 1696 that called for the suspension of Iran's uranium enrichment programme.[111] Tensions consequently rose while the international community pondered whether or not this would be the final trigger for the U.S. to take offensive action against Iran. The reaction by Iran in response to such a strike if it occurred was believed by many to be the closure of the Strait of Hormuz.[112] Three items will be analyzed as a fallout of this scenario that will further clarify the introductory remarks: first, Iran possesses the ability to effectively close-off the Strait of Hormuz; second, Iran's SSK capability is what enables them to achieve this; and last, to what effect would this closure have on the macroeconomy.

---

[109] "Sajjad Kouchaki," http://dkosopedia.com/wiki/Sajjad_Kouchaki; Internet; accessed 25 March 2008.

[110] Stalinsky, *The Iranian Military Targets American Forces.*

[111] Robin Hughes, "Iran's Ballistic Missile Developments - Long Range Ambitions," http://jdw.janes.com/subscribe/jdw/; Internet; accessed 28 January 2008.

[112] Tony Capaccio, "Iran might Try to Disrupt Hormuz Oil Flow if Attacked," Bloomberg.com, http://www.bloomberg.com/apps/news?pid=10000103&sid=a_Aw9B.MGCuY&refer=us; Internet; accessed 21 March 2008.

Past and Present

Iran possesses the dominant military in the region and their geography has led them to build a credible force.[113] Looking at the assets required for closure of the Strait, what differentiates their position now from that of the tanker war? Currently, they possess a large number of small attack craft[114] of all sizes including missile carrying variants, five major warships, numerous aircraft capable of carrying anti-ship missiles and a mobile launched anti-ship missile capability.[115] These capabilities were present in the effort to restrict traffic flow through the Strait of Hormuz during the tanker war but as stated were essentially unsuccessful to effectively achieve their goal. Further, another current complicating factor and major difference from the tanker war is the continuous U.S. military presence within the Persian Gulf and also the technological gap between the majority of U.S. and Iranian forces. Comparing capability during the tanker war to capability now, conventionally speaking, looking at this comparison, Iran would have more difficulty in closing the Strait.[116] To cap off this discussion, Iran's forces of surface ships and aircraft are known and seen entities. Utilizing the vast array of capabilities available, such as electronic sensor measures, signals intelligence and satellite imagery, targeting

---

[113] *Jane's Fighting Ships*. Currently the Iranian Navy's Order of Battle consists of 3 SSKs, 3 Frigates, 2 Corvettes, 92 Patrol Craft of various types, 12 Amphibious craft, 7 Hovercraft, 46 Auxiliary Craft of various types, 14 shipborne helicopters, 6 Sea Stallion, 3 P3 Orion. Iran has built the strength of their naval forces around regional craft. Saudi Arabia has the next largest force with 7 Frigates, 3 Corvettes, 65 Patrol Craft of various types, 7 Minesweepers, 23 Auxiliary Craft of various types. Saudi Arabia does not possess an SSK capability.

[114] *OPLAN 1019 Arabian Gauntlet*. On 06 January 2008 three US Navy vessels took evasive actions after five Iranian boats buzzed the ships transiting the Strait of Hormuz into the Persian Gulf. This was considered a serious incident by the Pentagon. The fast Iranian boats approached close at high speed that possibly could have displayed hostile intent.

[115] *Jane's Fighting Ships*.

[116] *Jane's Fighting Ships*. The major warships that Iran are operating were all constructed prior to 1970. They have gone through modernization programmes, however, the retrofitted equipment are from Soviet era construction. Compared to the technology advances that the U.S. military and allies have made, Iran is inferior when comparing technological capability.

and engagement of these forces would be easily achievable from an opposing, technologically superior force.

SSKs

So what is the difference? Notwithstanding all of the above, the acquisition of their SSKs has essentially tipped the scale in Iran's favour for success in closure of the Strait of Hormuz. Iran acquired their three Kilo class SSKs from the former Soviet Union signing the initial contract in 1988 with the first delivery in 1992 and final delivery occurring in 1997.[117] At the time, the sale was controversial with protests coming mainly from the U.S. that in the end had no effect in deterring the transfer of these weapons.[118] Kilo submarines are considered modern and capable SSKs and thus are very quiet when running on batteries. Jane's Intelligence Digest refers to Iran's submarines as hard to detect especially when operating in the littoral area and more importantly, "this type of submarine has proven elusive to U.S. Navy anti-submarine warfare."[119]

In fact, a Chinese Song class SSK, similar in size and capability to a Kilo, surfaced within the inner protective screen of the USS KITTY HAWK's carrier strike group during an exercise in 2006. Twelve ships were in the process of defending the carrier from aircraft and submarines in addition to further airborne assets that were also assigned to perform this task.

---

[117] *Ibid*.

[118] Michael R. Gordon, "Pentagon Says Russia is Selling Subs to Iran," *New York Times* Sep 24, 1992, http://proquest.umi.com/pqdweb?did=965338571&Fmt=7&clientId=65345&RQT=309&VName=PQD; Internet; 28 January 2008.

[119] "Iran and the US Navy in the Persian Gulf," Jane's Information Group, http://jid.janes.com/subscribe/jid/; Internet; accessed 28 January 2008.

Additionally, at least two USN submarines were involved in the defence of the carrier and were also unable to detect the Chinese SSK.[120] The terrifying reality to this situation was that the submarine went undetected by all forces with the aircraft carrier well within torpedo range of the submarine. Additionally, this occurred in "blue (deep) water" of the Pacific where acoustic conditions are more favourable for detection.

Looking at the capability a Kilo submarine offers, Lautenschlager tells us that Iran's SSKs could be used for coastal defence, naval attrition, fleet engagement and commerce warfare in a scenario involving closing-off the Strait of Hormuz.[121] Milan Vego in his book *Naval Strategy and Operations in Narrow Seas*[122] also states that a weaker state is in a more favourable position for success in attaining chokepoint control if that country is "guarding one or both shores of a sea's only exit."[123] Iran meets that condition. The end result to this equation of SSK plus geography is a higher possibility for success and credible threat of closing-off the Strait of Hormuz.

What else does the SSK offer to this situation to allow Iranian possession of the upper hand? One major factor that must be considered when looking at the Iranian SSKs is the fact that the presence of a submarine alone is a threat that demands a disproportional cost to try and neutralize that threat. The submarine alone does not even have to fire a weapon but will still require an enormous effort to try and find it by the opposing forces.

---

[120] Matthew Hickley, "The Uninvited Guest: Chinese Sub Pops Up in Middle of U.S. Navy Exercise, Leaving Military Chiefs Red-Faced," Daily Mail, http://www.dailymail.co.uk/pages/live/articles/news/worldnews.html?in_article_id=492804&in_page_id=1811; Internet; accessed 6 February 2008.

[121] Lautenschlager, *The Submarine in Naval Warfare, 1901-2001,* 103,104, 109, 126.

[122] Milan N. Vego, *Naval Strategy and Operations in Narrow Seas* (Portland, Oregon: Frank Cass Publishers, 1999), 331.

[123] *Ibid*., 245.

The Falkland Islands crisis is an excellent example of the impact that just one submarine can have on the overall operations of the opposing force. In 1982, Argentina had one operational SSK, the SAN LUIS, which was inadequately maintained and possessed a poorly trained crew. This one submarine caused the British enormous concern and although aware of this sole submarine threat, the British were unsuccessful in ever detecting it.[124] Three times the SAN LUIS was able to penetrate the defensive screen of the British to be in a firing position only to be unsuccessful in launching a torpedo due to technical difficulties.[125] The SAN LUIS' presence resulted in extensive anti-submarine warfare (ASW) operations, may have effected the positioning and overall disposition of British forces in the area and cost the British over 200 ASW weapons all of which were unsuccessful with a majority fired against false contacts.[126] This situation, similar to the KITTY HAWK's, occurred in deeper water with conditions that were more favourable to detect submarines. Although the SAN LUIS was unsuccessful, one must ask what the British reaction might have been if the SAN LUIS consummated their engagement against the British aircraft carrier: public resolve to end the conflict by the most expeditious manner might have been swayed significantly.

SSKs and the Strait of Hormuz

Transfer this scenario to that of Iran and the Strait of Hormuz. The Falkland example had one submarine and occurred in deeper water; Iran has three SSKs and would be operating in and out of the littorals causing greater problems both acoustically and with the amount of traffic

---

[124] Michael D. Wallace and Charles A. Meconis, "Submarine Proliferation and Regional Conflict," *Journal of Peace Research* 32, no. 1 (February 1995), http://links.jstor.org/; Internet; accessed 3 February 2008, 82.

[125] *Ibid*., 82.

[126] *Ibid*., 82.

transiting that region. If the Iranian SSKs were able to successfully deploy to sea and preposition, they would be ideally situated to conduct fleet engagement and commerce warfare. Coupled with an information operations campaign that effectively warned commercial traffic of the threat to shipping, Iran would be effective in deterring commercial vessels from transiting the Strait of Hormuz until that threat was neutralized. All it would take would be one engagement on a super tanker to send the message that shipping is severely threatened. Positioning the Kilos in the Gulf of Oman and cycling them around to avoid detection and over concentration, could lead to a significant amount of time and resources to locate them by enemy (U.S.) forces. This body of water is large and complex with varying acoustic conditions compounding the problems facing the forces assigned for localizing and neutralizing the threat.

SSKs Plus Other Forces

Another significant factor not to be discounted is the effect that other Iranian forces used in conjunction with the SSK threat would have. Forces assigned to counter the Kilo threat may also be vulnerable to the conventional threat from Iranian surface and air forces in addition to asymmetric warfare, something that Iran has been building and integrating into their overall force capability. Iran to some degree has two navies; the regular navy which possesses the larger vessels and the Iranian Revolutionary Guard Corps Navy (IRGCN) that has smaller boats and crafts. The resultant product is a navy that has a myriad of options spanning both the conventional and unconventional realm. Regarding this aspect of naval power, Admiral Kouchaki stated, "Our tactics are completely different from the enemy's conventional tactics...The IRGCN has good experience in the strategic dimension of speed boats, anti-ship

missiles and techniques and tactics of unbalanced warfare."[127] Layered with the Kilo threat, swarm tactics[128] may be employed against U.S. forces assigned to localize Iranian submarines. These forces would now be engaged in a dual conflict, mixing conventional and asymmetric warfare simultaneously leading to an exceptionally difficult situation to fight. In this instance, tactics employed to counter one threat may be detrimental for countering the other and the catch 22 scenario is now prevalent. No matter what defensive action is taken, one aspect of Iranian warfare could exploit that movement or effort. Captain USN John Morgan summarized it quite concisely stating, "We must recognize that in today's and tomorrow's conflict scenarios, the submarine is an underwater terrorist, an ephemeral threat. It will force us to devote a great deal of resources and time, which we might not have."[129]

Further exacerbating the problem that U.S. forces may encounter is the relative proximity to the Iranian coastline. The added complexity of air forces and shore based anti-ship missiles adds yet two more layers of warfare onto this already complex state of affairs. Bandar Abbas and Chah Bahar are the home to the Iranian 91st, 92nd and 101st Fighter Squadron composed of both F-4 Phantoms and SU-24 Fencer each possessing strike capability.[130] These aircraft are fitted with either the C801 or C802 anti-ship missile[131] and the location of these air bases easily places any ships operating within the Strait of Hormuz inside of the attack radius of these aircraft

---

[127] Matt Hilburn, "Asymmetric Strategy," *Sea Power* 49, no. 12 (December 2006), http://proquest.umi.com/; Internet; accessed 17 January 2008, 2.

