NAVAL POSTGRADUATE SCHOOL

Monterey, California

THESIS

THE PROLIFERATION OF CONVENTIONALLY-POWERED SUBMARINES: BALANCING U.S. CRUISE MISSILE DIPLOMACY? THE CASES OF INDIA AND IRAN

by

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June 1997

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19980102 098

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DTIC QUALITY INSPECTED 4

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	June 1997	Master's Thesis

4. TITLE AND SUBTITLE

THE PROLIFERATION OF CONVENTIONALLY-POWERED SUBMARINES: BALANCING U.S. CRUISE MISSILE DIPLOMACY? THE CASES OF INDIA AND IRAN

5. FUNDING NUMBERS

6. AUTHOR(S)

Eric R. Jones

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Naval Postgraduate School
Monterey CA 93943-5000

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT *(maximum 200 words)*

The end of the Cold War has left the United States as the world's sole superpower. The ability of the United States to strike deep into the territories of most nations with impunity represents a new security threat to many nations. Defeating the U.S. military is not feasible in most cases, but balancing the United States may be possible, especially with weapons of mass destruction (WMD). Although WMD might provide a formidable deterrent, their technical, political, and economic costs preclude most nations from pursuing them. On the other hand, modern conventionally-powered submarines are easier to obtain and operate and could present a significant deterrent to U.S. military force. This thesis assesses whether the perceived threat posed by the United States has emerged as a motivation for acquiring conventionally-powered submarines since the end of the Cold War. After examining the motivations behind the recent submarine acquisitions of India and Iran, this thesis presents an economic model to predict when developing nations will be able to afford submarines if they choose to acquire them.

14. SUBJECT TERMS

India, Iran, Submarine Proliferation, Economics

15. NUMBER OF PAGES
113

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18
298-102

Approved for public release; distribution is unlimited

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Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF ARTS IN NATIONAL SECURITY AFFAIRS

from the

NAVAL POSTGRADUATE SCHOOL
June, 1997

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ABSTRACT

The end of the Cold War has left the United States as the world's sole superpower. The ability of the United States to strike deep into the territories of most nations with impunity represents a new security threat to many nations. Defeating the U.S. military is not feasible in most cases, but balancing the United States may be possible, especially with weapons of mass destruction (WMD). Although WMD might provide a formidable deterrent, their technical, political, and economic costs preclude most nations from pursuing them. On the other hand, modern conventionally-powered submarines are easier to obtain and operate and could present a significant deterrent to U.S. military force. This thesis assesses whether the perceived threat posed by the United States has emerged as a motivation for acquiring conventionally-powered submarines since the end of the Cold War. After examining the motivations behind the recent submarine acquisitions of India and Iran, this thesis presents an economic model to predict when developing nations will be able to afford submarines if they choose to acquire them.

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EXECUTIVE SUMMARY

The increasing U.S. reliance on cruise missile diplomacy since the end of the Cold War has left many nations with a perceived security threat posed by the United States. This thesis assesses whether this perceived threat has emerged as a motivating factor behind conventionally-powered submarine acquisition. After examining the supply and demand-side factors behind conventional weapons transfers in general, this thesis analyzes the recent submarine acquisitions of India and Iran to determine if balancing the United States may have been a motivating factor.

Powerful supply-side factors currently make it a "buyers' market" for advanced conventional arms. Whether the supplier state is motivated to maintain its technological base, produce arms for economy of scale, or raise hard currency from foreign sources, it must actively seek markets for its arms. Submarine suppliers make attractive deals including the most advanced technology, training, support, and weapons to lure foreign buyers.

Although supply-side factors play a role in all conventional weapons transfers, historically, it has been the demand-side factors that drive countries to acquire conventional arms. Prestige, political influence, technology, bureaucracy, and security concerns are the demand-side factors assessed in this thesis. While each of these may play a role to varying degrees, security concerns appear to be the primary driver. Although documented evidence of motivations for any weapons acquisition simply does

not exist, motivations are inferred by examining details of the deal and the proposed methods of employment.

In January 1997, the Indian Defense Ministry concluded a deal with Russia to purchase two Project-636 *Kilo* submarines for approximately $430 million. It has also been reported that the latest Indian defense budget will include funds to build two more submarines to be in service by 2005. India produced two German Type-209s under license at the Mazagon Dock Ltd., Bombay during the 1980s. Although Indian security concerns over Pakistan's recent submarine acquisition from France are the primary drivers behind India's submarine acquisition, evidence suggests that balancing the U.S. naval presence in the region also might have played a small role.

Also in January 1997, Iran took delivery of its third *Kilo* class conventionally-powered submarine from Russia. The $600 million per hull deal included training, technical support, and weapons (including wake-homing heavy-weight torpedoes). This submarine capability will significantly enhance Iran's already considerable layered littoral warfare capabilities. Iran's acquisition of these submarines presents the best case of a regional power attempting to balance the overwhelming superiority of the United States.

After establishing the possibility that balancing the United States may be a motive for submarine acquisition, this thesis lays the foundation for building a predictive model of when emerging countries will be able to afford submarines because supply and demand-side factors are not the only issues involved. Using economic variables and statistical analysis, this thesis presents a preliminary model for predicting when countries can afford

submarines. Although economic constraints can be overcome when a nation is highly motivated to acquire expensive conventional weapons to counter perceived security threats, economic considerations can play a role in the decision making process. The model presented here requires refinement, however, it may prove useful for planning purposes to forecast when potential adversaries could acquire conventionally-powered submarines.

The findings of this thesis indicate that balancing the United States has emerged as a motivating factor in the acquisition of conventionally-powered submarine since the end of the Cold War. Also, the current "buyers' market" coupled with the growing economies of emerging nations suggests that more nations will be able to afford conventionally-powered submarines in the near future. The implications of these findings are that conventionally-powered submarines will continue to proliferate, as well as the number of countries operating them. U.S. policy makers must take into consideration the perceptions of nations with the potential to acquire submarines and weigh carefully the inherent costs associated with conducting cruise missile diplomacy against a nation possessing conventionally-powered submarines. And finally, the U.S. Navy must continue to shift its ASW focus to the conventionally-powered submarine operated in the littorals.

ACKNOWLEDGMENTS

No work is complete without acknowledging those who made it possible or worthwhile. I would first like to thank my father, Lloyd Jones, who so many years ago, took the time and effort to instill what I consider a healthy work ethic without which I would not even have had the opportunity to undertake this project. I must also thank my parents, Anita and Larry Anderson, for their continued unwavering support and nurturing the belief that I could accomplish anything. I would also like to express my most sincere appreciation to Dr. Richard Starr who helped get me started on the journey of higher learning and whose wisdom and generosity have meant so much to me.

For their help on this project specifically, I would first like to thank my thesis co-advisors Peter Lavoy and Robert Looney for all their efforts in making this work possible. I would also like to thank John Benedict who graciously provided much of the technical information required for this project. Special thanks go to Professor Frank Teti for rekindling my appreciation for philosophy and literature and to Professor Cynthia Levy for all her support. I must also thank my good friend Tim Sparks for his companionship during this study and for being a sounding board for all these "big thoughts."

Most of all, I would like thank my wife, Sonja, whose love, friendship, and support have truly given me meaning to life.

I. INTRODUCTION

The end of the Cold War has left the United States as the dominant military power in the world. Coupled with the global nature of U.S. national security interests, this unprecedented military superiority places the United States at odds with many nations with regional aspirations. The Gulf War and subsequent unilateral U.S. cruise missile attacks against Iraq has left many nations with a perceived security threat posed by the United States. According to balance-of-power theory, states will seek to balance threats posed by other states. In seeking to preserve their autonomy in the anarchic context of international relations, states will respond to the perceived threats posed by other states.[1] "States must constantly be ready to counter force with force or pay the cost of weakness."[2] So how do nations attempt balance the overwhelming conventional military force of the United States?

It must be understood at the outset that efforts to balance do not imply attempts to achieve equality. Balancing the threat posed by the United States does not require becoming a peer competitor or defeating the United States directly. Rather, regional powers can balance the overwhelming conventional military forces of the United States to a degree by increasing the risks and costs involved with U.S. intervention in a region. It is

[1] Barry R. Posen, *The Sources of Military Doctrine* (Ithica, New York: Cornell University Press, 1984), 17.

[2] Kenneth N Waltz, "The Third Image: International Conflict and International Anarchy," *Man, The State and War: A Theoretical Analysis* (New York: Columbia University Press, 1959), 160.

a given that the United States will remain engaged in a region as long as its national security objectives are at stake; however, by increasing the risks involved, a regional power could deter U.S. intervention in pursuit of lesser objectives. Thus the regional actor could have more latitude to pursue its objectives.

Since the end of the Gulf War, the United States has resorted to cruise missile strikes in pursuit of its national interests on four separate occasions. Whether employed for deterrence,[3] compellance,[4] or reprisal,[5] Tomahawk cruise missiles have become the weapon of choice for the U.S. National Command Authority. In fact, the use of cruise missiles has become the latest version of U.S. gunboat diplomacy.[6] Not only can they be employed without the fear of losing pilots, but steaming in international waters, U.S. warships, both surfaced and submerged, can lob cruise missiles deep within most nations' territories with near impunity. See Figure 1 for worldwide Tomahawk cruise missile coverage. This is the conventional military capability against which many other nations are likely to seek to balance.

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[3] Iraq, September 1996, U.S. use of cruise missiles to deter Saddam Hussein from advancing in the south.

[4] Bosnia, Summer 1995, U.S. use of cruise missiles to compel factions to the negotiating table.

[5] Iraq, January 1993, U.S. use of cruise missiles to destroy the nuclear weapons factory, and Iraq, June 1993, U.S. use of cruise missiles to destroy an intelligence building in response to the plotted assassination of former President Bush.

[6] For a detailed analysis of Tomahawk cruise missile employment since the Gulf War, see Timothy F. Sparks, "The Dawn of Cruise Missile Diplomacy," (Thesis, Naval Postgraduate School, Monterey, 1997).