[128] On 6 January 2008, three USN ships took evasive actions after they were probed by five Iranian navy speedboats.

[129] Captain John Morgan, "Anti-Submarine Warfare: A Phoenix for the Future," Federation of American Scientists, http://www.fas.org/man/dod-101/sys/ship/docs/anti-sub.htm; Internet; accessed 15 February 2008.

[130] "Jane's World Air Forces," Jane's Information Group, http://jwaf.janes.com/public/jwaf/index.shtml; Internet; accessed 19 April 2008.

[131] *Ibid*.

and their missiles. Further, surface ships operating within or near the strait, would risk being inside of the attack radius for land-launched missiles. Where before the assessed threat from these aircraft would have seemed manageable, dealing with these added problems, on top of the existing ones, compounds the issues and potentially distils a concentrated effort.

The SSKs, however, is the capability that gels all the other warfare areas together. Everything else is known except for the position of the submarines. The effort to locate them may seriously detract from the appropriate concern other warfare areas demand adding to a position of advantage.

SSKs, Oil and the Effect

CENTCOM's mission is to ensure regional access to keep the Strait of Hormuz open and now face a more challenging task. Certainly the SSK threat would dictate the positioning of carrier groups within the area of operations and consequently effect on station and combat radius for aircraft operations off those platforms. The possibility of a submarine penetrating the defensive screen cannot be dismissed; what would happen if an aircraft carrier was successfully engaged by a submarine? John Panneton in his article *Striking a Balance* says that "the results would be cataclysmic."[132] Further supporting Panneton's observation, Morgan identified that outcome of the Falklands War might have been very different if the Argentinean submarine was successful in engaging the British carrier, something that would strike at the very heart of British public morale.[133] In the Strait of Hormuz context, such an occurrence could dissuade the U.S. or coalition population for supporting the mission or have the opposite effect leading to total

---

[132] John A. Panneton, "Striking a Balance," *Sea Power* 49, no. 8 (August 2006), http://proquest.umi.com/; Internet; accessed 17 January 2008, 1.

[133] Captain John Morgan, *"Anti-Submarine Warfare: A Phoenix for the Future"*

annihilation of Iran. Nevertheless, the possibility of destroying an aircraft carrier is definitely within the realm of the possible.

These factors support that SSKs are the Iranian enabler for success in the closure of the Strait of Hormuz, but to what effect? Clearly it is recognized worldwide of the importance of this Strait with the immense amount of crude oil that transit through it everyday. Crippling the capability to provide the world with Persian Gulf oil would wreak havoc on the macroeconomy - the impact of which would touch everyone, everywhere. Iran would not venture into such a conflict unknowing of the consequences. Would they, in fact, dare to take such action?

Supply shortages occurring from a Strait of Hormuz closure and the resultant global impact would be one reason to attempt such an action. The U.S. Government Accountability Office (GAO) repeatedly refers to this scenario in their 2006 Strategic Petroleum Reserve (SPR) report as "catastrophic"[134] and a situation where the SPR and international reserves would be incapable to replace the lost oil.[135] The report further explains that in the world oil market there is very little oil excess capacity or as they refer to it an "oil market cushion."[136] This lack of cushion is what makes the price of oil so susceptible to supply disruptions and the less excess oil there is in the market the lesser the ability there is to mitigate price increases.[137] The SPR and other international reserves were created as part of the mitigation strategy to avoid drastic and sudden increases in oil prices resulting from supply disruptions. The report, however, indicates

---

[134] *Strategic Petroleum Reserve*, 8, 24, 27, 45, 55.

[135] *Ibid*., 27.

[136] *Ibid*., 12. Bassam Fattouh, "Spare Capacity and Oil Price Dynamics," Middle East Economic Survey, http://www.mees.com/postedarticles/oped/v49n05-5OD01.htm; Internet accessed 18 April 2008.

[137] *Ibid*., 12. Robert Pirog, "CRS Report for Congress - World Oil Demand and its Effects on Oil Prices," Congressional Research Service, http://www.fas.org/sgp/crs/misc/RL32530.pdf; Internet; accessed 25 February 2008, 14.

that due to the vast quantity of crude oil transiting through the Strait of Hormuz, the SPR and international reserves would only be able to affect a fraction of the oil loss and thus they are insufficient in capacity. Consequently, what would result would be an "oil price shock" and as the report states in 2006, crude oil prices could increase to over 175 dollars US per barrel.[138]

Oil shocks have occurred repeatedly as a result of a supply disruption. The October War and Oil Embargo in 1973, the Iranian Revolution and outbreak of the Iran-Iraq in 1980, the invasion of Kuwait in 1990 and the OPEC meeting in 1999 are the most prominent examples of oil shocks. Robert Barsky and Lutz Lilian in the article *Oil and the Macroeconomy Since the 1970s* determine that "increase in oil prices have been held responsible for recessions, periods of excessive inflation, reduced productivity and lower economic growth."[139] The GAO report concludes for just a month closure of the Strait of Hormuz, the damage to the U.S. economy would be anywhere from 16-28 billion US dollars loss in Gross Domestic Product (GDP).[140] At the micro level, meaning the ordinary consumer, everyone would be affected. Typically a barrel of oil is broken down to produce 45 percent for gasoline, 23 percent for heating oil and diesel fuel, 17 percent for petrochemical, 9 percent for jet fuel, 4 percent for asphalt and 4 percent for propane.[141] Oil can be related to almost everything that we use as consumers. It is used in synthetic fiber, synthetic rubber, used to produce plastic, drugs, fertilizer, paint, heart valves and the list goes on.[142] Oil shocks hit the producer and result in higher production costs that are then

---

[138] *Ibid*., 29.

[139] Robert B. Barsky and Lutz Kilian, "Oil and the Macroeconomy since the 1970s," *The Journal of Economic Perspectives* 18, no. 4 (Autumn, 2004), http://links.jstor.org/; Internet; accessed 24 March 2008, 115.

[140] *Strategic Petroleum Reserve*, 33.

[141] Alan Reynolds, "Oil Prices: Cause and Effect," CATO Institute, http://www.cato.org/pub_display.php?pub_id=3947; Internet; accessed 26 February 2008.

[142] *Ibid*.

passed down to the consumer who in return spends less leading to lower productivity and following this cycle could possibly lead to a recession.

This global impact and the effect on the macroeconomy is the reason for worry. The Strait of Hormuz is the world economic vital chokepoint whose unhindered access must be assured. The problem now unlike the problem faced by the U.S. and Western nations before, is that Iran possesses SSKs. The complicating issues that are now present resulting from this capability provide Iran the capability to effectively close-off the Strait of Hormuz. Their efforts in maintaining closure do not have to be indefinite. The GAO report uses the time period of only one month for the "catastrophic" oil supply disruption to wreak havoc on the global macroeconomy. Recognizing the economic implications puts Iran in a position of strength for bargaining with the U.S. or West for an end to potential confrontations, something that it did not earlier possess. It also must be emphasized that Iran would be facing a large coalition of forces and not just the U.S. as the impact of closing the Strait of Hormuz is truly global in nature. However, this fact does not weaken their position as long as Iran capitalizes on timing and recognizes when a build-up of forces is occurring. Iran would naturally try to isolate the U.S. from coalition partners as part of their endstate but for their initial campaign, it must be fast and indiscriminate to underscore that everyone is in danger thus achieving their immediate goal of oil supply shock.

The Iranian SSK capability, has in essence given Iran a strategic global destabilizing capability. Although always considered a fringe rogue state, the threat of closing the Strait of Hormuz by Iran was never deemed credible or possible. SSKs now make Strait closure a reality, quite disconcerting for military planners. Not only would forces have to fight the abundant conventional forces but also deal with the emerging asymmetric threat and conduct intensive

operations to locate and fight three submarines. The potential for losing a warship has increased significantly and the potential for losing an aircraft carrier is within the realm of the possible, all of which are due to the intensive ASW operations that would consume the majority of surface forces. The unhindered acquisition of three diesel submarines by Iran has illustrated that destabilization of the region has occurred, that Iran has to be given careful and due consideration when they make threats concerning closing the Strait of Hormuz and that essentially every person worldwide could be impacted by the capability that these three submarines bring to Iran.

Chapter Three - East and Southeast Asia

General

The previous example of Iran illustrates the destabilizing effect that proliferation of diesel submarines to a "rogue" state had on that region. The Iran's of the world are fortunately few, so what would be the impact of diesel submarines exported to a stable region with developing countries? This chapter will look at this scenario focussing on East Asia and in particular Southeast Asian countries. The reasons for military build-up including submarine acquisition will be examined with a purpose to demonstrate that the quest for stability in fact leads to instability resulting in regional destabilization with the potential for conflict.

Southeast Asian nations that will be specifically studied for the purpose of this examination are Indonesia, Malaysia, Singapore and Thailand. These countries in the last twenty years have demonstrated an interesting pursuit of military power including a diesel submarine capability and therefore are scrutinized to provide insight into the reasons for acquisition. Immediately after the end of the Cold War, "Southeast Asian countries have...gone on a military spending spree."[143] Further, continuing through the 1990's and into the new twenty-first century, Richard Bitzinger and Curie Maharani in their commentary *Arms, Money and Security: Southeast Asia's Growing Importance as an Arms Market* stated, "the Southeast Asian arms market is a growing market. Since the depths of the Asian Financial Crisis of the late 1990s, regional economies – and, in turn, regional defense spending – have rebounded robustly."[144]

---

[143] James Clad and Patrick Marshall, "Southeast Asia's Quiet Arms Race," *Chicago Tribune* 23 May 1992, http://pqasb.pqarchiver.com/chicagotribune/access/24410236.html?dids=24410236:24410236&FMT=ABS&FMTS=ABS:FT&type=current&date=May+23%2C+1992&author=James+Clad+and+Patrick+Marshall.&pub=Chicago+Tribune+(pre-1997+Fulltext)&edition=&startpage=21&desc=Southeast+Asia%27s+quiet+arms+race; Internet; accessed 2 April 2008.

[144] Richard Bitzinger and Curie Maharani, "Arms, Money, and Security: Southeast Asia's Growing Importance as an Arms Market," S. Rajaratum School of International Studies, http://www.rsis.edu.sg/publications/Perspective/RSIS0432008.pdf; Internet; accessed 21 April 2008.

Why would these countries feel compelled to increase their military capability at a time when the largest military build-up between the worlds' super powers came to an end? There is no single reason that can account for this regional trend but there are numerous factors, both internal and external, that contributed to a relative rapid build-up of military capability.

Threat

First and foremost when talking about issues relating to military forces and associated acquisitions are whether or not the purchases are in response to a perceived threat. These four countries rapidly increased their defence expenditures in 1979 due to the perceived threat of Vietnam's activity in Cambodia with Malaysia increasing their defence expenditures by 100 percent over the four year period spanning 1979-1983.[145] Projecting forward ten years, the fear of a major regional power asserting itself to fill the void left by withdrawn Russian forces and uncertain U.S. commitment was the perceived threat in post Cold War years.[146] China and Japan were seen as the frontrunners for region hegemon with China gaining significant strides over Japan in recent years. China, as stated in Erik Eckholm's article for the New York Times, "will undercut the pre-eminence of Japan, challenge America's role as regional overseer and rewrite Southeast Asia's economic and political course."[147] With its current claim stating possession of almost the entire South China Sea (SCS), China logically is of major concern especially as

---

[145] Geoffrey Harris, "The Determinants of Defence Expenditure in the ASEAN Region," *Journal of Peace Research* Vol.23, no. 1 (March, 1986), http://www.jstor.org; Internet; accessed 25 March 2008, 44.