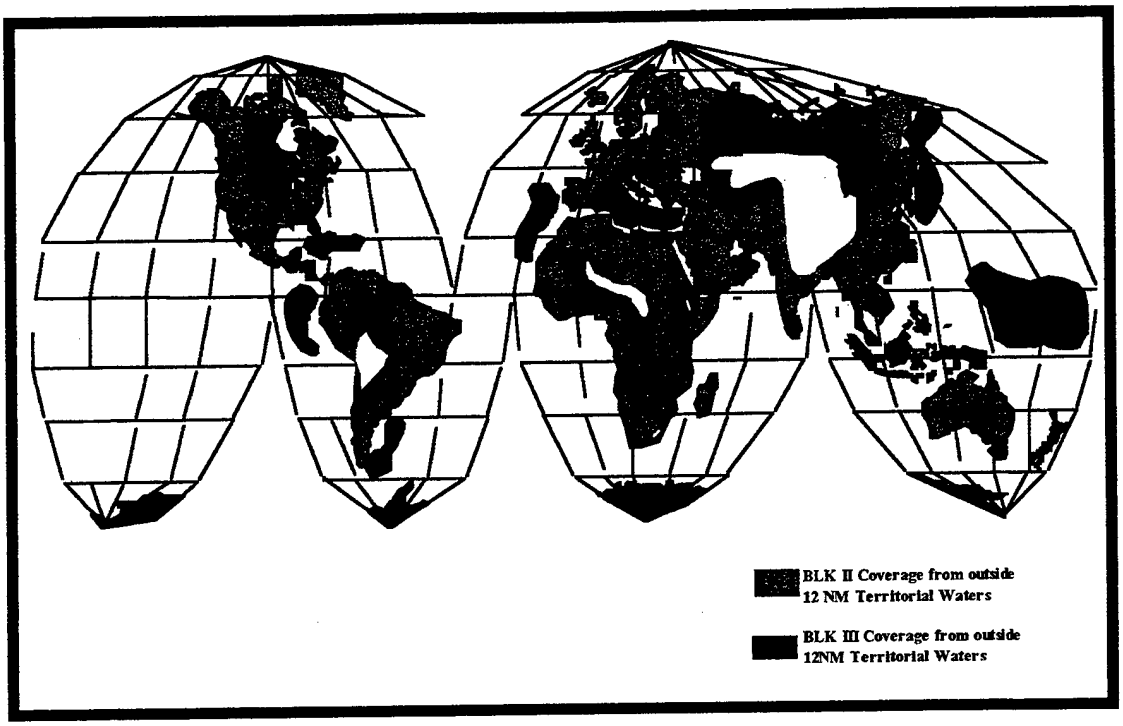

Figure 1. Worldwide Tomahawk Coverage
Courtesy of U.S. Navy Program Executive Office: Cruise Missiles and UAVs

Weapons of mass destruction (WMD) certainly provide a balancing option. Possession of WMD by foreign states (and even non-state actors) can weigh heavily on the calculus U.S. decision makers use to determine if the United States should be involved in a region; however, the immense technical, economic, and political costs of WMD have precluded most states from pursuing them.[7] Additionally, Iraqi attempts to develop WMD have been met with U.S. cruise missile attacks. Could this be a harbinger of future U.S. response to WMD development by other nations? Furthermore, simply possessing

[7] For a detailed analysis of the technical and economic costs of WMD development see Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction* (Washington, D.C.: U.S. Government Printing Office, 1993).

WMD may not be enough to deter U.S. cruise missile attacks since, with the exception of nuclear weapons, WMD are virtually ineffective against U.S. naval vessels.[8] State-sponsored terrorism could provide another balancing option, but here again the political costs would be enormous.[9]

If countries are unable to balance the United States with WMD or state-sponsored terrorism, how can they preserve their autonomy in the face of overwhelming U.S. conventional forces? It may be possible for nations to balance U.S. conventional military force by incorporating the latest technology in a thousand-year-old concept -- the modern conventionally-powered submarine.

This thesis examines the supply and demand-side factors behind the acquisition of modern conventionally-powered submarines and assesses whether U.S. military strategies since the end of the Cold War have actually motivated some nations to acquire them. The recent submarine acquisitions of India and Iran are presented as case studies. Using statistical analysis, this thesis then assesses the feasibility of using economic indicators to predict when a nation will be able to afford acquiring submarines. And finally, this thesis explores the implications the proliferation of modern conventionally-powered submarines have for future U.S. foreign policy and makes recommendations on how the United States can minimize their impact.

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[8] Not only are the means to deliver and disperse chemical and biological weapons inadequate to completely disable naval vessels at sea, U.S. naval vessels are equipped and trained in mission oriented protective postures (MOPP) that allow the ship to continue its mission while under chemical or biological attack.

[9] If accountability of a terrorist act could be traced back to a particular state, U.S. retaliation would most likely be massive.

The remainder of this chapter introduces modern submarine warfare by tracing its development from the Second World War to the Falklands War and then assesses the significance of current submarine capabilities. The following two chapters discuss the supply-side and demand-side factors behind arms transfers more generally; chapters four and five are the case studies on India and Iran respectively. The economic analysis and forecast portion of this study are presented in chapter six. The concluding chapter summarizes the main findings of the study, their implications, and presents policy recommendations.

A. THE SUBMARINE AS A BALANCE TO U.S. STRATEGY

Invincibility lies in the defense; the possibility of victory in the attack.
One defends when his strength is inadequate; he attacks when it is abundant.

Sun Tzu[10]

The modern conventionally-powered submarine can offer many states a potent alternative to developing WMD to raise the potential costs of U.S. involvement in the region. The conventionally-powered submarines currently on the market are sophisticated and have the potential to challenge and significantly complicate U.S. military options. These submarines can remain undetected in the relatively restricted waters of littoral regions. Equipped with modern anti-ship torpedoes and mines, even one or two submarines can have significant destructive power. Upgraded with high-

[10] Sun Tzu, *The Art of War*, trans. Samuel B. Griffith (London: Oxford University Press, 1971), 85.

technology quieting, sensors, weapons, and propulsion systems, these submarines have the potential to hold enemy naval forces at risk while posing a difficult challenge for anti-submarine forces. Coupled with the recent U.S. de-emphasis in anti-submarine warfare (ASW) as a result of the end of the Cold War,[11] conventionally-powered submarines can present a significant deterrent to regional intervention by U.S. naval forces.

1. Historical Precedence

The concept of submarine warfare is almost as old as naval warfare itself; however, it was not until the beginning of the twentieth century that the submarine came into its own as a weapon of war. By the Second World War, the submarine was an instrument of global power.[12] Although the submarine was initially employed as an instrument of attrition warfare, it has proven to be an effective coastal defense platform. The following historical accounts are not intended to be authoritative or all inclusive; however, they are intended to illustrate the tremendous impact a relatively small number of submarines can have and the massive ASW effort required to counter them.

[11] Thomas A. Brooks, Rear Admiral, U.S. Navy (Ret.), "Whatever Happened to ASW?" *U.S. Naval Institute Proceedings* 122 no. 2 (February 1996), 13.

[12] For an excellent survey of the evolution of submarine technology, submarine capability, and strategies in submarine warfare see Karl Lautenschläger, "The Submarine in Naval Warfare," *International Security* 11 no. 3 (Winter 1986-87): 94-140.

a. Germany During World War II

Between 1935 and 1945, the German navy commissioned a total of 1,171 submarines. During the war 940 German U-boats sortied and were responsible for the sinking of over 2,800 Allied merchant ships, accounting for 68 percent of all tonnage. Between January and July 1942, 14 German U-boats sank over 450 Allied ships. The Allied ASW response was tremendous. For each operational U-boat, the United States and Britain responded with 25 warships and over 100 aircraft. In the end, over 6 million men, 5,500 specially constructed ships and 20,000 small craft were required to counter the German U-boat threat.[13] This tremendous dedication of men and material ultimately resulted in the destruction of 593 of the 784 German U-boats lost during the war.[14]

b. United States During World War II

In the Pacific Campaign against Imperial Japan during the Second World War, the United States sortied 249 submarines against Japan. The U.S. Submarine Force is credited with the destruction of 1,178 Japanese merchant vessels (5,053,491 tons) and 214 Japanese Naval vessels accounting for 55 percent of all Japanese shipping sunk during the war in the Pacific.[15] The Japanese ASW effort was not nearly as effective as

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[13] Department of the Navy, *Naval Warfare, Naval Doctrine Publication 1* (Washington, D.C.: U.S. Government Printing Office, 1994), 32.

[14] Karl Lautenschläger, "The Submarine in Naval Warfare, 1901-2001," 122.

[15] Theodore Roscoe, *U.S. Submarine Operations in WWII* (Annapolis, Maryland: Naval Institute Press, 1949): 491-494.

that of the Allies against Germany; however, it too required a disproportionate allocation of resources and is credited with 31 of the 48 U.S. submarines lost during the war.[16]

c. *Indo-Pakistani War, 1971*

During the 1971 Indo-Pakistani war, three of the four Pakistani submarines (an ex-U.S. *Tench* class submarine renamed *Ghazi* and two of the three modern *Daphne* class) were involved in combat operations. At the outbreak of hostilities, Pakistan had been operating submarines for less than ten years and had only been operating the *Daphnes* for one year, yet the best ASW efforts of the Indian Navy were unable to defeat the Pakistani *Daphne*-class submarines. In fact, no modern diesel submarine has ever been destroyed by ASW forces.[17]

The *Ghazi* and one of the *Daphne* submarines conducted operations in the Bay of Bengal during the first two days of the conflict, 2,000-3,000 nautical miles from their Karachi operating base. The *Ghazi*, while attempting to mine a harbor off Vishakhapatam apparently struck one of its own mines and sunk, but the *Daphne*, after conducting a refueling operation south of Sri Lanka, attacked the Indian aircraft carrier *Vikrant* just south of Cox's Bazar, 3,000 nautical miles from Karachi. Although the *Daphne's* attack was unsuccessful, so was the Indian ASW counter attack. One week

[16] Karl Lautenschläger, "The Submarine in Naval Warfare, 1901-2001," 122.

[17] John R Benedict, "Future Perspectives in Antisubmarine Warfare." *APL Technical Review* 3, no. 2 (1992),161.

later, Pakistan's other *Daphne*, operating in the Arabian Sea south of Diu, attacked and sunk an Indian ASW frigate that was investigating a reported submarine sighting.

d. Falklands War, 1982

During the Falklands War, although the Argentinean Type-209 submarine *San Luis* was unsuccessful in its attacks on British warships, it did elude the best ASW efforts of the British Navy. The Argentinean submarine had an inexperienced and poorly trained crew. Nevertheless, it spent almost seven weeks at sea, operated up to 800 nautical miles from its operating base, conducted two attacks on British warships, and survived the conflict. Failure of both single-shot torpedo attacks conducted by the *San Luis* was attributed to maintenance problems (fire control computer casualties) and training deficiencies (torpedo control wires were broken prematurely).

The massive British ASW effort against this single conventionally-powered submarine was unsuccessful. Numerous British assets were dedicated to the effort including two ASW aircraft carriers and over a dozen frigates and destroyers. During the course of the conflict, the British expended over 200 items of ASW ordnance against this one submarine and what was described as a "sea full of false targets."[18]

Traditionally, the submarine has been the preferred ASW weapon; however, it is extremely difficult to coordinate surface and submarine ASW efforts. The

[18] Benedict, "Future Perspectives in Antisubmarine Warfare," 160.

required communications between the involved surface ships and submarines and the identification of friendly submarines significantly impedes the detection, classification, and identification of enemy submarines. The British submarines that were deployed to the theater during the Falklands War were not integrated into a coordinated ASW effort. In fact, these submarines were specifically kept out of the area to eliminate the possibility of fratricide and allow for an "ASW weapons free" zone for surface and air assets to prosecute the enemy submarine.[19]

2. Current Assessment

Currently, thirty-three non-NATO nations operate conventionally-powered submarine forces. Seven countries are designing and building submarines for export, three design and build submarines, but do not currently export, and seven countries build submarines for their own use. Table 1 provides a list of submarine producers broken down in the above categories and Appendix A provides a listing of worldwide inventories of conventionally-powered submarines grouped by region.

The worldwide total of operational submarines, both nuclear and conventionally-powered, is not likely to increase significantly in the coming decades. However, as both the United States and Russia continue reduce their inventories of nuclear submarines, the number of conventionally-powered submarines operated by other countries will increase

[19] John R. Benedict, "Third World Submarine Developments," *Submarine Review* (October 1990), 54.

to maintain the overall number.[20] Additionally, as submarine technology becomes more advanced and more affordable, obsolete conventionally-powered submarines will be replaced with modern ones.

Table 1. Conventionally-Powered Submarine Producers

	Builds	Designs and Builds	Designs, Builds and Exports
Countries	Argentina Australia Brazil India North Korea South Korea Turkey	Italy Japan United States	China France Germany Netherlands Russia Sweden United Kingdom

The "buyers' market" with respect to conventionally-powered submarines, coupled with the motivation to acquire submarines and the increasing ability of emerging nations to afford them, suggest not only that the number of conventionally-powered submarines will increase, but so will the number of countries operating them.

3. Implications for U.S. Foreign Policy

Post-Cold War U.S. foreign policy and military strategies are important new factors in the proliferation of submarines. The acquisition of submarines by states has

[20] John R. Benedict, "Undersea Weapons -- Technology Transfer with Anti-ship Implications" (brief prepared for CIA/OTE, May 1996 update), 19.

traditionally been influenced by regional security issues, prestige, and political motivations. While these may still be valid motivations for acquiring submarines, balancing U.S. regional influence has emerged as a new motivation in the aftermath of the Cold War.

A conventionally-powered submarine force of even one or two platforms offers a deterrent without the immense political and economic costs of WMD. A few properly operated submarines might not only be able deter the United States, but could possibly even defeat U.S. military strategy and effect U.S. disengagement from the region. U.S. forward deployed naval forces are exposed. Submarines able to operate undetected in the littoral regions occupied by U.S. naval forces would have the advantage. Not only are submarines difficult to detect and identify, but restrictive peacetime rules of engagement would most likely preclude U.S. forces from preemptively eliminating this hazard. By default, the first shot would likely be left to the enemy submarine. This set of circumstances could be a powerful deterrent to the United States which must justify the costs of engagement in the region.

A nation facing cruise missile strikes from U.S. warships off its coast would be justified in fighting back. Possessing one or two conventionally-powered submarines could provide a means to do so. A single hit with a modern torpedo fired from a conventionally-powered submarine would most likely have a devastating effect.[21]

[21] During the Falklands War the 13,000-ton Argentine cruiser *Belgrano* sank in about one hour after being struck by two British torpedoes of fifty-year-old design.

Inflicting this type of damage on U.S. naval forces has the possibility of causing U.S. interests to be called into question. The domestic reaction on both sides is likely to be intense. U.S. domestic opinion could just as easily rally behind the action or compel U.S. leadership to withdraw forces from the area. Complicating the issue further would be that U.S. naval forces would most likely swiftly dispose of the enemy submarine once fired upon. On the other hand, the submarine would likely be that nation's most prized warship. Rallying their domestic (and perhaps world) opinion behind the "martyrs" defending their country would be easy.

Entering into a war of attrition with the United States would not be a likely objective of most nations. However, a regional actor pursuing regional objectives could benefit by deterring the United States from intervening in the region. Conventionally-powered submarines could possibly provide a credible, limited deterrent against the United States without the political costs associated with WMD.

The proliferation of conventionally-powered submarines requires U.S. policy makers to be aware of the potential hazards and consequences associated with engaging an unfriendly nation possessing submarines. In this light, using the Gulf War and the subsequent cruise missile attacks against Iraq as guides for future planning is misleading. Although the consequences of Iraq possessing submarine assets during the Gulf War cannot be estimated, it can be assured that they would not have been trivial. If Iraq had possessed one or two submarines at the beginning of the conflict, U.S. strategy would most likely have been much different. If unable to destroy the submarines at the outset,

the United States would have had to divert assets to prosecute them, and possibly alter major portions of its strategy. Remember that U.S. amphibious assault on Kuwait was abandoned largely due to the possibility of mines, and the potential threat posed by conventionally-powered submarines is much more significant than that of mines.[22] The Iraqi submarines would not even have had to have been operational. If Iraq had been able to tow a non-operational submarine out to sea and scuttle it without being detected by the United States, this one "unaccounted for submarine" would have required the diversion of significant resources possibly hampering the sealift supply lines.

In situations short of war, as in the unilateral cruise missile strikes against Iraq subsequent to the Gulf War, hostile submarines complicate the situation even more. Restrictive U.S. rules of engagement (ROE) might afford the hostile submarine the first shot, and the ensuing devastation inflicted on U.S. assets may be more than domestic opinion would tolerate. Being forced from a region in this manner would have a significant impact on future U.S. foreign policy. Therefore, before engaging in such scenarios, U.S. national interests must be clearly defined and shown to outweigh the potential costs.

[22] "Iran's Naval Forces: A Shadow across the Gulf?" *Jane's Navy International* 102, no. 2 (1 March 1997), 14.

4. Implications for U.S. ASW Capabilities

The proliferation of conventionally-powered submarines also requires the United States to concentrate its ASW efforts to deal with this potential problem. Throughout the Cold War, U.S. ASW efforts were focused on the Soviet nuclear submarine threat centering on the ability to destroy the Soviet SSBN fleet while protecting U.S. SSBNs from Soviet SSNs. The threat posed by conventionally-powered submarines was relegated to a much lower priority. The logic behind this strategy was that if U.S. ASW efforts could effectively deal with the Soviet nuclear submarine threat, they could deal with the lessor threat posed by conventionally-powered submarines. And while little attention was paid to conventionally-powered submarines in the 1980s, the latest U.S. Navy ASW assessment concedes that passive detection of these submarines would have been "significantly more challenging than against the quietest nuclear powered submarine of the day."[23] The end of the Cold War requires a major paradigm shift in ASW efforts.

The notion advanced by John Keegan in *The Price of Admiralty*, that in war the seas will "appear empty" and that advanced submarines will duel for supremacy, is no longer applicable.[24] The end of the cold war eliminated the Soviet submarine threat and the Russian submarine force that superseded it is significantly reduced. Shifting our peer competitor to China, as Tom Clancy does in his latest novel *SSN*,[25] is equally as

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[23] Department of the Navy, *ASW Assessment* (U), Washington, D.C.: U.S. Government Printing Office, 1996, 16 (SECRET document).

[24] John Keegan, *The Price of Admiralty* (New York: Viking Penguin Press, 1988), 275.

[25] Tom Clancy, *SSN* (New York: Berkley Books, 1996).

unlikely. The open-ocean threat posed by nuclear submarines operated by a strong peer competitor has all but completely vanished, and it is not likely to reemerge for decades.

In spite of this, the U.S. Navy continues to discount the threat to U.S. naval forces posed by conventionally-powered submarines citing crew inexperience, lack of training, lack of maintenance capabilities, and lack of skill.[26] This logic is extremely dangerous. Current U.S. ASW capabilities cannot prevent conventionally-powered submarines from operating undetected in the littorals. Forward deploying U.S. naval forces in waters where hostile conventionally-powered submarines operate puts them at risk. U.S. ASW efforts must concentrate on the threat posed by conventionally-powered submarines operating in the littorals because as events since the end of the Cold War have shown, this is the environment that U.S. naval forces are most likely to be employed.

B. CONCLUSION

The U.S. National Security Strategy of "Engagement and Enlargement" articulates the vision of enhanced U.S. security, prosperity at home, and democracy abroad.[27] The U.S. Military Strategy of "Flexible and Selective Engagement" and in particular the U.S. Navy Strategy of "Forward...from the Sea," developed to meet our national security objectives, depend heavily on forward presence to promote stability and thwart

[26] Ed Smith, Capt. U.S. Navy, "They Can Buy It, But..." *U.S. Naval Institute Proceedings* 120, no. 3 (February 1994):45-48.

[27] The White House, *A National Security Strategy of Engagement and Enlargement* (Washington, D.C.: U.S. Government Printing Office, February 1996), ii.

aggression.[28] The diplomatic value of forward deployed warships has long been recognized, and they have been a cornerstone of U.S. foreign policy for over a century. However, forward deployed warships are also instruments of coercive diplomacy.