[146] Desmond Ball, "Arms and Affluence: Military Acquisitions in the Asia-Pacific Region," *International Security* 18, no. 3 (Winter, 1993), 78-112, http://links.jstor.org/; Internet; accessed 8 February 2008, 84.

[147] Erik Eckholm and Joseph Kahn, "Asia Worries about Growth of China's Economic Power," *The New York Times* 24 November 2002, http://proquest.umi.com/; Internet; accessed 2 April 2008.

Malaysia, Indonesia, Singapore and Thailand are all island or coastal nations that depend greatly on the sea lines of communication (SLOC) through the SCS for national survival. Further, numerous states in this region have competing claims and ongoing disputes with China and other neighbouring nations regarding the SCS region.

Superpower Withdrawal

A second and significant external factor especially prevalent immediately following the Cold War was the future of U.S. forces within the region. The withdrawal of the Soviet presence and associated threat from the region left the question as to whether the U.S. would remain as the dominant force playing the 'big brother' role. This perceived lack of presence directly relates to the above mentioned threat of another major power rising and also to a potential increase in regional conflict. Desmond Ball in *Military Acquisitions in the Asia-Pacific Region* refers to the U.S presence as the "tempering mechanism" that kept tensions under control.[148]

Throughout the last fifteen years, the U.S. presence in the Philippines has been removed and if you compare force numbers solely on a quantitative measure there has been a reduction of forces deployed to East Asia. In 1999 the U.S. Seventh Fleet, responsible for the East Asian region, was comprised of 50-60 ships, 350 aircraft and 60000 navy and marine corps personnel.[149] In 2008, there are 40-50 ships, 200 aircraft and 20000 navy and marine corps personnel.[150] This however, does not necessarily mean a lack of presence or commitment to the

---

[148] Ball, *Arms and Affluence: Military Acquisitions in the Asia-Pacific Region*, 87.

[149] Charles A. Meconis and Michael D. Wallace, *East Asian Naval Weapons Acquisitions in the 1990s: Causes, Consequences, and Responses* (Westport, Connecticut: Praeger Publishers, 2000), 166.

[150] "Forward Presence," U.S. Seventh Fleet, http://www.c7f.navy.mil/Pages/Forwardpresence.html; Internet; accessed 2 April 2008.

region once the reduced threat and increase of ship and force capability is factored into the equation. In fact the U.S. Seventh Fleet makes specific reference to force levels and states that unlike what occurred in Europe, the U.S. presence in East Asia has remained constant for the last ten years. Further, the U.S. Seventh Fleet emphasized their commitment by officially proclaiming, "We remain engaged in the region and committed to maintaining peace and stability."[151] Nevertheless, a time of uncertainty did occur immediately after the end of the Cold War where U.S. regional intentions were unknown or unclear that may have contributed to an aggressive military build-up by Southeast Asian nations.

Self-Reliance

Ball identifies a third reason; countries after the Cold War felt the need to "enhance their defense self-reliance to enable them to deal better with regional contingencies on the basis of their own resources."[152] These nations are either island or coastal in geography and therefore the impetus was such that a higher emphasis on maritime security was required. For some of the Southeast Asian countries, this meant a redefinition of policy away from the internal counter-insurgency threat to an external maritime realm.[153] The implications in developing a self-reliance capability are that for success to happen the ability to conduct independent surveillance, intelligence and warning[154] amongst other significant capabilities must be acquired and

---

[151] *Ibid*. The U.S. Seventh Fleet stated missions are: 1. Defend and protect the territory, citizens, commerce, sea lanes, allies and other vital interests of the United States. 2. Deter aggression with capable, flexible and mobile U.S. naval forces, cooperating closely with other U.S. military services and the forces of allied and friendly nations. 3. If deterrence fails, conduct prompt and sustained combat operations to terminate hostilities on terms favourable to the United States and allies.

[152] Ball, *Arms and Affluence: Military Acquisitions in the Asia-Pacific Region*, 82.

[153] *Ibid*., 83.

[154] *Ibid*., 83.

established. An endeavour such as this would naturally see a dramatic increase of military expenditure for equipment and infrastructure over a short period of time.

Geography

A fourth factor for regional build-up is simply the geography of the region coupled with the fallout of the UN Law of the Sea Convention (UNCLOS III). This area is complex and littered with thousands of islands that have associated with them conflicting claims of territorial waters (TTW) and Economic Exclusion Zones (EEZ) that were established by UNCLOS (III). East Asia and the Southeast Asia are rich with natural resources and the competing claims to nation's EEZs in addition to constricted waterways and straits result in issue raising naval deployments over claims of sovereignty. In this regard, the best way to assert your claimed sovereignty in the Southeast Asian maritime context is through presence and this is achieved by naval vessels.

Economics

Economics has certainly influenced nations defence expenditures and their subsequent military build-up programmes. Geoffrey Harris in *The Determinants of Defence Expenditure in the ASEAN Region*[155] examined how much of an influence domestic economics had on defence expenditures in Southeast Asian countries from the period 1960 and early 1980's. He concluded that the two were directly related and when the economy and GDP was higher, the expenditures on defence were increased.[156] Charles Meconis and Michael Wallace in their book *East Asian*

[155] Harris, *The Determinants of Defence Expenditure in the ASEAN Region*

[156] *Ibid*., 46.

Naval Weapons Acquisitions in the 1990s[157] support Harris, also stating that economic prosperity within the region was the impetus for national military build-up.[158] They further state that the regional build-up was occurring at such an accelerated rate that the international community had cause for worry.[159] However, the economic crisis that commenced in 1997 stifled this aggressive pace of regional build-up and it was not until 1999-2000 that most of the Southeast Asian countries resumed their ambitions towards military acquisitions and expenditures.[160] Fortunately for these nations, the events of September 11, 2001 and the wars in Afghanistan and Iraq had deflected much of the attention away from this region.

Prestige

Lastly, the element of national prestige could shape military expenditures and certain acquisitions. This would certainly apply to the purchase of SSKs as their possession alone would send a statement to other countries, more so to those in the region. "The possession of high-technology weapons systems, and the demonstrated ability to operate and maintain them, is regarded as an indicator of political and economic modernization."[161] Although not as substantive as the other factors, one cannot rule out the effect that owning sophisticated weaponry has on national pride. Possession of SSKs would essentially enter a nation into the exclusive and arguably elite club of nations with an operational submarine capability.

---

[157] Meconis and Wallace, *East Asian Naval Weapons Acquisitions in the 1990s: Causes, Consequences, and Responses*, 226

[158] *Ibid*., 4.

[159] *Ibid*., xvii.

[160] *Ibid*., xvii.

[161] Ball, *Arms and Affluence: Military Acquisitions in the Asia-Pacific Region*, 92.

SSK Fleets

These factors in isolation or combined, provided the recipe for a rapid arms increase in the Southeast Asian region. As mentioned in Chapter 2, embedded within these military expenditure programmes for Indonesia, Malaysia, Singapore and Thailand are the modernization, expansion or establishment of an SSK fleet with the capabilities for coast defence, naval attrition, fleet engagement and commerce warfare.[162] Indonesia currently possesses two German Type 209 SSKs and has adopted the expansionist approach by approving the plan for acquiring two South Korean Chang Bogo SSKs[163] and signing a deal for two Russian Kilo SSKs.[164] Malaysia is using an establishment policy and set to receive the first of two French Scorpene SSKs in January 2009 with the second being delivered in October 2009.[165] Establishment is also what Singapore did commencing in 2000 with the arrival of the first of four ex-Swedish Sjöormen class while the last was delivered in 2004.[166] Singapore has also adopted the expansionist/modernization approach with the planned delivery of two Swedish Västergötland class SSKs in 2010. Finally, Thailand is seeking to establish a submarine capability and rates it as one of the highest priorities for the navy.[167] This build-up of SSK capability happened rapidly

---

[162] Karl Lautenschlager, "The Submarine in Naval Warfare, 1901-2001," *International Security* 11, no. 3 (Winter, 1986), 94-140, http://links.jstor.org/; Internet; accessed 17 January 2008, 103, 104, 109,126.

[163] "Jane's Fighting Ships," Jane's Information Group, http://jfs.janes.com/public/jfs/index.shtml; Internet: accessed 13 March 2008.

[164] Chad Bouchard, "Indonesia-Russia Arms Deal Raises Concern," GlobalSecurity.org, http://www.globalsecurity.org/military/library/news/2007/09/mil-070911-voa02.htm; Internet; accessed 6 April 2008.

[165] *Jane's Fighting Ships*

[166] *Ibid*.

[167] "Royal Thai Navy," GlobalSecurity.org, http://www.globalsecurity.org/military/world/thailand/navy-intro.htm; Internet; accessed 6 April 2008.

and regardless of the factors or intentions involved, the consequence to these acquisitions is one of regional destabilization.

Destabilizing Weapon

Meconis and Wallace list five criteria when identifying a weapon acquisition as destabilizing. As listed, these criteria are

> "1. The acquisition is large quantitatively compared either with a state's existing forces or its rival's forces in the weapons category in question.
>
> 2. The acquired systems represent a substantial qualitative improvement in the performance of that state's forces in this weapons category.
>
> 3. The acquisition is rapid on the time scale of the existing rivalry.
>
> 4. The weapon or weapons acquired permit little or no effective countermeasures.
>
> 5. They result in decreased strategic warning time and tactical warning time."[168]

The fourth and fifth criteria apply universally to Indonesia, Malaysia, and Singapore. SSKs as discussed in Chapter One offer little or no countermeasures with reduced to no warning time. The first criterion, a large quantitative increase, also applies to the three aforementioned nations and their respective SSKs. Indonesia had two SSKs and formalized their acquisitions to purchase four more, a substantial increase in numbers alone. Malaysia went from a position of zero SSKs to a planned total of two while Singapore went from a similar position of not possessing this capability to purchasing four within a four year period. Relatively speaking all of these nations had a substantial increase in quantitative SSK capability. Criterion two, relating to qualitative improvements, applies to Indonesia who already possessed an SSK capability. Through their acquisitions they are improving upon their existing fleet by the acquisition of four

[168] Meconis and Wallace, *East Asian Naval Weapons Acquisitions in the 1990s: Causes, Consequences, and Responses*, 35.

additional modern SSKs. The third criterion concerning rapidity of implementation applies to Singapore who acquired possession of their SSKs over four years with the overall programme taking nine years. On a faster scale, Malaysia went from contract signing, construction, to a planned delivery of SSKs in only seven years. Thailand does not possess an SSK fleet nor has formalized active plans to acquire them and therefore is not discussed as the criteria apply to the weapon system and not the nation itself when referring to destabilization. However, if Thailand were to commence an SSK acquisition programme, criteria 2-5 would apply.

Unwanted Conflict

Meconis and Wallace provide criteria for the SSK to be considered a destabilization weapon within the East and Southeast Asian regions. Operation of this destabilizing weapon in a perceived stable region, in some circumstances potentially could lead to an unwanted conflict. The factors that could lead to unwanted conflict include inexperience, the concentration of submarines within East Asia and associated problems of identifica

energy source is primarily oil.[170] An enormous amount of oil is imported daily, mainly from the Persian Gulf, making many of East Asian countries dependent upon imported oil. The SCS, however, "is widely said to hold enormous potential as a source of oil and natural gas"[171] and has now become a strategic asset economically for those who can lay claim to the natural resources that it possesses.

UNCLOS (III) and the South China Sea

The question now arises, who owns the SCS, who has rights to the potential abundant energy resources that lie underneath and who owns the waters within the region? UNCLOS (III) was designed to resolve maritime disputes but ironically what it did in the East Asian context was exacerbate the problems of ownership regarding the SCS. UNCLOS (III) contributed to this problem by setting parameters to define islands, territorial sea, contiguous zones, continental shelf and an Exclusive Economic Zone.