U.S. cruise missile diplomacy employed since the end of the Gulf War has sent a clear message to the rest of the world that the United States is not only capable, but willing to use its forward deployed military forces unilaterally to influence the political leadership of other nations. The proposed arsenal ship, having but one mission, "to inflict overwhelming punishing damage" only accentuates the rest of the world's perception of the U.S. ability to attack with impunity.[29] By acquiring conventionally-powered submarines, nations may be attempting to balance U.S. regional presence.

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[28] Joint Chiefs of Staff, *National Military Strategy* (Washington, D.C.: U.S. Government Printing Office, 1995), and Department of the Navy, *Forward...From the Sea* (Washington, D.C.: U.S. Government Printing Office, 1995).

[29] Richard L. Wright, Capt. U.S. Navy, "Arsenal Ship: Potent and Punishing," *Surface Warfare* 22, no. 1 (January/February 1997), 22.

II. CONVENTIONALLY-POWERED SUBMARINE SUPPLY

A. INTRODUCTION

Transfers of expensive advanced conventional weapons, such as submarines, experience strong supply-side and demand-side pressures. The supplier state is influenced by a number of supply-side factors such as political leverage, maintaining technological bases, and economics. The recipient state is influenced by a number of demand-side factors such as prestige, and security concerns.[30] This chapter examines the supply-side factors contributing to the current "buyers' market" for conventionally-powered submarines, and chapter three explores the demand-side factors. The proliferation of conventionally-powered submarines is driven by the combination of supply and demand-side factors present.

B. SUPPLY-SIDE FACTORS

For the purposes of the following description, the supply-side factors are divided into three broad categories: political leverage, technology, and economics.[31] These categories may seem somewhat arbitrary because there are no definite dividing lines

[30] For excellent analyses of conventional arms transfers see Keith Krause, *Arms and the State: Patterns of Military Production and Trade* (Toronto: Cambridge University Press, 1992), and Edward J. Laurance, *The International Arms Trade* (New York: Lexington Books, 1992).

[31] Adapted from Christian Catrina, "Main Directions of research in the Arms Trade," *AAPSS Annals* 535 (September 1994): 190-205.

between them and there are elements of each present in all of them; however, these broad categories can serve to illuminate some of the major differences between post-Cold War Russian and Western supply-side motivations.

1. Political Leverage

Throughout the Cold War, arms sales and transfers were a major source of political leverage. Arms transfers became an instrument of the greater ideological struggle by bringing the recipient into the supplier's camp. Not only could the supply of arms serve to build trust in the relationship, the supplier could often exert an intangible influence over the recipient government. Transfers of conventional arms continue to be a "legitimate instrument of U.S. foreign policy."[32]

Arms transfers can also serve to establish coalitions and ensure alliance interoperability. During the Cold War, both Soviet and Western arms suppliers sought to strengthen their respective coalitions in military terms through the supply of arms. It was also imperative to ensure hardware interoperability among members of each alliance.

During the Cold War, the United States supplied many of its allies with wartime surplus and older submarines as new ones were built and put into commission. This practice continued for almost three decades until the U.S. submarine force was exclusively nuclear powered. The recipients of these conventional submarines is quite long and

[32] Lora Lumpe, "Clinton's Conventional Arms Export Policy: So Little Change," *Arms Control Today* 25 no. 4 (May 1995): 9-14.

includes most of Latin America and some European countries. In fact, Turkey continues to operate 7 *Guppy* class and 2 *Tang* class submarines.

The Soviet Union supplied the Eastern Europe and the Communist Bloc with most of their conventionally-powered submarines; Romania, Poland, and China are prime examples.[33] Although Russian arms transfers are no longer an instrument of the greater ideological struggle, they continue to be a source of political leverage to be applied in international relations.[34]

2. Technology

The need to maintain a technological base from which to produce submarines is a supply-side factor. A producer state may not need additional submarines in its own arsenal; however, stopping production may limit the ability to produce them in the future. Although conventionally-powered submarines do not require the same degree of sophistication as nuclear submarines, the skills and technology are just as perishable.

The producer state must find a market to supply in order to maintain the capability to produce submarines. Although the United States does not export submarines, the requirement to maintain a technological base was quite evident in the recent debate over funding the third *Seawolf* submarine. There have also been proposals

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[33] Appendix A gives the current worldwide inventories of conventionally-powered submarines grouped by region.

[34] Konstantin Sorokin, "Russia's 'New Look' Arms Sales Strategy," *Arms Control Today* 23 no. 8 (October 1993): 7-12.

to build German Type-209 submarines under license for export to maintain U.S. conventional ship-building base.[35]

Western European submarine producers including France, Germany, and Sweden are all seeking to maintain their technological base by producing submarines for export.[36]

3. Economics

Producing and selling advanced military hardware has always been a good way to raise hard currency. Arms producing companies in a capitalist system must sell to make a profit. Economies of scale (reducing the manufacturing cost of an individual unit by producing more units in order to recoup research and development expenditures) are a good way to increase the profit margin. If they are not required in the arsenal of the producer state, they are made for export.

Since the dissolution of the Soviet Union, the Russian economy has been in shambles. Besides selling their vast reserves of natural resources, selling surplus and newly manufactured conventional arms is one of the only ways to raise hard currency. In 1996, Russia sold approximately $3.6 billion worth of military arms accounting for 17

[35] "Building Conventional Subs in the United States," *Naval Forces* 15, no. 5 (1994): 20--24.

[36] Lara Cantuti, "Pakistan Looks to Russia, France for Advanced Aircraft and Subs," *Arms Control Today* 24 no. 10 (December 1994), 22, "SUBCON '95," *Naval Forces* 16, no. 6 (1995): 34-39, and "Swedish Submarine Technology," *Naval Forces* 15, no. 3 (1994): 40-48.

percent of the world total.[37] Although economic factors influence western producers as well, the condition of the western economies lessen their magnitude. The state of the Russian economy and the need to raise hard currency from abroad magnifies the economic factors involved in their submarine export program. According to naval expert Norman Polmar, "The Russians will sell anything to anybody to earn hard currency and keep production lines going.".[38]

C. CONVENTIONALLY-POWERED SUBMARINE EXPORTS

Currently, seven countries design, build, and export conventional submarines: Germany, Russia, France, Sweden, United Kingdom, Netherlands, and China. Three nations design and build but do not currently export submarines: United States, Japan, and Italy. Seven countries build submarines under license for their own use: Australia, Turkey, Argentina, Brazil, India, North Korea, and South Korea. Besides the German Type-209, and the Russian *Kilo*, other submarines for export include France's *Daphne*-class and more recently the *Agosta*-class submarines, Sweden's T96, the British *Oberon*-class, the Netherlands' *Zwaardvis*-class, and China's former Soviet-based designs. These submarines are extremely capable and are available on the open market; however, since most of the deals for these submarines are still being negotiated, only the German Type-

[37] Youry A. Lambert, "High Technology and Defense Industry Sectors Opening up in Russia and Ukraine," *Information Access Company, Newsletter Database*, World Trade Executives, Inc. (March 1, 1997).
[38] Michael R. Gordon, "Pentagon says Russia is Selling Subs to Iran," *New York Times*, September 24, 1992, 9.

209 and the Russian *Kilo* are discussed below. For a comparison of these two submarines see Table 2.

Table 2. Comparison of German Type-209 And Russian *Kilo* [39]

	Type-209	*KILO*
Surface/Submerged Displacement (tons/tons)	1660/1850	2500/3000
Length/Beam (m/m)	64.4/6.5	72.6/9.9
Max. Speeds Surface/Submerged (kts/kts)	11/22	10/17
Submerged Horsepower (shp)	4600	5000
Range Surfaced/Speed (nm/kts)	13000/10	6000/7
Range Submerged/Speed (nm/kts)	400/4	400/3
Normal Operating Depth (m)	260	240
Torpedo Tubes/Size (#/mm)	8/533	6/533
Weapons Load* (# torpedoes/# mines)	14/24**	18/24***
Ships Complement (#)	40	52

* Maximum for each type of weapon, combinations of the two are possible with the Kilo.
** The Type-209 has an optional external mine belt carrying up to 24 mines in addition to full torpedo loadout.
*** With a full loadout of 18 torpedoes, 6 are stowed in the torpedo tubes and 12 are rack stowed; with a full loadout of 24 mines, 12 are tube loaded (2 per tube), and 12 are stowed on racks.

1. German Type-209

The German Type-209 has been the most successful submarine export program. Since its introduction in 1971, over 50 Type-209s have been exported to or produced under license by various counties including most of Latin America, Greece, Turkey, South

[39] Information compiled from various sources including: *Jane's Fighting Ships* (London: Jane's Information Group, Limited, 1996), David Miller, *Submarines of the World* (New York: Orion Books, 1991), and John Benedict, "Undersea Weapons -- Technology Transfer with Anti-ship Implications" brief prepared for Johns Hopkins University Applied Physics Laboratory May 1996.

Korea, and India. Although the Type-209 can be made to order, taking into account the specific needs of the recipient, the standard model displaces about 1600 tons surfaced and 1800 tons submerged. It is powered by a standard diesel-electric drive capable of speeds up to 11 kts surfaced and up to 22 kts sprint speed submerged. Carrying up to 14 heavy-weight anti-ship torpedoes, the Type-209 has a tremendous destructive capability. The Type-209 can also be fitted with an external mine stow capable of carrying 24 mines in addition to the full torpedo loadout.[40]

The Type-209 is a very capable platform. The four MTU V12 diesel engines supply 2400 hp each and give the submarine a 13,000 nm range at 10 kts on the surface. The four 1.8 MW alternators and battery system provide for a submerged range of 400 nm at 4 kts. Its normal operating depth is 260 m and the stowage and auxiliary support equipment provide an endurance of 60 days.[41]

Equipped with a standard surface search radar and both active and passive medium frequency search and attack sonars, the Type-209 is capable of both surface and submerged torpedo attack. The 14 AEG SUT Mod 1 wire guided torpedoes with active/passive homing to 28 km (15.3 nm) at 23 kts or 12 km (6.6 nm) at 35 kts carry a 250 kg warhead and are potent anti-ship weapons.[42]

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[40] David Miller, *Submarines of the World*, 154-155.