Articles 3, 55-75, 76-77 and 121 directly relate to the SCS. Article 3 concerns territorial sea and states "Every State has the right to establish the breadth of its territorial sea up to a limit not exceeding 12 nautical miles."[172] Articles 55-75 relate to the Exclusive Economic Zone (EEZ) defined as a zone to extend no further than 200 NM from the baselines that the territorial sea is measured.[173] Within the EEZ, the coastal state has, "sovereign rights for the purpose of

71

[170] *Ibid*., 6.

[171]

exploring and exploiting, conserving and managing the natural resources."[174] The continental shelf is addressed in Articles 76-77 and similar to the EEZ, if a country has a continental shelf that meets the detailed definition in Article 76, then "The coastal State exercises over the continental shelf sovereign rights for the purpose of exploring it and exploiting its natural resources."[175] Finally, Article 21 relates to islands stating that "Rocks which cannot sustain human habitation or economic life of their own shall have no exclusive economic zone or continental shelf."[176]

UNCLOS (III) did not exclusively account for the quagmire of territorial claims prevalent within the SCS but did enable the contesting nations to legitimize their claims using the Articles relating to territorial sea, islands, continental shelf and EEZ. Prior to UNCLOS (III) there already were ongoing territorial disputes with perhaps the most notable being the Spratly Islands. China, Taiwan, Vietnam, the Philippines and Malaysia all have various claims regarding the Spratly Islands.[177] China, Taiwan and Vietnam all claim the entire Spratly Islands while Malaysia lays claim to three islands and the Philippines claim eight islands.[178] Since UNCLOS (III), all have sent forces to inhabit one or more of the islands in order to meet the requirements outlined in Article 121 to be eligible for EEZ or continental rights.[179] Further UNCLOS (III) has

---

[174] *Ibid*., 43.

[175] *Ibid*., 54.

[176] *Ibid*., 66.

[177] "Table 5. Territorial Claims in the Spratly and Paracel Islands," Asian Studies WWW Virtual Library, http://www.southchinasea.org/why.html#Unifying_factors; Internet; 23 April 2008.

[178] *Ibid.*

[179] Burgess, *The Politics of the South China Sea: Territoriality and International Law*, 3.

led to numerous overlapping territorial sea and EEZ that is unavoidable in the enclosed SCS with the unfortunate result of sovereignty related conflicts.[180]

Resources

The pursuit to secure resources in the SCS has previously led to numerous military clashes and disputes. China and Vietnam have repeatedly exchanged measures of military force that included actions such as seizing the Parcel Islands in 1974, a 1988 naval confrontation in the central Spratly Islands resulting in 70 Vietnamese deaths and numerous vessels lost and a naval confrontation in 1994 occurring in Vietnamese claimed territorial waters over oil exploration.[181] Others forceful military clashes have occurred between China and the Philippines, Taiwan and Vietnam and Philippines and Vietnam.[182] Further, throughout the 1990s, there have been numerous disputes between Vietnam and China regarding oil exploration and drilling. Currently, East Asian countries have for the most part agreed that force will not be used to settle future disputes[183], however, although stated the past cannot be ignored and given the right "trigger", the region once again could see the clash of military forces. SSKs, as a destabilizing weapon, in this situation could become that trigger.

---

[180] *Ibid*., 3.

[181] "The South China Sea," Asian Studies WWW Virtual Library, http://www.southchinasea.org/intro.html; Internet; accessed 28 March 2008.

[182] *Ibid*.

[183] *Ibid*.

Experience versus Inexperience

With the exception of Indonesia, who has been operating SSKs for a number of years,[184] Malaysia and Singapore have quickly developed their SSK fleets. Unlike other defined submarine fleets such as those of the U.S. and U.K. who have developed their fleet over generations, these two countries do not have that same level of experience. In ten years, it is unrealistic to think that the competency levels in operations, safety and maintenance could be adequately achieved where it took others decades to successfully develop.

The U.S. put its submarine officers through extensive training that involves numerous courses and tours before being selected to attend the Prospective Commanding Officers (PCO) course that will lead to eventual command. The main point here is that the PCO was instituted in 1946 and has been running continuously ever since.[185] Although similar in intent but different in content, the "Perisher" course is the British equivalent of the PCO and incredibly has been running since 1914.[186] The senior instructors of the Perisher course "are the keepers of the institutional memory"[187] passing on the accumulated knowledge of generations of submariners. Malaysia, Singapore and to some extent Indonesia have a challenging time ahead of them to build that same level of experience.

Notwithstanding the vast institutional experience that the U.S. has, accidents do happen evident recently in the collision involving the USS NEWPORT NEWS and the sinking of

---

[184] Sam Bateman, "Perils of the Deep: The Dangers of Submarine Operations in Asia," S. Rajaratnam School of Internation Studies, http://www.rsis.edu.sg/publications/Perspective/RSIS0122007.pdf; Internet; accessed 28 March 2008, 2.

[185] Tom Clancy, *Submarine: A Guided Tour Inside a Nuclear Warship* (New York: Berkley, 1993), 32.

[186] *Ibid*., 156.

[187] *Ibid*., 156.

the Japanese fishing vessel by the USS GREENVILLE.[188] Dr Sam Bateman, a senior fellow at the S. Rajaratnam School of International Studies, wrote in his commentary *Perils of the Deep: The Dangers of Submarine Operations in Asia*, that "the number of submarines in the region (Asia) is increasing and the risk of major accidents are increasing proportionately."[189] He further adds when talking about Singapore,

> "submarine safety is a bit like road safety: the avoidance of an accident largely depends on the skill of the other driver and the quality of the road rules...Human error has been identified as the major cause of accidents at sea - the consequences are just much greater if you are fifty metres or more below the surface!"[190]

Accidents are going to happen as a result of inexperience coupled with the increased submarine traffic in the region. The problem with an accident leading to a loss of a submarine is the lack of conclusive evidence as to what exactly occurred that in turn leads to speculation and accusation. The loss of the Russian submarine KURSK is a prime example of all the theories and accusations that resulted from this most unfortunate accident.[191] These accusations could add fuel to the fire in a time of tension and may be the catalyst leading to conflict in a time of strained or tenuous relations.

---

[188] Bateman, *Perils of the Deep: The Dangers of Submarine Operations in Asia*, 1.

[189] *Ibid*., 2.

[190] *Ibid*., 3.

[191] "The Sinking of the Russian Sub Kursk!" http://www.whatreallyhappened.com/KURSK/index.html; Internet; accessed 23 April 2008. This article makes reference to a collision between the Kursk and USS Toledo that caused the fateful torpedo explosion.
"What Happened to 'Kursk'?" http://www.aeronautics.ru/nws002/kursk001.htm; Internet; accessed 23 April 2008. Immediately within this webpage is poll asking if people think the Kursk sank from a collision, striking a W.W.II mine, striking the seafloor or as a result of a faulty mine. Further, the article says that Former Russian Commander of the Black Sea Fleet, Admiral Eduard Baltin stated the tradegy was a result from a collision with a Western submarine.
Both these articles illustrate that when accidents happen, the environment in which they happen leads to speculation.

Identification

Identification is the second factor potentially leading to conflict. East Asian countries account for 134 SSKs, almost half the number of all operational SSKs worldwide[192] with Indonesia, Malaysia and Singapore accounting for eight submarines[193] out of that overall number. The region itself is a complex maritime environment where the geography is complicated and the oceanographic features are challenging[194] and that is just referring to navigation for surface vessels let alone adding yet another operating dimension for SSKs. The SCS is an extremely busy international sea-lane with more than half of all the supertankers in the world passing through it annually. The Strait of Malacca (SOM) is a strategic vital chokepoint that has more than three times the traffic than the Suez Canal and five times that of the Panama Canal.[195] Approximately 15 million barrels of crude oil per day pass through this Strait, second only to the Strait of Hormuz in addition to 50000 ships transiting annually.[196] These figures represent the merchant traffic alone and do not account for the abundance of military vessels operating within the region and other smaller coastal craft. This illustrates the vast and significant concentration of surface traffic operating within the region that will undoubtedly complicate the SSK's already saturated operating environment where the largest regional concentration of SSKs exists.

---

[192] "Jane's Underwater Warfare Systems - the Submarine," Jane's Information Group, http://www4.janes.com/subscribe/juws/; Internet; accessed 11 February 2008.

[193] *Ibid*.

[194] "Tropical Research and Conservation Centre - Shipping," Tropical Research and Conservation Centre, http://www.tracc.org.my/Borneocoast/spratly_islands/SHIPPING.html; Internet; accessed 7 April 2008.

[195] *Ibid*.

[196] Energy Information Administration, "World Oil Transit Chokepoints," Department of Energy, http://www.eia.doe.gov/cabs/World_Oil_Transit_Chokepoints/Full.html; Internet; accessed 7 April 2008.

Although SSKs are stealthy in nature, detection does in fact happen leading to the problematic situation of identification. Previously during the Cold War, a comprehensive effort was made by the U.S and allies to build acoustic signatures on Soviet submarines to use as a library for future classification.[197] No such known programme exists in the East Asian region and SCS increasing the potential for misidentification and a possible inadvertent attack depending on the situation. Even if a force were successful in identifying the class of an SSK (most likely through visual identification of submarine on the surface[198]), the problem of misidentification still exists due to the use of common platforms. China and North Korea both operate Romeo class submarines while China and India possess Kilos.[199] Indonesia, India and South Korea all operate Type 209s[200] and without the benefit of an acoustic database it would be next to impossible to discern the nationality of the SSK. Further compounding the identification problem are the acoustic conditions itself within the SCS which are difficult as the oceanographic setting is affected by geography and ambient noise from the high traffic density.[201]

This obviously raises concern when looking at the inadvertent attack scenario. Peaceful or amicable relations between nations could very rapidly deteriorate if one nation destroyed another friendly nations' SSK without cause. Looking at Southeast Asia, latent, ongoing tensions

---

[197] Michael D. Wallace and Charles A. Meconis, "Submarine Proliferation and Regional Conflict," *Journal of Peace Research* 32, no. 1 (Feb., 1995), 79-95, http://links.jstor.org/; Internet; 17 January 2008, 83.

[198] Commander Peter Hinchcliffe, "Countering the SSK: A CO's Perspective," *Canadian Maritime Tactical Newsletter*, 2002.

[199] *Jane's Underwater Warfare Systems - the Submarine*

[200] *Ibid*.

[201] Meconis and Wallace, *East Asian Naval Weapons Acquisitions in the 1990s: Causes, Consequences, and Responses*, 54.

exist between many of these countries and pertinent to this discussion are the relations between Indonesia, Malaysia and Singapore. The Association of Southeast Asian Nations (ASEAN) was established in 1967[202] and is cited as a regional body that has succeeded in "mitigating intra-regional tensions." However, as noted by JN Mak in his working paper, *Sovereignty in ASEAN and the Problem of Maritime Cooperation in the South China* Sea, the mitigation of tensions and disputes primarily relates to the land vice maritime context.[203] Further, he adds that throughout the period of ASEAN existence, despite the perception of peace, a potential for conflict exists. Malaysia and Indonesia demonstrate these maritime tensions in their multiple "aggressive encounters"[204] during sovereignty patrols in the 1990s and as recently as 2005 with a collision between Malaysian and Indonesian warships.