[41] *Jane's Fighting Ships*, 287-305.

[42] Ibid.

The Type-209 is available for between $100 and $380 million. The follow-on design with air independent propulsion will be available for approximately $500 million.[43]

2. Russian *Kilo*

The Russian export submarine program is the *Kilo*-class submarine. The *Kilo* program has also been very successful; over 20 have been exported or produced under license since the first unit was completed in 1982. This submarine is considerably larger than the Type-209 and can also be built to specification. The standard export model is known as the 877EKM variant and its follow-on variant is known as Project-636. The Project-636 is basically the same as the 877EKM except that it more closely resembles the Russian Navy version because it is quieter and has a higher degree of automation.

The 877EKM variant *Kilo* exported to Iran and India is another capable platform. Designed by the Central Design Bureau for Marine Engineering Rubin, at St. Petersburg, the 877EKM has a double hull providing additional space for equipment storage outside the pressure hull (e.g., the steering gear and high-pressure air bottles). Additionally, the outer hull is able to absorb impact damage, particularly the bow and stern. The pressure hull is 51.8m long and the overall length is 72.6m. Although it can be made to order, the typical *Kilo* displaces 2,500 tons surfaced and 3,000 tons submerged.

[43] John Benedict, "Undersea Weapons -- Technology Transfer with Anti-ship Implications."

The *Kilo* has a 32 percent reserve buoyancy (compared with about 13 percent for U.S. nuclear submarines) providing for a greater safety factor. The *Kilo* is designed such that the submarine will remain afloat with either any one compartment and two main ballast tanks on the same side flooded or the stern compartment and the adjacent main ballast tank flooded.[44]

For surface propulsion, the *Kilo* has two four-stroke, six cylinder in-line Model 4-2DL-42M engines with gas turbine superchargers providing 1,500 hp at 700 rpm and giving the submarine a snorkeling range of 6,000 nm at 7 kts. The two PG-142 DC 1,000 kW generators and associate battery system provide a submerged range 400 nm at 3 kts and sprint speeds up to 17 kts.[45] The normal operating depth for the *Kilo* is 240 m, and the stowage and auxiliary equipment provide an endurance of 45 days without replenishment and up to 260 hours of underwater travel.

Equipped with a surface search radar, a medium frequency detection and tracking sonar, and a high frequency attack sonar and armed with 18 heavy weight anti-ship torpedoes or up to 24 anti-ship mines, the *Kilo* can be a potent adversary. The Russian export deals usually include 53-65KE wake homing anti-ship torpedoes and TSST-71MS wire guided ASW torpedoes.[46]

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[44] David Miller, "New Russian Submarine Hunts Export Market," *International Defense Review* 9 (1994): 52-59.

[45] *Jane's Fighting Ships*, 321.

[46] John Benedict, "Undersea Weapons -- Technology Transfer with Anti-ship Implications."

In January 1997, Iran took delivery of its third 877EKM *Kilo* from Russia. The $600 million deal included training, support, and weapons.[47] Also in January 1997, a high-level Indian Defense Ministry delegation in St. Petersburg agreed to purchase two Project-636 *Kilo* submarines from Russia. The deal was reportedly for $430 million. Additionally, *Defense News* has quoted Indian defense officials as saying that New Delhi would release additional funds in 1997 to build two Type-209.[48]

D. CONCLUSION

Although political influence, coalition interoperability, and alliance building are not the powerful supply-side factors that they were during the Cold War, it is still a buyers' market for advanced conventional arms. Whether the supplier state is motivated to maintain its technological base, produce arms for economy of scale, or raise hard currency from foreign sources, it must actively seek markets for its arms. Suppliers make attractive deals including the most advanced technology, training, support, and weapons to attract foreign buyers. Supply-side factors play a role in every weapons transfer; however, because it is currently a "buyers' market" with respect to conventionally-powered submarines, this study will focus on the demand-side factors described in the following chapter.

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[47] Anthony H. Cordesman and Ahmed S. Hashim, *Iran: Dilemmas of Dual Containment* (Colorado: Westview Press, 1997), 255-258.

[48] "India plans to buy two Russian Subs," *North American Wire* Reuters, Limited, (January 8, 1997).

III. CONVENTIONALLY-POWERED SUBMARINE DEMAND

A. INTRODUCTION

Although the supply-side factors presented in the previous chapter make it a buyer's market when it comes to conventional weapons, it is the demand-side factors that drive conventional weapons acquisitions. These demand-side factors exert strong pressures on the recipient state to acquire advanced conventional weapons, such as submarines. This chapter examines the demand-side factors that drive countries to acquire conventionally-powered submarines in general. The following two chapters look at these factors more specifically as they apply to the cases of India and Iran.

B. DEMAND-SIDE FACTORS

The demand-side factors driving conventional weapons acquisition can be divided into five categories: prestige, political influence, technology, bureaucracy, security concerns, and war-time replacement.[49] For the purposes of the discussion below, war-time replacement is omitted because submarines require long lead times to produce and are not easily replaced during conflict. Additionally, since the end of the Second World War, no country has been able to acquire submarines while involved in a conflict.

[49] Adapted from Christian Catrina, "Main Directions of Research in the Arms Trade," *AAPSS Annals* 535 (September 1994): 109-205.

1. Prestige

A strong navy has been a symbol of national prestige for almost three centuries and the premier navy for most of that time was the British Royal Navy. For most of the eighteenth and nineteenth centuries, the Royal Navy was emulated by other great powers, particularly the United States,[50] Germany, and Japan. The naval arms race between Great Britain and Germany at the turn of the twentieth century was particularly fierce and is attributable as a factor leading to the First World War.[51] The great powers desired bigger and better ships not only to defeat the ships of their enemy, but also to foster national recognition in the international system. Theodore Roosevelt's "Great White Fleet" is a prime example. Initially, national prestige was symbolized by large battleships, then submarines, and ultimately aircraft carriers.

Today the aircraft carrier remains the ultimate symbol of naval prowess; however, large nuclear-powered aircraft carriers are prohibitively expensive to all but the United States. Even the Soviet Union at its height was unable to match the U.S. carrier fleet during the Cold War. Nuclear-powered submarines can also symbolize national prowess; however, they are also prohibitively expensive. Currently, only five nations operate nuclear-powered submarines: United States, United Kingdom, France, Russia, and China.

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[50] Although it is constitutionally mandated to provide for and maintain a navy (Article I, Section 8), the types of vessels and aircraft placed into service can be influenced by prestige.

[51] For an excellent analysis of the naval arms race between Germany and Great Britain at the turn of the century see Robert K. Massie, *Dreadnought* (New York: Ballantine Books, 1991).

Along with ballistic missiles, super-sonic aircraft and large naval vessels,[52] the conventionally-powered submarine is an attainable advanced weapon that can foster national prestige. Although possessing submarines alone does not determine great power status, all the great powers possess submarines. Only the United States and Great Britain have been able to afford an exclusively nuclear-powered submarine force. Conventionally-powered submarines are possessed by all the other great powers (France, Russia, China, and Japan). Possessing a submarine force can be a symbol of national prestige because submarines have been legitimized by the other great navies.

Since the end of the Cold War and the dissolution of the bipolar international system, are emerging nations turning to conventionally-powered submarines as a means of fostering their position in the new multipolar international system?

2. Political Influence

Being on the receiving end of advanced conventional weapons transfers can provide the recipient with some political influence over the supplier. This is the mirror image of the supply-side factor argument made in the previous chapter. Just as the supplier state may be able to exert some influence over the recipient, the recipient may welcome that influence and even exploit the relationship. Recipient states may be able to influence the supplier state to place the recipient under its protection. Relatively weak

[52] Dana P. Eyre and Mark C. Suchman, "Status, Norms and the Proliferation of Conventional Weapons: An Institutional Approach," in Peter J Katzenstein, ed., *The Culture of National Security: Norms and Identity in World Politics* (New York: Columbia University Press, 1996): 79-113.

recipient states can influence much more powerful supplier states in this manner. Even a supplier as powerful of the United States has been influenced by recipients of its arms. Taiwan during the Quemoy Crisis of 1958 provides a good illustration.[53]

Entering into the large economic agreements required for submarine acquisition can also serve to align the interests of the supplier and recipient. Protecting the economy of the recipient serves to guarantee payment for the supplier. Pursuing national interests that are in line with the supplier state, helps ensure the recipient that it can depend on the supplier for continued support after the sale. Political influence may also play a role in acquiring conventionally-powered submarines.

3. Technology

Technological imperatives can also drive states to acquire more advanced weaponry. The transfer of conventionally-powered submarines often includes technical assistance both during the sale and for a long time afterward. Many of the current proposals to transfer conventionally-powered submarines include technology transfers that will enable the recipient to build under license its own follow-on platforms. This kind of technology transfer can significantly enhance the technological infrastructure of the recipient and can positively influence its economy as a whole.

[53] Alexander L. George and Richard Smoke, *Deterrence in American Foreign Policy: Theory and Practice* (New York: Columbia University Press, 1974), 370.

Additionally, being able to build and maintain its own weapons can foster a nation's technological self-reliance and thereby enhance its security situation. Although security concerns as a motivation for acquiring conventionally-powered submarines are fully developed later in this chapter, in this context, a state that is self-reliant in the production of its arms would not only be unaffected by potential arms embargoes, it could dissociate itself from the political influences of the supplier states. The resulting increased latitude for pursuing that state's interests could be translated to enhanced security. In this manner, technology transfer may be a motivating factor behind conventionally-powered submarine acquisition.

4. Bureaucracy

Bureaucratic organizations within governments seek to enhance their position both within the state apparatus and with respect to their foreign counterparts.[54] This seems to be particularly true with respect to navies. Not only do navies bolster their position within the state apparatus, but they orient themselves towards the navies of other states as potential adversaries. Traditionally, navies have fought only other navies; however, with the development of deep strike land attack cruise missiles, this may be changing. The possession of advanced naval hardware not only bolsters the position of the navy within the military and within the government as a whole, it can advance the reputation of

[54] See Edward L. Katzenbach, "The Horse Cavalry in the Twentieth Century: A Study in Policy Response," *Public Policy* 8 (1958): 120-149, and Edward Rhodes, "Do Bureaucratic Politics Matter? Some Disconfirming Findings from the Case of the U.S. Navy," *World Politics* 17 (October 1991): 1-41.

the navy within international naval circles. The conventionally-powered submarine is such a weapon.