Malaysia and Singapore also have a tenuous history starting with the separation of Singapore in 1965 as a result of economic and ethnic tensions.[205] Since then, the two nations have for the most part co-existed successfully notwithstanding some occasional disagreements.[206] Nevertheless, "the two erstwhile federal partners use each other as political whipping boys to divert domestic discontent,"[207] and combined with rapidly expanding navies

---

[202] "Overview: Association of Southeast Asian Nations," Association of Southeast Asian Nations, Association of Southeast Asian Nations, Internet; accessed 23 April 2008.

[203] JN Mak, "Sovereignty in ASEAN and the Problem of Maritime Cooperation in the South China Sea," (working paper, S. Rajaratnam School of Internation Studies, 2008), 1.

[204] *Ibid*., 6.

[205] Meconis and Wallace, *East Asian Naval Weapons Acquisitions in the 1990s: Causes, Consequences, and Responses*, 80.

[206] *Ibid*., 80.

[207] *Ibid*., 83.

and close-quarter operating areas could all lead to unintended conflict through an inadvertent attack.

A likely and potential scenario is one regarding sovereignty patrols where success can be achieved using any platform including submarines. Malaysia, for example, may be conducting a sovereignty patrol with their soon to be delivered Scorpene while concurrently so is Singapore and Indonesia. All these submarines are operating within the same confined area and enforcing what they believe to be their rightful EEZ. Unfortunately for these nations is the fact that UNCLOS (III) has resulted in overlapping EEZs that complicates this scenario. Further complicating the situation are Indonesian surface forces conducting the same mission. The Indonesian surface forces detect a submarine in what they think is their EEZ and immediately ask the question, what is the intent of the submarine and more importantly who is that submarine? They know where their own Indonesian submarine is operating, but that is the extent of their knowledge. The submarine could be from Malaysia, Singapore or even from China or India. Uncertainty leads to increased tensions and the Indonesian commanding officer has no amplifying information such as a discrete acoustic source to classify the underwater contact. The more time he takes to make the identification, the more likely the unknown submarine will evade and he will lose contact thus putting his ship in a position of great disadvantage and susceptible to attack. Proper identification in a time of crisis is crucial and if the wrong assumption is made the consequences could be catastrophic[208] bringing Indonesia into a conflict with Malaysia or Singapore that otherwise would not have occurred or should ever have occurred.

The Malaysia or Singaporean submarines operating in the area could also misinterpret the action that has happened and counter-fire on the Indonesian warship assuming that they were the

---

[208] *Ibid*., 54.

one being attacked. The commanding officer's experience or lack thereof would determine his reactions possibly leading to the ensuing negative consequences. Now the conflict multiplies bringing potentially another country into the turmoil as a result of misidentifying the intent of the other force. What was once a stable situation is now unstable with retaliation becoming all the more possible from the nation losing forces. The problem of misidentification is not germane to only countries that possess common platforms but to all nations that operate SSKs regionally as detection will most likely only yield contact, not class, meaning that the information received will permit the knowledge that there is a submarine operating, however ownership would be unknown.

Prevention of Mutual Interference

The potential of accidents has led to a regional arrangement in order to "prevent mutual interference (PMI)."[209] PMI "minimizes the risk of collision by coordinating water space to ensure friendly submarines are not operating in the same area at the same time. PMI also considers surface ships with towed sonar arrays and other towed bodies."[210] The coordinating authority as part of their duties, would be assigning areas and transit routes for deconfliction and collision avoidance. However, notwithstanding the good intentions of this arrangement, the output of this organization will only be as good as the inputs received. The complexity of the territorial claims within the region would preclude a nation from knowingly publishing their intended transit of a submarine, something that would immediately compromise the SSK mantra

---

[209] Bateman, *Perils of the Deep: The Dangers of Submarine Operations in Asia*, 3.

[210] Kelly, LCDR Christopher J., "The Submarine Force in Joint Operations" Air Command and Staff College Air University, http://www.rtna.ac.th/article/The%20Submarine%20Force%20in%20Joint%20Operations_Research%20paper%20of%20Mexwell%20Airforce%20Base%20USA.pdf; Internet; accessed 10 April 2008, 34.

of stealth. This once again emphasizes where the lack of experience could have a major impact. There would be a public element to PMI and then the unpublished, unknown version. An SSK commanding officer cannot assume that he has exclusive use of the water column just because the PMI plan says so. If that submarine does assume exclusivity, they may do so to their own peril. It is hard to assume that the structure in place is to the standard which now exists amongst NATO countries. NATO procedures and guidelines are extremely extensive and well-practiced evident in available unclassified publications.[211] Additionally, as with other accidents, if two submarines did collide and one survived, how would intent be ascertained? One nation might view the accident as a guise for another more sinister action. Experienced submariners and the extensive training that they do could help mitigate this situation and further underscore the relevance of operational and institution experience.

Command and Control

Finally, a last aspect of the SSK and respective operations that could lead to conflict is the limited ability to control and communicate with the platform. Communications at their best are sometimes difficult and if an SSK is involved in a sensitive mission, then trying to communicate with that platform and relay information could prove to be extremely

---

[211] "Submarine Advisory Team (SAT) Standard Operating Procedures (SOPs)" *COMSUBLANT Battle Group Operations*, 5 December 2004. This document outlines the SOPs for the SAT who are otherwise known as the Submarine Element Coordinator (SEC). Essentially, this team deploys with a Battle Group and form a cell that coordinates the waterspace for the Battle Group Commander. Amongst other responsibilities, they ensure that there are no PMI incidents to include collisions between friendly submarines and engagements between friendly surface and sub-surface units.
"MTP 1 (D) Volume 1 - Multinational Maritime Tactical Instructions and Procedures," (Brussels: NATO, 2002). MTP 1(D) is the unclassified NATO manual that may be released to non-NATO countries on a need to know basis. Throughout the manual it refers to PMI, defines it and outlines procedures to avoid friendly on friendly incidents.
"AJP 3. Allied Joint Maritime Operations," (Brussels: NATO, 2004). AJP 3.1 is another unclassified NATO document that discusses within Section 4 article 0134 page 1-18, the importance of PMI as a crucial planning consideration during offensive maritime operations. Within that section, classified documentation is reference when it refers to specific PMI requirements and procedures.

problematic.[212] Fictionally, the movie "Crimson Tide" illustrates the potential for catastrophe when a submarine loses its ability to communicate with command. In real operations, an example of the difficulty of command and control when communicating to a submarine is demonstrated by the sinking of the Argentinean cruiser GENERAL BELGRANO during the Falkland's War in 1982. Immediately prior to the sinking of this ship by the British submarine HMS CONQUEROR, extensive last minute talks were being conducted and brokered by third parties to try and resolve this situation before conflict ensued.[213] HMS CONQUEROR had received permission to engage and attack the BELGRANO and conspiracy theories aside, after receiving approval, subsequent revocation of that order would have been close to impossible as the submarine would have submerged and manoeuvred to position for attack. Consequently, the sinking of the BELGRANO "torpedoed" any chance for peaceful resolution and if a revocation order would have been transmitted, the inability to receive that order clearly demonstrates the potential for submarines to have strategic impact bringing nations into conflict when otherwise this would not have been the case. Submarines are autonomous weapon systems that communicate infrequently with higher authority resulting in a greater chance that actions taken in the moment may contradict the intent of political leadership. Overarching once again is the experience level of the commanding officer and crew and it is imperative that the mission is fully understood and actions taken are well thought out in times of tenuous situations.

---

[212] Bateman, *Perils of the Deep: The Dangers of Submarine Operations in Asia*, 3.

[213] "Falklands War," Online Encyclopedia, http://encyclopedia.jrank.org/Cambridge/entries/047/Falklands-War.html; Internet; accessed 10 April 2008.

Stability to Instability

The proliferation of SSKs have added an element of insecurity to East Asia and destabilized the balance of relations. In a region where the political landscape is one that has previously resorted to violence to settle disputes, the economic boom and related pursuit of natural resources has put East Asia on a razor's edge. Throughout the region, there has been a rapid build-up of military procurement and capability. An unintentional wrong move by one nation misinterpreted by another could plunge those states into unwanted and unintentional conflict. Southeast Asian SSKs are destabilizing weapons that sharpen the razor blade within the East Asian context. Their use, coupled with the propensity for misidentification of submarines and intent, potential for accidents, lack of command and control and the overarching malevolence of inexperience all contribute to the potential for unwanted conflict. Arnold Wolfers, a political scientist, identified in his 1952 article, "*National Security" as an Ambiguous Symbol*[214] the problem that these Southeast Asian countries are currently facing; "What a country does to bolster its own security through power can be interpreted by others, therefore, as a threat to their security,"[215] or otherwise simply stated that greater security begets greater insecurity.

[214] Arnold Wolfers, ""National Security" as an Ambiguous Symbol," *Political Science Quarterly* 67, no. 4 (December 1952), 481-502; http://www.jstor.org; Internet; accessed 27 August 2007.

[215] Wolfers, "National Security" as an Ambiguous Symbol, 494.

Conclusion

The SSK is an extremely powerful and potent weapon system that affords a possessing nation a myriad of capabilities to further national interest. The SSK permits countries to protect their sovereignty through the ability to conduct coastal patrol, allows engagement of an adversary's fleet and also enables a country to wreak havoc on commercial maritime traffic. These are the capabilities that the SSK provides to a nation, but what they also contribute is a state of regional instability. Nations that pursue the quest for acquisition of a submarine are enabled that ability through a market environment without control.

States that have the financial competence to afford SSKs, can easily find a seller of these complicated and destabilizing weapons. There is no international mechanism that prevents the proliferation of this weapon other than good will and common sense and this, however, has not been the case when looking at Iran. Russia sold three Kilo class submarines to Iran resulting in a tipping of the scales towards Iran now being considered a credible foe when threatening to close the vital strategic chokepoint of the Strait of Hormuz. Previously, when Iran spoke about closing the Strait it was just rhetoric, now with SSKs, they are a threat. The region has been destabilized as a result of the unimpeded sale from Russia, something that was objected to by the U.S. but without an effective international agreement or treaty, was useless to halt.

East and Southeast Asian nations are considered relatively stable and it is for this reason that people should be concerned about the proliferation of SSKs to this region. An immense regional military build-up has occurred, including the acquisition and establishment of submarine fleets. Indonesia, Malaysia, Singapore and potentially Thailand all fall within the category of nations pursuing SSK dreams. The reasons for this pursuit are varied and differ from country to

country, however, one aspect is germane in that they all in some way are trying to further their security and with SSKs the result may in fact be greater insecurity and unwanted conflict.

These nations have a young SSK service with relatively inexperienced crews and maintainers. This lack of experience, combined with others factors including lack of command and control, difficulty in identification of sub-surface contacts, over saturation of the area with SSKs and an insufficient prevention of mutual interference scheme combined with an already tenuous territorial claim situation exacerbated by the fallout of UNCLOS (III), provide the recipe that could propel these states into an abyss of regional conflict.

Repeatedly the theme is that countries have been able to obtain these weapon systems without any say from the international community. Consequently, international society as a whole may be unnecessarily heaved into a conflict resolution action, something that might not have been the situation if there were controls on SSK proliferation. It is evident when looking at Iran and East Asia, there needs to be an international oversight mechanism whose mandate would control SSK proliferation. With the implementation and definition of criteria defining eligibility or ineligibility for SSK possession, this oversight committee would have been able to foresee the complications concerning the Iran SSK acquisition and would have more clearly analyzed the problematic effects of operating a large number of SSKs in the South China Sea. Currently, the aspirations of Venezuelan SSK expansion is an example of how such an oversight committee would demonstrate their effectiveness and potentially limit the desired acquisition of SSKs for the betterment of regional stability.