Bureaucratic motivations for acquiring submarines are similar to the national prestige motivations and can have the same result; however, they are on different levels of analysis. Bureaucratic motivations are on the organizational level rather on the state level of analysis associated with prestige motivations. On the organizational level, bureaucratic motivations seek to enhance the position of the organization within the state and/or with respect to their foreign counterparts. Prestige motivations are on the state level of analysis and seek to enhance the position of the state within the international hierarchy.

5. Security Concerns

A tremendous amount of literature discusses the nature of states' security concerns and how they influence state behavior particularly arms acquisitions. For the purposes of the following discussion, state security is defined as the protection and preservation its minimum core values: political independence and territorial integrity.[55] This definition is intentionally narrow, purposely omitting aspects such as regime security and the concept of national security.[56] Although both internal and external

[55] Talukder Maniruzzaman, "The Security of Small States in the Third World," *Canberra Papers on Strategy and Defense, No. 25* (Canberra, Australia: The Strategic and Defence Studies Centre, The Australian National University, 1982), 15.

[56] For an excellent analysis Third World security along these lines see Brian L. Job, ed. *The Insecurity Dilemma: National Security of Third World States* (Boulder, Colo.: Lynne Reinner Publishers, Inc., 1992).

factors affect a state's security;[57] since this study focuses on naval arms acquisitions which have little utility with respect to internal security threats, internal security aspects are ignored.

The external security of every state depends on its military capabilities and/or those of its allies. In order to be secure, states must be able to deter external aggression or effectively deal with it through negotiations and/or armed conflict. Traditionally, this has meant balancing the capabilities of other states within the region; however, the global nature of conflict in the twentieth century has changed the scope. Advanced weaponry such as ballistic missiles and weapons of mass destruction have made it possible for some states to intervene well outside their traditional regions. While regional powers are still of concern and can be significant influences on arms acquisitions,[58] the United States as the last remaining superpower has become a security concern of many states. Those states which are not aligned with the United States, may perceive that there is no one to defend them. Is balancing the United States a motivating factor for acquiring conventionally-powered submarines by these countries?

[57] See Edward E. Azar and Chung-in Moon, eds. *National Security in the Third World: The Management of Internal and External Threats* (Aldershot, England: Edward Elger Publishing, Ltd., 1988).

[58] India and Pakistan, and North and South Korea are prime examples.

C. CONCLUSION

Many demand-side factors exert strong pressures on states to acquire advanced conventional weapons, such as submarines. Each weapons transfer is influenced by different combinations of the supply and demand-side factors, each to varying degrees. For the purposes of this study, it is assumed that it is a "buyer's market" with respect to conventionally-powered submarines so the focus is on the demand-side factors. Although documented evidence of motivations for any weapons acquisition simply does not exist, motivations may be able to be inferred by examining details of the deal and the proposed methods of employment.

Weapons acquired for prestige may lack direct military applications or may be beyond the capabilities to be successfully employed in combat. Weapons acquired as part of larger deals may indicate political influence as a motive. Technological imperatives may be manifested in the transfer of advanced technologies along with the actual weapons transfer. The particular choice of weapons and/or evidence of bribes or kickbacks can imply that bureaucratic politics are playing a part in the acquisition. Security concerns as a motivation can be evident in the nature of the weapons acquired and the proposed methods of their employment. Some weapons by their nature, such as tanks, can be employed against both internal and external security threats; while other weapons can only be employed against one or the other. Submarines cannot be employed effectively against internal threats; therefore, if a state acquires submarines in response to security concerns it must perceive some sort of external security threat.

The following two chapters assess the motivations behind the recent submarine acquisitions of both India and Iran as case studies to ascertain if balancing the threat posed by U. S. cruise missile diplomacy has emerged as a new motivation for states to acquire conventionally-powered submarines.

IV. CASE STUDY I: INDIA

A. INTRODUCTION

In January 1997, the Indian Defense Ministry concluded a deal with Russia to purchase two Project-636 *Kilo* submarines for approximately $430 million.[59] It has also been reported that the latest Indian defense budget will include funds to build two more submarines to be in service by 2005.[60] India produced two German Type-209s under license at the Mazagon Dock Ltd., Bombay during the 1980s. Whether the submarines to be built are of German or Russian design is still under debate.

This chapter examines the possible motivations behind India's acquisition of these submarines to see if balancing the U.S. naval presence in the region has played a role. The chapter begins with an overview of India's relevant national statistics and those of its navy, and then takes a detailed look at its submarine force. After examining India's submarine capabilities and proposed methods of employment, the Indian motivations for acquiring the submarines are inferred.

[59] Sanjeev Miglani, "Russia to Revive India Reactor Sale," *Asia Times* (21 March 1997), 1.

[60] "India to take two more *Kilo* class submarines," *Jane's Navy International* 102, no. 2 (1 March 1997), 8.

1. Relevant Statistics

India is a major regional power. Its population of over 950 million makes it the second most populous country after China. India's GDP in 1995 was estimated at $330 billion, which equates to roughly $1,400 per capita.[61] Its territories cover some 3.2 million square kilometers and because of its peninsular shape, India's coastline stretches some 7,000 kilometers.[62] Additionally, India's coastline is augmented by 1,400 kilometers of island and rock territories extending far into both the Arabian Sea and the Bay of Bengal. Over 470 island territories comprise the Lakshadweep Group in the Arabian Sea, and 723 islands stretching over 900 kilometers in the Bay of Bengal constitute the Andaman and Nicobar Groups (the nearest of which lies more than 1000 kilometers from the mainland).[63] Defense expenditures in 1995 were $8.3 billion, supporting a military of 1,145,000 personnel and a navy of 55,000.[64]

2. The Indian Navy

The Indian Navy is the largest navy in the region. The Indian surface navy consists of 26 major surface combatants including 2 aircraft carriers (one is in the process

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[61] International Institute for Strategic Studies, *The Military Balance 1996/97* (London: Oxford University Press, 1996), 159.

[62] *Academic American Encyclopedia* (Danbury, Conn.: Grolier, 1994), 79.

[63] Rahul Roy-Chaudhury, "The Problem," *Seminar 448: Special Issues on Maritime Security* (December 1996), 12.

[64] International Institute for Strategic Studies, *The Military Balance 1996/97*, 159.

of being scrapped), 5 destroyers, 19 frigates, 44 patrol and coastal combatants, 20 mine countermeasure ships, 9 amphibious ships, and 27 support and miscellaneous ships. The Indian Navy also operates 18 submarines including 8 *Kilos*, 4 Type 209/1500, and 6 *Foxtrots*.[65]

Indian naval doctrine stresses being able to "seek and destroy enemy units heading for our offshore assets, islands and merchant shipping."[66] The specific missions of the Indian Navy have been articulated as:

- Protecting the mainland and island territories from seaborne invasion,
- Protecting the territorial waters, EEZ [Exclusive Economics Zone] and other off shore assets,
- Protecting India's Sea Lanes of Communication,
- Safeguarding the nation from gunboat diplomacy, and
- Safeguarding India's interests in contiguous waters[67]

According to Admiral V. S. Shekhawat, Chief of the Indian Naval Staff, the role of Indian naval forces in serving Indian national interests lie more in the diplomatic sphere, "fostering interaction between countries, assisting in disaster relief, and complementing each other in training and cooperation." He goes on to say:

> If the countries of the region are left free from outside interference, history shows the potential for conflict will considerably reduce. The Indian Ocean states have much to gain from profitable trade, cooperation, and

[65] International Institute for Strategic Studies *The Military Balance 1996/97*, and *Jane's Fighting Ships* (London: Jane's Information Group Limited, 1997).

[66] Vijay Madan, Lt. Gen., PVSM, VSM (Ret.), "The Defense Budget," *Indian Defense Review* 11, no. 4 (October-December 1996), 42.

[67] Sanjay J. Singh, LT, Indian Navy, "The Indian Navy is No Threat," *U.S. Naval Institute Proceedings* 117, no. 3 (March 1991), 75-76.

avoidance of maritime conflict. National naval forces should, therefore, be seen more as an insurance against the unpredictable than as a requirement against perceived geostrategic threats in the region.[sic][68]

3. The Indian Submarine Force

The Indian submarine force plays a vital role in accomplishing overall navy missions. The 18 submarines currently in service in the Indian Navy are of three classes. There are six older Russian *Foxtrots,* eight 877EKM *Kilos,* and four Type-209s (two built in Germany and two produced under license in India). The *Foxtrots* are all scheduled to be decommissioned by 2000.[69]

According to Commodore Bhim S. Uppal, Indian Navy, (Ret.) Director of the Submarine Arm between 1984 and 1989 and former commander of one of India's front-line conventionally-powered submarines (the first to have completed over 1,000 hours submerged), the Indian Navy will continue to operate and modernize its submarine force because submarines provide the following:

- the most effective weapons platform for expenditure
- great flexibility
- counter surface ASW forces effectively
- multi-mission platforms (ASUW, Special Forces, I&W, ASW)
- covert and deployable platform without political ramifications
- ability to operate without supporting escorts.

[68] "The Future of Seapower," *Jane's Navy International* 101, no. 1 (January/February 1996), 27.

[69] "India to take two more *Kilo* class submarines," 8.

The operational doctrine of the Indian submarine force is divided into three categories: infrastructure, training, and tactics.[70]

a. Infrastructure

India stresses its shore support infrastructure for its submarine force because as Uppal points out, "without infrastructure, no country can keep a submarine at sea for optimum time periods." The Indian submarine shore support infrastructure includes battery maintenance, torpedo and weapons support, maintenance facilities, demagnetizing and degaussing facilities, and acoustic testing facilities. The submarine maintenance program is divided into four echelons:

- Level 1 Cleaning and normal operating maintenance
- Level 2 At sea or in-boat repairs using spares carried on board
- Level 3 In-port, pierside upkeep maintenance
- Level 4 Dockyard (Drydock) or shipyard maintenance

Indian submarine maintenance is quite good, but it has not been without its problems. In particular, the batteries supplied by the Russians were not designed for the warm waters of the Indian Ocean and had to be replaced with batteries made in India under license.