Iran and East Asia demonstrate the need and importance for this proposed international oversight mechanism for if SSK proliferation continues to go unchecked, it will affect every person, everywhere. Whether it is the trip to the gas station or a trip to the grocery store,

everyday people will feel the consequences of the SSK; despite their silent nature, their impact is deafening and global.

Bibliography

"Factbox: The Strait of Hormuz, Iran and the Risk of Oil." Reuters. http://www.reuters.com/article/topNews/idUSL0715889720080107?sp=true; Internet; accessed 25 March 2008.

"Forward Presence." U.S. Seventh Fleet. http://www.c7f.navy.mil/Pages/Forwardpresence.html; Internet; accessed 2 April 2008.

"Investigation Report - Formal Investigation into the Circumstances Surrounding the Downing of Iran Air Flight 655 on 3 July 1988." http://homepage.ntlworld.com/jksonc/docs/ir655-dod-report.html; Internet; accessed 26 March 2008.

"Jane's Fighting Ships." Jane's Information Group. http://jfs.janes.com/public/jfs/index.shtml; Internet; accessed 13 March 2008.

"Jane's Underwater Warfare Systems - the Submarine." Jane's Information Group. http://www4.janes.com/subscribe/juws/; Internet; accessed 11 February 2008.

"Jane's World Air Forces." Jane's Information Group. http://jwaf.janes.com/public/jwaf/index.shtml; Internet; accessed 19 April 2008.

"OPLAN 1019 Arabian Gauntlet." GlobalSecurity.org. http://www.globalsecurity.org/military/ops/arabian-gauntlet.htm; Internet; accessed 25 February 2008.

"Royal Thai Navy." GlobalSecurity.org. http://www.globalsecurity.org/military/world/thailand/navy-intro.htm; Internet; accessed 6 April 2008.

"Sajjad Kouchaki." http://dkosopedia.com/wiki/Sajjad_Kouchaki; Internet; accessed 25 March 2008.

"The South China Sea." Asian Studies WWW Virtual Library. http://www.southchinasea.org/intro.html; Internet; accessed 28 March 2008.

"Tropical Research and Conservation Centre - Shipping." Tropical Research and Conservation Centre. http://www.tracc.org.my/Borneocoast/spratly_islands/SHIPPING.html; Internet; accessed 7 April, 2008.

"Wassenaar Arrangement." http://www.wassenaar.org/index.html; Internet; accessed 12 March 2008.

"The World Factbook - Iran." Central Intelligence Agency. https://www.cia.gov/library/publications/the-world-factbook/print/ir.html; Internet; accessed 26 March 2008.

"The 15 Major Spender Countries in 2006." Stockholm International Peace Research Institute. http://www.sipri.org/contents/milap/milex/mex_major_spenders.pdf; Internet; accessed 18 March, 2008.

"Arms Trade Treaty." *Arms Control Today* 37, no. 9 (November 2007): 5; http://proquest.umi.com/; Internet; accessed 17 March 2008.

"Chavez Plans Russian Visit to Buy Arms." *Star - Phoenix,* Jun 16, 2007. http://proquest.umi.com/; Internet; 24 January 2008.

"Falklands War." Online Encyclopedia. http://encyclopedia.jrank.org/Cambridge/entries/047/Falklands-War.html; Internet; accessed 10 April 2008.

"Gains in Processing Power Will Improve Sensor Capabilities for Subs, Official Says." *C4I News* (Mar 15, 2007): 1. http://proquest.umi.com/; Internet; accessed 17 January 2008.

"Indonesia, Russia Sign $1 Bln Defense Deal." *Moscow News (in English),* Sep 7-Sep 13, 2007. http://proquest.umi.com/; Internet; accessed 24 January 2008.

"Iran and the US Navy in the Persian Gulf." Jane's Information Group. http://jid.janes.com/subscribe/jid/; Internet; accessed 28 January 2008.

"Press Conference on Arms Trade Treaty Held at U.N. Headquarters." *US Fed News Service, Including US State News* (Oct 9, 2007). http://proquest.umi.com/; Internet; accessed 17 March 2008.

"PROSPECTS 2008: US-China Tensions Set to Increase." *OxResearch* (Dec 06, 2007): 1. http://proquest.umi.com/; Internet; accessed 2 April 2008.

"United Nations Convention on the Law of the Sea of 10 December 1982." United Nations. http://www.un.org/Depts/los/convention_agreements/texts/unclos/unclos_e.pdf; Internet; accessed 8 April 2008.

"World and Regional Military Expenditure Estimates 1988-2006." Stockholm International Peace Research Institute. http://www.sipri.org/contents/milap/milex/mex_wnr_table.html; Internet; accessed 18 March 2008.

"Country Reports on Terrorism." U.S. Department of State. http://www.state.gov/t/us/rm/9962.htm; Internet; accessed 20 March 2008.

*Strategic Petroleum Reserve*United States Government Accountability Office, 2006, http://www.gao.gov/new.items/d06872.pdf; Internet; accessed 26 March 2008.

"China Caucus Chairman Warns about Emerging China." *Defense Daily* 227, no. 46 (Sep 6, 2005): 1. http://proquest.umi.com/; Internet; accessed 17 January 2008.

"Does Canada Even Need Submarines?" *The Gazette,* Oct 16, 2004. http://proquest.umi.com/; Internet; accessed 17 January 2008.

"World Watch." *Wall Street Journal,* Dec 23, 2004. http://proquest.umi.com/; Internet; accessed 17 January 2008.

"For Sale: Russian Submarine." *Naval History* 14, no. 2 (Apr, 2000): 61. http://proquest.umi.com/; Internet; accessed 24 January 2008.

"Littoral Anti-Submarine Warfare Concept." http://www.fas.org/man/dod-101/sys/ship/docs/aswcncpt.htm#fig4; Internet; accessed 13 April 2008.

"Germany Details Indonesian Submarine Bid." *Jane's Defence Weekly* (Jun 11, 1997): 26. http://proquest.umi.com/; Internet; accessed 8 February 2008.

"India Agrees on Price for New Russian SSKs." *Sea Power* 40, no. 7 (Jul, 1997): 33. http://proquest.umi.com/; Internet; accessed 24 January 2008.

"Kilo Class for China." *Naval Forces* 18, no. 4 (1997): 80. http://proquest.umi.com/; Internet; accessed 24 January 2008.

"Malaysian Submarines." *Jane's Defence Weekly* (May 29, 1996): 13. http://proquest.umi.com/; Internet; accessed 8 February 2008.

"Russian-Built Submarine on Way to Iran, U.S. Says." *New York Times,* Dec 25, 1996. http://proquest.umi.com/; Internet; accessed 24 January 2008.

"Russia Intends to Fulfill Contract on Selling Submarines to Iran." *The Current Digest of the Post - Soviet Press* 47, no. 12 (Apr 19, 1995): 24. http://proquest.umi.com/; Internet; accessed 24 January 2008.

"Sub Sales to North Korea Raise Alarm." *The Vancouver Sun,* Jan 22, 1994. http://proquest.umi.com/; Internet; accessed 24 January 2008.

"Iran Eyes Purchase of Two More Russian Subs." *Aviation Week & Space Technology* 137, no. 19 (Nov 9, 1992): 20. http://proquest.umi.com/; Internet; accessed 24 January 2008.

"The Sinking of the Russian Sub Kursk!" http://www.whatreallyhappened.com/KURSK/index.html; Internet; accessed 23 April 2008.

"What Happened to 'Kursk'?" http://www.aeronautics.ru/nws002/kursk001.htm; Internet; accessed 23 April 2008.

"Table 5. Territorial Claims in the Spratly and Paracel Islands," Asian Studies WWW Virtual Library, http://www.southchinasea.org/why.html#Unifying_factors; Internet; 23 April 2008.

"Submarine Advisory Team (SAT) Standard Operating Procedures (SOPs)" *COMSUBLANT Battle Group Operations*, 5 December 2004.

"MTP 1 (D) Volume 1 - Multinational Maritime Tactical Instructions and Procedures," (Brussels: NATO, 2002).

"AJP 3. Allied Joint Maritime Operations," (Brussels: NATO, 2004).

"Overview: Association of Southeast Asian Nations," Association of Southeast Asian Nations, http://www.aseansec.org/64.htm; Internet; accessed 23 April 2008.

Annati, Massimo. "Arming Submarines: Torpedoes and/or Missiles ?" *Military Technology* 31, no. 4 (Apr, 2007): 108. http://proquest.umi.com/; Internet; accessed 17 January 2008.

Ball, Desmond. "Arms and Affluence: Military Acquisitions in the Asia-Pacific Region." *International Security* 18, no. 3 (Winter, 1993): 78-112. http://www.jstor.org/; Internet; accessed

Barisic, Sonja. "New Command Renews Navy Focus on Hunting Submarine." The Associated Press. http://www.globalsecurity.org/org/news/2004/040407-navy-command.htm; Internet; accessed 13 April 2008.

Barsky, Robert B. and Lutz Kilian. "Oil and the Macroeconomy since the 1970s." *The Journal of Economic Perspectives* 18, no. 4 (Autumn, 2004): 115-134. http://www.jstor.org/; Internet; accessed 24 March 2008.

Bateman, Sam. "Perils of the Deep: The Dangers of Submarine Operations in Asia." S. Rajaratnam School of Internation Studies. http://www.rsis.edu.sg/publications/Perspective/RSIS0122007.pdf; Internet; accessed 28 March 2008.

Bishop, Shelley. "The Navy's Whale Tale." *Sea Power* 48, no. 4 (Apr, 2005): 5. http://proquest.umi.com/; Internet; accessed 17 January 2008.

Bitzinger, Richard, Curie Maharani "Arms, Money, and Security: Southeast Asia's Growing Importance as an Arms Market." S. Rajaratnam School of Internation Studies. http://www.rsis.edu.sg/publications/Perspective/RSIS0432008.pdf; Internet; accessed 21 April 2008.

Bouchard, Chad. "Indonesia-Russia Arms Deal Raises Concern." GlobalSecurity.org. http://www.globalsecurity.org/military/library/news/2007/09/mil-070911-voa02.htm; Internet; accessed 6 April 2008.

Bourne, Dr John, Dr Peter Liddle, and Dr Ian Whitehead. *The Great World War 1914-45*. Vol. 2. London, England: Harpers Collins Publishers, 2000.

Bryant, Lynwood. "The Development of the Diesel Engine." *Technology and Culture* 17, no. 3 (Jul., 1976): 432-446. http://www.jstor.org/; Internet; accessed 17 January 2008.

Burgess, J. Peter. "The Politics of the South China Sea: Territoriality and International Law." *Security Dialogue* 34, no. no. 1 (March 2003, 2003), http://www.southchinasea.org/docs/Burgess,%20Politics%20of%20the%20South%20China%20Sea-Territoriality%20and%20.pdf ; Internet; accessed 6 February 2008.

Burgess, Richard R. "A New Generation." *Sea Power* 49, no. 7 (Jul, 2006): 26. http://proquest.umi.com/; Internet; accessed 17 January 2008.

Bush, George W. "29 January 2002 State of the Union Address." The White House. http://www.whitehouse.gov/news/releases/2002/01/20020129-11.html; Internet; accessed 20 March 2008.

Capaccio, Tony. "Iran might Try to Disrupt Hormuz Oil Flow if Attacked." Bloomberg.com. http://www.bloomberg.com/apps/news?pid=10000103&sid=a_Aw9B.MGCuY&refer=us; Internetl; accessed 21 March 2008.

Castelli, Christopher J. "Admiral: Diesel Subs OK for Others, Not U.S." http://www.military.com/features/0,15240,95378,00.html; Internet; accessed 9 February 2008.