[70] The following description of Indian submarine infrastructure, training, and tactics has been adapted from a brief prepared by Bhim S. Uppal, NM, VSM, Commodore, Indian Navy, (Ret.) "A Third World Submarine Perspective" American Systems Corporation (December 1994).

b. Training

Indian submarine force training consists of four phased requirements for certification for operational patrol (a process which is similar to U.S. submarine force requirements). The first phase consists of in-port inspection by Flotilla Staff to assess whether the submarine is safe to take to sea. These inspections are conducted after a 50 percent change of crew, after repair periods greater than nine months or major hull repairs, and after change of command. The second phase consists of safety of ship demonstrations at sea in shallow water. Trim dives, safety drills, and tests for sea-worthiness including evolutions such as anchoring, bottoming, etc. The third phase is weapon workups (torpedo-firing, mine-laying, etc.) conducted by a submarine on its own. Each submarine conducts 10-12 exercise shots per year. The final phase is weapons firings in concert with other forces and multi-ship exercises. Once the ship has completed this cycle, it is certified until one of the conditions mentioned earlier occurs.

c. Tactics

Indian submarine force tactics are quite sophisticated. The preparation for "war patrol" begins with a screw change to the war reserve propellers. These screws will have already been inspected to insure no defects or damage to minimize noise emanated by the submarine. Once all the shore preparations and weapons loadout are completed, the ship will depart under cover of darkness with a small craft escort for navigational assistance and sound masking. Once outside the harbor and as soon as sufficient water is

beneath the keel (30m), the submarine will submerge and commence patrol at patrol speed (2 kts).

While on patrol, the submarine will maintain emissions control (EMCON), a receive-only mode where no signals of any kind are transmitted. Communications are received via very low frequency (VLF) radio. During the day the submarine will remain submerged; at night it will snorkel to recharge its batteries. The submarine will normally snorkel until the battery is fully charged or until daylight. The battery is normally not allowed to go below 80 percent (it takes 10-12 hours at submerged patrol speeds to deplete the battery to 80 percent), and a 95 percent charge is sought nightly. While snorkeling, the boat travels at 5-6 kts, prepositioning itself for submerged operations.

The submarine is most vulnerable to detection when it is snorkeling; however, it is equipped with an electronic surveillance measures (ESM) mast to detect enemy radar while the submarine is snorkeling. The submarine will secure snorkeling and submerge upon receiving any ESM detection. It must then wait, periodically exposing only the ESM mast to verify no hostile contacts before recommencing snorkeling.

The normal sonar tactic is to place the sonar above the layer and flood down aft to put as much of the submarine as possible below the layer. This is a sophisticated sonar tactic and is by no means easy; however, it does make the submarine even more difficult to detect. Although it is beyond the scope of this project to fully

develop the acoustics and oceanography involved in this tactic, Figure 2 gives a graphical representation of the acoustics involved.[71]

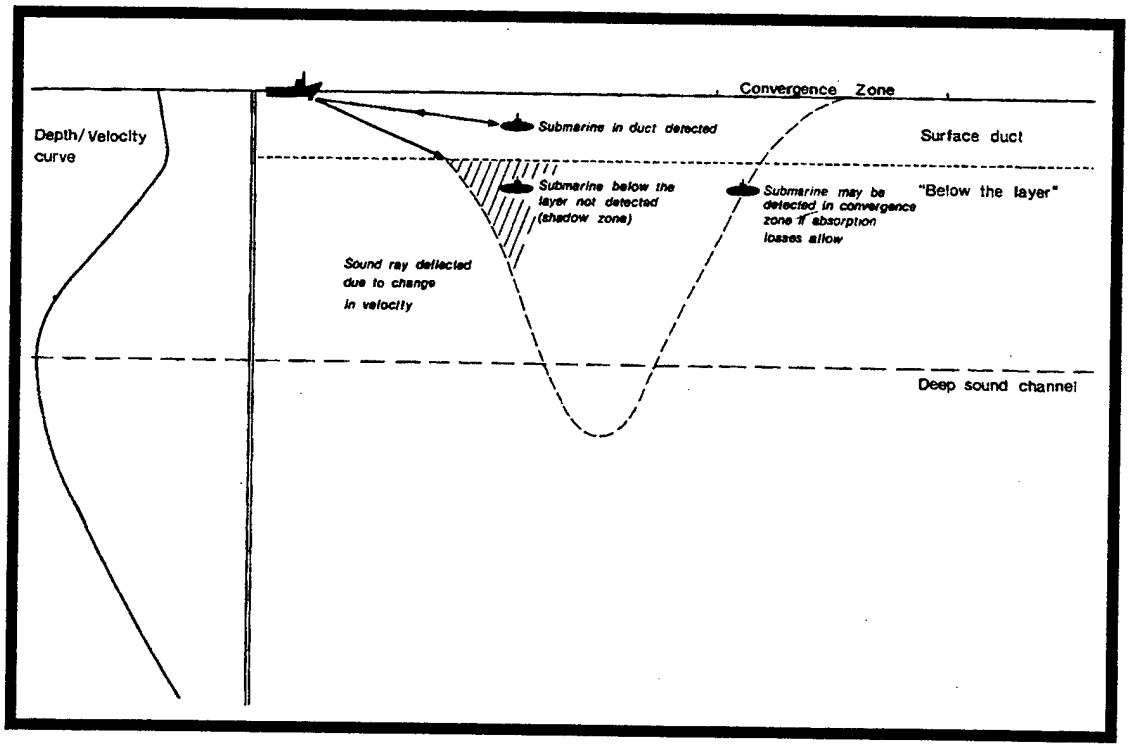

Figure 2. ASW Acoustics
Courtesy of the U.S. Naval Institute Press

Each submarine crew is trained for passive-only sonar approaches and target solutions and are efficient in torpedo tactics employing wake-homing torpedoes and mining operations. The German Type-209/1500 can be equipped with a jettisonable mine

[71] For an excellent overview of modern ASW see J.R. Hill, *Anti-Submarine Warfare,* 2nd ed. (Annapolis, Maryland: Naval Institute Press, 1989).

belt capable of carrying up to twenty-four mines without interfering with the torpedo loadout.

According to Uppal, the main threat of detection is from ASW helicopters with dipping sonar. To avoid being detected, the submarine will turn its stern towards the helicopter, approach the bottom to within 3-5 m, slow to 1-2 kts, and "creep away." If detected, the submarine "clears datum" by sprinting away at 10-12 kts for 10-15 miles.

The stated mission priority of India's submarine force includes anti-surface warfare (ASUW), Surveillance, Special Forces, anti-submarine warfare (ASW), and providing services for training. However, as noted by Uppal, to sell the platform to the politicians "ASW was the uppermost mission and ASUW [was] last in the list."[72]

B. INDIAN MOTIVATIONS BEHIND SUBMARINE ACQUISITION

It must be understood at the outset of this discussion that documented evidence of motivations for any weapon acquisition simply is not available. However, by examining the proposed employment methods of particular weapons, it may be possible to infer the motivations behind the acquisition.

It is unlikely that prestige has played a significant role in the recent Indian conventionally-powered submarine acquisitions. India already operates the largest navy in the region and its force includes an aircraft carrier. Additionally, the Indian navy

[72] Bhim S. Uppal, "A Third World Submarine Perspective."

operated an ex-Soviet *Charlie* class nuclear-powered submarine which it leased from the USSR from 1988 to 1991.

Prestige as a motivating factor may be more appropriate when discussing the Indian nuclear-powered submarine project. Currently, the Indians are pursuing an indigenously constructed nuclear-powered submarine. The project has priority over their new aircraft carrier program and is taking funds from all other naval projects. The nuclear propulsion system has already been tested at shore and actual submarine construction is scheduled to begin in 1997.[73] Unless the Indians pursue multiple hulls of this design, the tremendous effort expended on this one submarine will add little tactical advantage suggesting prestige as a motivating factor.

Even though it appears that Russia was able to make a more attractive deal than its western counterparts, political influences may have played a role in India's decision to purchase the Russian *Kilo* over other submarines currently available on the market. Although there are no formal alliances between Russia and India and there is little likelihood of direct military assistance in the event of an actual war, the purchase of these submarines certainly fosters friendship on both sides. Russia is on the receiving end of desperately needed hard currency, and Russian support personnel provide a presence that could be exploited for future political influence. India, by becoming a significant arms

[73] *Jane's Fighting Ships*, 288.

recipient, aligns itself with Russia in the hopes that it will be able to exert some political influence over Russia to offset the perceived threats posed by China and Pakistan.

A technology transfer to build future hulls of the Russian design in India would most certainly be welcome, but that deal has yet to be concluded. Additionally, India already possesses most of this technology. The Russian design is not revolutionary by any means, and India has already indigenously produced of two Type-209s in the 1980s and is currently producing a nuclear-powered submarine of its own design.

Hard evidence of bureaucratic motives is extremely difficult to find; however, the allegations of malpractices related to conventionally-powered submarines procurement would certainly suggest some evidence of it.[74] Although it is beyond the scope of this project to prove that bureaucratic motivations exist, it is safe to say that even if present, they would not be sufficient to be the sole motivation. The size of the $430 million submarine deal in the light of austere Indian defense spending, in general and in the navy in particular, suggests that additional motivating factors must be involved.

Security concerns tend to be the traditional motivation behind arms acquisitions, and this appears to be the case with India's recent conventionally-powered submarine acquisition. India's historic external security concerns lie with China and Pakistan. While the threat presented by China is non-naval in character, the threat from Pakistan has a distinct naval component. According to Admiral V. S. Shekhawat, although the Indian

[74] Ashley J. Tellis, "Securing the Barrack: The Logic, Structure and Objectives of India's Naval Expansion, *Naval War College Review* 43 (Autumn 1990): 31-57.