Chen, Kathy. "China Buys Russian Submarines, Raising Tension Level in Region." *Wall Street Journal,* Feb 9, 1995. http://proquest.umi.com/; Internet; accessed 24 January 2008.

Clad, James and Patrick Marshall. "Southeast Asia's Quiet Arms Race." *Chicago Tribune,* 23 May 1992, http://pqasb.pqarchiver.com/chicagotribune/access/24410236.html?dids=24410236:24410236&FMT=ABS&FMTS=ABS:FT&type=current&date=May+23%2C+1992&author=James+Clad+and+Patrick+Marshall.&pub=Chicago+Tribune+(pre-1997+Fulltext)&edition=&startpage=21&desc=Southeast+Asia%27s+quiet+arms+race; Internet; accessed 2 April 2008.

Clancy, Tom. *Submarine: A Guided Tour Inside a Nuclear Warship*. New York: Berkley, 1993.

Compton-Hall, Richard. *Submarine Boats: The Beginnings of Underwater Warfare*. New York: ARCO Publishing Inc., 1983.

Cordesman, Anthony H. *Iran, Oil, and the Strait of Hormuz*. Washington, D.C.: Center for Strategic and Internation Studies, 2007, http://www.csis.org/media/csis/pubs/070326_iranoil_hormuz.pdf.; Internet; accessed 27 March 2008.

Day, Phillip. "Security in a Straitjacket? --- Why it's so Hard to make a Key Asian Waterway Safe from Terror." *Wall Street Journal,* Jun 13, 2003. http://proquest.umi.com/; Internet; accessed 2 April 2008.

Duk-Ki, Commander Kim. *Naval Strategy in Northeast Asia*. London, England: Frank Cass Publishers, 2000.

Eastwood, Robert K. "Macroeconomic Impacts of Energy Shocks." *Oxford Economic Papers* 44, no. 3 (Jul., 1992): 403-425. http://www.jstor.org/; Internet; accessed 24 March 2008.

Eckholm, Erik and Joseph Kahn. "Asia Worries about Growth of China's Economic Power." *The New York Times,* 24 November 2002, 2002, http://proquest.umi.com/; Internet; accessed 2 April 2008.

Ed, Crooks. "Threat of Dollars 100 Crude Raises Global Alarm." *Financial Times,* Nov 22, 2007. http://proquest.umi.com/; Internet; accessed 24 March 2008.

Energy Information Administration. "World Oil Transit Chokepoints." Department of Energy. http://www.eia.doe.gov/cabs/World_Oil_Transit_Chokepoints/Hormuz.html; Internet; accessed 21 February 2008.

———. "World Oil Transit Chokepoints." Department of Energy. http://www.eia.doe.gov/cabs/World_Oil_Transit_Chokepoints/Full.html; Internet; accessed 7 April 2008.

———. *World Petroleum Consumption* Department of Energy, 2008, http://www.eia.doe.gov/emeu/international/RecentPetroleumConsumptionBarrelsperDay.xls ; Internet; accessed 27 March 2008.

Erwin, Sandra I. "Diesel Submarine Irritant to U.S. Navy." http://www.nationaldefensemagazine.org/issues/2004/Aug/Diesel_Submarines.htm; Internet; accessed 9 February 2008.

Fattouh, Bassam. "The Myth of the Iranian Oil Weapon." Oxford Institute for Energy Studies. http://www.oxfordenergy.org/pdfs/comment_0807-2.pdf; Internet; accessed 20 February 2008.

———. "Spare Capacity and Oil Price Dynamics." Middle East Economic Survey. http://www.mees.com/postedarticles/oped/v49n05-5OD01.htm; Internet; accessed 18 April 2008.

Fontenoy, Paul E. *Submarines: An Illustrated History of their Impact*. Santa Barbara, California: ABC-CLIO Inc, 2007.

Friedman, Norman. "Back in the Surveillance Game." *United States Naval Institute. Proceedings* 133, no. 1 (Jan, 2007): 90. http://proquest.umi.com/; Internet; accessed 17 January 2008.

Galeotti, Dr Mark. "Decline & Fall | Russia Looks East." *Jane's Intelligence Review* (Jul 1, 1997): 291. http://proquest.umi.com/; Internet; accessed 24 January 2008.

Ganesan, N. "Malaysia in 2002: Political Consolidation Amid Change?" *Asian Survey* 43, no. 1, A Survey of Asia in 2002 (Jan. - Feb., 2003): 147-155. http://www.jstor.org/; Internet; accessed 8 February 2008.

Garret, Richard. *Submarines*. London, England: Weidemfeld and Nicolson, 1977.

Gill, R. Bates. "China Looks to Thailand: Exporting Arms, Exporting Influence." *Asian Survey* 31, no. 6 (Jun., 1991): 526-539. http://www.jstor.org/; Internet; accessed 8 February 2008.

Gisser, Micha and Thomas H. Goodwin. "Crude Oil and the Macroeconomy: Tests of some Popular Notions: Note." *Journal of Money, Credit and Banking* 18, no. 1 (Feb., 1986): 95-103. http://www.jstor.org/; Internet; accessed 24 March 2008.

Goldstein, Joshua S., Xiaoming Huang, and Burcu Akan. "Energy in the World Economy, 1950-1992." *International Studies Quarterly* 41, no. 2 (Jun., 1997): 241-266. http://www.jstor.org/; Internet; accessed 24 March 2008.

Gordon, Michael R. "Pentagon Says Russia is Selling Subs to Iran." *New York Times,* Sep 24, 1992. http://proquest.umi.com/; Internet; accessed 24 January 2008.

Grimmett, Richard F. "CRS Report for Congress. Conventional Arms Transfers to Developing Nations, 1999-2006." Congressional Research Service. http://assets.opencrs.com/rpts/RL34187_20070926.pdf; Internet; accessed 18 March, 2008.

Gronwald, Marc. "Large Oil Shocks and the US Economy: Infrequent Incidents with Large Effects." *The Energy Journal* 29, no. 1 (2008): 151. http://proquest.umi.com/; Internet; accessed 24 March 2008.

Gunton, Michael. *Submarines at War*. New York: Carroll and Graf Publishers, 2003.

Harkavy, Robert E. "The Changing International System and the Arms Trade." *Annals of the American Academy of Political and Social Science* 535, no. The Arms Trade: Problems and Prospects in the Post-Cold War World (Sep., 1994): 11-28. http://www.jstor.org/; Internet; accessed 8 February 2008.

Harris, Brayton. *Submarines: A Political, Social, and Military History*, edited by Walter J. Boyne. New York: The Berkley Publishing Group, 1997.

Harris, Geoffrey. "The Determinants of Defence Expenditure in the ASEAN Region." *Journal of Peace Research* Vol.23, no. 1 (March, 1986), http://www.jstor.org/; Internet; accessed 25 March 2008.

Heginbotham, Eric. "The Fall and Rise of Navies in East Asia: Military Organizations, Domestic Politics, and Grand Strategy." *International Security* 27, no. 2 (Autumn, 2002): 86-125. http://www.jstor.org/; Internet; accessed 8 February 2008.

Hervey, J. B. *Submarines*. London, England: Brassey's Ltd, 1994.

Hezlet, Admiral Sir Arthur. *The Submarine and Seapower*. Plymouth, England: Clarke, Doble & Brendon Ltd, 1967.

Hickley, Matthew. "The Uninvited Guest: Chinese Sub Pops Up in Middle of U.S. Navy Exercise, Leaving Military Chiefs Red-Faced." Daily Mail. http://www.dailymail.co.uk/pages/live/articles/news/worldnews.html?in_article_id=492804&in_page_id=1811; Internet; accessed 6 February 2008.

Hilburn, Matt. "Asymmetric Strategy." *Sea Power* 49, no. 12 (Dec, 2006): 14. http://proquest.umi.com/; Internet; accessed 17 January 2008.

Hinchcliffe, Commander Peter, "Countering the SSK: A CO's Perspective," *Canadian Maritime Tactical Newsletter*, 2002.

Hoon, Shim Jae. "Russia Returns." *Far Eastern Economic Review* 163, no. 2 (Jan 13, 2000): 21. http://proquest.umi.com/; Internet; accessed 24 January 2008.

Horton, Edward. *The Illustrated History of the Submarine*. London, England: Sidgwick & Jackson, 1974.

House Permanent Select Committee on Intelligence. *Recognizing Iran as a Strategic Threat: An Intelligence Challenge for the United States*2006, http://intelligence.house.gov/Media/PDFS/IranReport082206v2.pdf; Internet; accessed 27 March 2008.

Hubbard, R. Glenn. "Supply Shocks and Price Adjustment in the World Oil Market." *The Quarterly Journal of Economics* 101, no. 1 (Feb., 1986): 85-102. http://www.jstor.org/; Internet; accessed 24 March 2008.

Hughes, Robin. Iran's Ballistic Missile Developments - Long Range Ambitions. 2006. , http://jdw.janes.com/subscribe/jdw/; Internet; accessed 28 January 2008.

Huxley, Tim. "Singapore in 2000: Continuing Stability and Renewed Prosperity Amid Regional Disarray." *Asian Survey* 41, no. 1, A Survey of Asia in 2000 (Jan. - Feb., 2001): 201-207. http://www.jstor.org/; Internet; accessed 8 February 2008.

Hyer, Eric. "China's Arms Merchants: Profits in Command." *The China Quarterly* no. 132 (Dec., 1992): 1101-1118. http://www.jstor.org/; Internet; accessed 17 January 2008

Jacobs, Keith. "Indonesian Navy: A Stabilising Factor in South East Asia." *Naval Forces* 27, no. 5 (2006): 93. http://proquest.umi.com/; Internet; accessed 2 April 2008.

Jones, Charles M. and Gautam Kaul. "Oil and the Stock Markets." *The Journal of Finance* 51, no. 2 (Jun., 1996): 463-491. http://www.jstor.org/; Internet; accessed 23 March 2008.

Kahn, Erik Eckholmjoseph. "Asia Worries about Growth of China's Economic Power." *New York Times,* Nov 24, 2002. http://proquest.umi.com/; Internet; accessed 2 April 2008.

Keller, John. "New Ship Takes Lead in Countermine and Anti-Submarine Warfare." *Military & Aerospace Electronics* 17, no. 8 (Aug, 2006): 28. http://proquest.umi.com/; Internet; accessed 17 January 2008.

Keller, William W. and Janne E. Nolan. "The Arms Trade: Business as Usual?" *Foreign Policy* no. 109 (Winter, 1997): 113-125. http://www.jstor.org/; Internet; accessed 17 March 2008.

Kelly, LCDR Christopher J. "The Submarine Force in Joint Operations."Air Command and Staff College Air University, 1998. http://www.rtna.ac.th/article/The%20Submarine%20Force%20in%20Joint%20Operations_Research%20paper%20of%20Mexwell%20Airforce%20Base%20USA.pdf; Internet; accessed 10 April 2008.

Kinsella, David. "Rivalry, Reaction, and Weapons Proliferation: A Time-Series Analysis of Global Arms Transfers." *International Studies Quarterly* 46, no. 2 (Jun., 2002): 209-230. http://www.jstor.org/; Internet; accessed 17 March 2008.

Klare, Michael T. "The Arms Trade in the 1990s: Changing Patterns, Rising Dangers." *Third World Quarterly* 17, no. 5 (Dec., 1996): 857-874. http://www.jstor.org/; Internet; accessed 8 February 2008.

Lague, David. "Money is the Motive in Sales of Weapons and Technology to Beijing: China Keeps Russia, Israel Up in the Arms Stakes." *Far Eastern Economic Review* 165, no. 3 (Jan 24, 2002): 32. http://proquest.umi.com/; Internet; accessed 24 January 2008.

Lautenschlager, Karl. "The Submarine in Naval Warfare, 1901-2001." *International Security* 11, no. 3 (Winter, 1986): 94-140. http://www.jstor.org/; Internet; accessed 17 January 2008.

Lawrence,Susan V. and David Lague. "China's Russian-Arms Spree --- an Eye on Taiwan, Beijing Sustains Ex-Soviet Defense Industry." *Wall Street Journal,* Dec 10, 2002. http://proquest.umi.com/; Internet; accessed 24 January 2008.

Levine, Paul and Ron Smith. "Arms Export Controls and Proliferation." *The Journal of Conflict Resolution* 44, no. 6, Economic Analysis of Conflict (Dec., 2000): 885-895. http://www.jstor.org/; Internet; accessed 17 March 2008.

Liu, Melinda and Kevin Platt. "Buying a Better Army; China has Turned to an Old Strategic Rival-- Russia--to Help Modernize its Military." *Newsweek* (Dec 18, 2000): 46. http://proquest.umi.com/; Internet; accessed 24 January 2008.

Luft, Gal and Korin, Anne. "Terror's Next Target." Institute for the Analysis of Global Security. http://www.iags.org/n0111041.htm; Internet; accessed 25 February 2008.

Mak, J.N. "Sovereignty in ASEAN and the Problem of Maritime Cooperation in the South China Sea," Working paper, S Rajaratnam School of International Studies, 2008.

Manseck, Hartmut. "Royal Thai Navy." *Naval Forces* 28, no. 5 (2007): 102. http://proquest.umi.com/; Internet; accessed 8 February 2008.

Mazzetti, Mark. "Gates Pledges U.S. Help for Indonesian Military." *New York Times,* Feb 26, 2008. http://proquest.umi.com/; Internet; accessed 2 April 2008.

McConnell, J. Michael. *Annual Threat Assessment of the Intelligence Community for the Senate Armed Services Committee*Director of National Intelligence, 2008, http://www.dni.gov/testimonies/20080227_testimony.pdf; Internet; accessed 27 March 2008.

Meconis, Charles A. and Michael D. Wallace. *East Asian Naval Weapons Acquisitions in the 1990s: Causes, Consequences, and Responses*. Westport, Connecticut: Praeger Publishers, 2000.

Mehrara, Mohsen. "The Asymmetric Relationship between Oil Revenues and Economic Activities: The Case of Oil-Exporting Countries." *Energy Policy* 36, no. 3 (Mar, 2008): 1164. http://proquest.umi.com/; Internet; accessed 24 March 2008.

Miller, David. *Submarines of the World*. St. Paul, Minnesota: MBI Publishing Company, 2002.

Moeller, Rear Admiral Robert T. "Statement before the House Committee on Resources." http://www.navy.mil/navydata/testimony/readiness/moeller030506.txt; Internet; accessed 13 April 2008.

Mohamedi, Fareed. "Oil Prices and Regime Resilience in the Gulf." *Middle East Report* no. 232 (Autumn, 2004): 36-38. http://www.jstor.org/; Internet; accessed 24 March 2008.

Moore, Captain J. E. and Commander R. Compton-Hall. *Submarine Warfare: Today and Tomorrow*. London, England: Michael Joseph Ltd, 1986.

Morgan, Captain J. "Anti-Submarine Warfare: A Phoenix for the Future." Federation of American Scientists. http://www.fas.org/man/dod-101/sys/ship/docs/anti-sub.htm; Internet; accessed 15 February 2008.

Mouawad, Jad and Cleveland.,Christopher Maag contributed reporting from. "Gas Prices Soar, Posing a Threat to Family Budget." *New York Times,* Feb 27, 2008. http://proquest.umi.com/; Internet; accessed 24 March 2008.

Muller, Davis G. Jr. *China as a Maritime Power*. Boulder, Colorado: Westview Press, 1983.

Myers, Cmdr John M. "Singular Vision: A Plan to Enable CENTCOM and State to Work Together." Armed Forces Journal. http://www.afji.com/2008/03/3190410; Internet; accessed 28 March 2008.

Neuman, Stephanie G. "International Stratification and Third World Military Industries." *International Organization* 38, no. 1 (Winter, 1984): 167-197. http://www.jstor.org/; Internet; accessed 17 January 2008.

Olive, David. "Running on Empty; Once a Blessing, our Oil Dependency is Now a Curse. and Things are Likely to Get Worse before they Get Better." *Toronto Star,* Mar 16, 2008. http://proquest.umi.com/; Internet; accessed 24 March 2008.

O'Reilly, Finbarr. "180 Russian Subs Decommissioned in Bid to Raise Cash: Cold War Relics for Sale: Used as Restaurants, Tourist Attractions." *National Post,* Aug 15, 2000. http://proquest.umi.com/; Internet; accessed 24 January 2008.

Panneton, John A. "Striking a Balance." *Sea Power* 49, no. 8 (Aug, 2006): 3. http://proquest.umi.com/; Internet; accessed 17 January 2008.

Paul, Richter "U.S. Threatens Sanctions if Russians Arm Tehran." *The Gazette,* Nov 23, 2000. http://proquest.umi.com/; Internet; accessed 24 January 2008.

Phillips,Michael M. and Bob Davis. "Gore is Criticized for Russian Arms Deal that Endorsed Sale of Submarine to Iran." *Wall Street Journal,* Oct 16, 2000. http://proquest.umi.com/; Internet; accessed 24 January 2008.

Pirog, Robert. "CRS Report for Congress - World Oil Demand and its Effects on Oil Prices." Congressional Research Service. http://www.fas.org/sgp/crs/misc/RL32530.pdf; Internet; accessed 25 February 2008.

Polmar, Norman and Julian Noot. *Submarines of the Russian and Soviet Navies, 1718-1990*. Annapolis, Maryland: Naval Institute Press, 1991.

Pringle, Peter. "Concerns Rise Over Russian Arm Sales." *The Ottawa Citizen,* Sep 26, 1992. http://proquest.umi.com/; Internet; accessed 24 January 2008.

Prozorov, V. S. "Deployment Experience of Pacific Fleet Diesel Submarines." *Military Thought* 15, no. 2 (2006): 190. http://proquest.umi.com/; Internet; accessed 24 January 2008.

Regehr, Ernie. "Canada and the Arms Trade Treaty." *Behind the Headlines* 64, no. 6 (Nov, 2007): 1. http://proquest.umi.com/; Internet; accessed 17 March 2008.

Reynolds, Alan. "Oil Prices: Cause and Effect." CATO Institute. http://www.cato.org/pub_display.php?pub_id=3947; Internet; accessed 26 February 2008.

Roberts, Brad. "From Nonproliferation to Antiproliferation." *International Security* 18, no. 1 (Summer, 1993): 139-173. http://www.jstor.org/; Internet; accessed 17 January 2008.

Sanchez-Andres, Antonio. "Arms Exports and Restructuring in the Russian Defence Industry." *Europe-Asia Studies* 56, no. 5 (Jul., 2004): 687-706. http://www.jstor.org/; Internet; accessed 17 January 2008.

———. "Restructuring the Defence Industry and Arms Production in Russia." *Europe-Asia Studies* 52, no. 5 (Jul., 2000): 897-914. http://www.jstor.org/; Internet; accessed 17 January 2008.

Sanger, David E. "North Korea Buying Old Russian Subs." *New York Times,* Jan 20, 1994. http://proquest.umi.com/; Internet; accessed 24 January 2008.

Saunders, Commodore Stephen, ed. *Jane's: Fighting Ships*. 110th 2007-2008 ed. Surrey, England: Jane's Information Group Limited, 2007.

Shambaugh, David. "China's Military in Transition: Politics, Professionalism, Procurement and Power Projection." *The China Quarterly* no. 146, Special Issue: China's Military in Transition (Jun., 1996): 265-298. http://www.jstor.org/; Internet; accessed 17 January 2008.

Simon, Sheldon W. "Alternative Visions of Security in the Asia Pacific." *Pacific Affairs* 69, no. 3 (Autumn, 1996): 381-396. http://www.jstor.org/; Internet; accessed 8 February 2008.

———. "East Asian Security: The Playing Field has Changed." *Asian Survey* 34, no. 12 (Dec., 1994): 1047-1063. http://www.jstor.org/; Internet; accessed 8 February 2008.

———. "Davids and Goliaths: Small Power-Great Power Security Relations in Southeast Asia." *Asian Survey* 23, no. 3 (Mar., 1983): 302-315. http://www.jstor.org/; Internet; accessed 8 February 2008.

Stalinsky, Steven. "The Iranian Military Targets American Forces." The New York Sun. http://www2.nysun.com/article/48978; Internet; accessed 28 March 2008.

Till, Geoffrey. *Seapower: A Guide to the Twenty-First Century*. Cornwall, England: Frank Cass Publishers, 2004.

———. *Modern Seapower*. Vol. One. London, England: Brassey's Defence Publishers, 1987.

Tzu, Sun. *The Art of War* . Translated by Samuel B. Griffith. New York: Oxford University Press, 1963.

United Nations General Assembly. "United Nations General Assembly Resolution A/Res/61/89." United Nations. http://www.un.org/News/Press/docs/2006/ga10547.doc.htm; Internet; accessed 18 March 2008.

Vego, Milan N. *Naval Strategy and Operations in Narrow Seas*. Portland, Oregon: Frank Cass Publishers, 1999.

Wallace, Michael D. and Charles A. Meconis. "Submarine Proliferation and Regional Conflict." *Journal of Peace Research* 32, no. 1 (Feb., 1995): 79-95. http://www.jstor.org/; Internet; accessed 17 January 2008.

Watkins, Eric. "Chavez Courts Russia, Iran." *Oil & Gas Journal* 105, no. 26 (Jul 9, 2007): 28. http://proquest.umi.com/; Internet; accessed 17 January 2008.

Watts, Anthony J., ed. *Janes's: Underwater Warfare Systems*. 15th 2003-2004 ed. Surrey, England: Jane's Information Group Limited, 2003.

Weiner, Tim. "U.S. Leads Sales in World's Multibillion-Dollar Armaments Market Saudi Arabia, Taiwan are Biggest Weapons Buyers; Russia's Economic Troubles Fuel Sales as Source of Hard Currency." *The Globe and Mail,* Aug 5, 1998. http://www.jstor.org/; Internet; accessed 24 January 2008.

Woolf, Amy F., Steve Bowman, and Sharon Squassoni. *CRS Report for Congress. Arms Control and Nonproliferation: A Catalog of Treaties and Agreements*Congressional Research Service, 2007, http://www.fas.org/sgp/crs/nuke/RL33865.pdf; Internet; accessed 12 March 2008.

Yucel, Mine K. "Reducing U. S. Vulnerability to Oil Supply Shocks." *Southern Economic Journal* 61, no. 2 (Oct., 1994): 302-310. http://www.jstor.org/; Internet; accessed 24 March 2008.

Yusin, Maksim. "The Last Submarine Will Cast Off for Teheran." *The Current Digest of the Post - Soviet Press* 46, no. 39 (Oct 26, 1994): 3. http://proquest.umi.com/; Internet; accessed 24 January 2008.

Zubir, Mokhzani. "THe Strategic Value of the Strait of Malacca." Centre for Maritime Security and Diplomacy - Maritime Institute for Malaysia. http://www.mima.gov.my/mima/htmls/papers/pdf/mokhzani/strategic-value.pdf; Internet; accessed 16 February 2008.