Ocean region has known little serious maritime conflict (mostly exported from Europe), the one naval conflict of purely local origin was the Indo-Pakistan War of 1971, "the roots of which also lay in historical influences still unresolved."[75]

The Pakistani surface navy consists of 11 major surface combatants (3 destroyers and 8 frigates) and 13 patrol and coastal combatants. The Pakistani submarine force, which has been described as the largest and best trained Third World submarine force,[76] consists of 9 submarines, including 2 *Agosta*, 4 *Daphne*, and 3 midget submarines. In September 1994, France agreed to sell three additional *Agosta*-class 90B diesel-electric submarines with air-independent propulsion to Pakistan. Pakistan will pay $950 million for the three submarines, associated training, upgrades of its Karachi shipyard, supply of required machine tools, and guaranteed logistical support. The deal includes a significant transfer of the related technology as well. The first hull is to be built in France and delivered in 1999. The second unit will be fabricated in France, but assembled in Pakistan. The third hull will be built entirely in Pakistan.[77]

According to Rahul Roy-Chaudhary, a research officer at the Indian Institute for Defence Studies and Analyses,

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[75] "The Future of Seapower," 27.

[76] Andras de Lionis, "Pakistan's Naval Special Service Group," *Jane's Intelligence Review* 6, no. 3 (March 1, 1994), 136.

[77] Lara Cantuti, "Pakistan Looks to Russia, France for Advanced Aircraft and Subs," *Arms Control Today* 24 no. 10 (December 1994), 22.

> It is clear that the advanced technology systems present in the Pakistani submarines would enable the vessels to pose a far more complex threat to Indian naval merchant ships. The defence of Karachi would also be enhanced further. Such a state of affairs would be exacerbated by the natural erosion of India's own submarine fleet in the next few years....At present, the new advanced technology submarines to be acquired simply represent a modernisation of Pakistan's submarine force. The boats will not tilt the naval balance in the Indian subcontinent in Pakistan's favour. They, however, represent a decrease in the Indian Navy's edge over the Pakistani Navy in warfare.[78]

While these naval developments could pose a direct threat to India, the Indians are more concerned with a "potential implosion of the state of Pakistan" rather than Pakistani naval aggression.[79]

The 1990s have been austere times for defense spending worldwide and India is no exception. India is definitely shifting from a power-projection naval force to one oriented on defense; however, the role of conventionally-powered submarines will continue to expand. In the words of Brigadier G. B. Reddi, (Ret.),

> Today [the Indian Navy] have wisely restricted themselves to a sea control role only, which can be performed by a more cost-effective naval force. The naval thrust should, therefore, be positively towards the development of smaller, faster and maneuverable surface ships and stealth submarines offering fewer prime targets and greater strategic options at more economic life-cycle costs.[80]

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[78] Rahul Roy-Chaudhary, "Advanced technology Submarines for Pakistan: Implications for the Indian Navy," *Strategic Analysis* 17 no. 9 (December 1994): 1087-1098.

[79] R.K. Jasbir Singh, PVSM, Lt. Gen. (Ret.) ed., *Indian Defence Yearbook 1997-98* (Dehra Dun, India: Natraj Publishers, 1997), 21.

[80] G.B. Reddi, Brigadier, Indian Army (Ret.), "Defense Preparedness – Issues and Choices: An Agenda for the Twenty-First Century," *Indian Defense Review* 11, no. 2 (April-June 1996), 38.

According to Vijay Madan, Lt. Gen., Indian Army (Ret.), "the aim should be to possess fast surface units armed with missiles, and a much larger number of submarines, all supported by land-based maritime aircraft and fighters. Such engagements should not take place outside the range of our land-based aircraft.[81] This strategy is designed to counter the threats posed by Pakistan and China, but it would work equally as well if countering limited naval action conducted by the United States.

Although not considered as a traditional security threat, the United States has had a long history of involvement in the Indian Ocean and continues routinely to deploy carrier battlegroups and amphibious ready groups to the Indian Ocean. During the 1962 Indo-China War, the United States promised to send a carrier task force into the Indian Ocean as a measure of support. It did not arrive until 1971, just after India's naval victory over Pakistan. This delay is still considered by many Indians as the "great betrayal."[82] The recent U.S. supply of $370 million worth of arms to Pakistan following the Brown amendment in 1995 is the latest "thorn" in Indo-U.S. relations.[83]

Although there has been some movement towards accommodation between the United States and India, it has its limits. According to Nalini K. Jha, an Indian specialist in Indo-U.S. relations,

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[81] Vijay Madan, "The Defense Budget," 42-43.

[82] Interview with Waheguru Pal Singh Sidhu, Monterey, Calif., 24 April 1997.

[83] Singh, ed., *Indian Defence Yearbook 1997-98*, 16.

> It [would] be misleading to ignore undercurrents of differences in Indo-U.S. relations. On the question of Kashmir, for instance, Washington, unlike New Delhi, has never regarded Kashmir as an undisputed territory. In fact, the process of Indo-U.S. accommodation has been punctuated by sticky patches of differences on issues such as arms supply to Pakistan, (in the 1990s), activities of the Sikh terrorists in the United States, the Bhopal gas disaster of 1984, which involved a U.S. multinational corporation, India's testing of an intermediate missile, *Agni*, in 1989, New Delhi's withdrawal (under domestic pressures) of refueling facility to the U.S.-led multinational force during the Gulf War of 1991, trade matters, especially intellectual property rights, alleged violations of human rights and Missile Technology Control Regime (MTCR), environmental pollution, India's sale of wheat to Cuba, and so on.[84]

Although the United States and India have conducted a joint naval exercise consisting of two destroyers and two frigates in May 1992,[85] the large U.S. naval build up in the Persian Gulf and their employment against Iraq are a source of tension for India. According to Dr. A.K. Pasha, Assistant Professor at Jawaharlal Nehru University, New Delhi,

> ...U.S. domination of the Gulf region is otherwise marginalising our influence in the area. This is not to deny the benefits from low oil prices resulting from Iraq's defeat. But it is a matter for concern that the U.S. has been going about defending its interests in a rather aggressive manner. But we must neither blindly endorse the U.S. strategy in the area nor suspect it on every issue, but should redouble our diplomatic efforts to quickly assert, protect and promote our interests in the region which are mainly related to oil, immigrants and security. Once tension is removed, the huge Western naval presence which is cause for concern may decline in the neighbourhood of India.[86]

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[84] Nalini K. Jha, "India and the United States: Pursuit and Limits of Accommodation, *Strategic Analysis* 17 no 1 (April 1994): 89-107.

[85] Rahul Roy-Chaudhury, *Sea Power and Indian Security* (London: Brassey's Ltd., 1995), 132.

[86] A.K. Pasha, "The Recent Gulf Crisis: India's Options," *Strategic Analysis* 17 no 10 (January 1995): 1271-1286.

Again according to Nalini K. Jha, the thorniest long range question concerning Indo-U.S. relations is the still unresolved status of India as a partner or merely a camp follower.

> History does not suggest that Washington would give much to the Indian view on global matters and India is not going to completely forgo its autonomy in international relations. India's geo-strategic location, its having been a seat of a great ancient civilisation, its socio-cultural milieu, the ideals of its freedom struggle and democratic political system did not allow it to do so in the 1950s, and will not permit it to do that half a century later.[87]

In order for India to maintain its autonomy and avoid being merely a camp follower of the United States, it must be prepared to balance the conventional military forces of the United States.

C. CONCLUSION

India is a major regional power and as such has maintained and will continue to maintain a formidable navy. In addition to operating the region's largest surface fleet, India has operated a submarine force continuously since its initial purchase of three *Foxtrots* from the USSR in the late 1960s. The Indian Navy is projected to continue to upgrade and modernize its submarine force well into the twenty-first century.

Although prestige, political influences, technological transfer, and bureaucratic motives may all have played some role in India's recent decision to acquire additional

[87] Nalini K. Jha, "India and the United States: Pursuit and Limits of Accommodation," 101.

conventionally-powered submarines from Russia, the primary motives were security concerns. The acquisition of new submarines to replace older ones can be viewed in the context of several real and perceived threats. Traditional Indian security concerns are focused toward China to the North and Pakistan to the West. The threat from China is not currently naval in nature and appears to be a primary motivation for India's nuclear weapons and ballistic missile programs. The threat from Pakistan also contains a nuclear component, but it has a large naval component as well. Pakistan's continued submarine modernization program, coupled with its recent submarine purchase from France, is most likely the primary motivation behind India's recent submarine purchase.

Although not one of India's primary security concerns, evidence suggests that balancing the U.S. naval presence in the region may have played a small role in the decision to purchase additional conventionally-powered submarines. The United States as the sole remaining superpower and the largest naval presence in the region, is certainly capable of exercising cruise missile diplomacy on India, however unlikely this may be. Additionally, India continues to find itself opposing the United States on issues such as human rights violations and nuclear proliferation policies. Avoiding being merely a camp follower of the United States and maintaining India's autonomy requires balancing the capabilities of the United States. In this light, deterring the United States from exercising cruise missile diplomacy could be considered one of India's national security objectives.

India's possession of nuclear weapons may not be sufficient to deter the United States from exercising cruise missile diplomacy particularly since India currently lacks the

means to strike the United States with such weapons. India's possession of a conventionally-powered submarine force, on the other hand, may be capable of denying the United States the opportunity of exercising cruise missile diplomacy by raising the potential costs involved. India is well aware of U.S. capabilities and must be prepared to balance them or "pay the price of weakness."

V. CASE STUDY II: IRAN

A. INTRODUCTION

In January 1997, Iran took delivery of its third *Kilo* class conventionally-powered submarine from Russia. The $600 million per hull deal included training, technical support, and weapons (including wake-homing heavy-weight torpedoes) significantly enhancing Iran's layered littoral warfare capabilities.[88]

Unlike Indo-U.S. relations which are accommodating overall, but not without friction, Iran and the United States are openly hostile towards one another. Iran has labeled the United States as the 'Great Satan,' and has mounted a strong opposition movement targeted at U.S. 'hegemony.' The United States meanwhile continues to accused Iran of being a 'rogue' state, the largest exporter of terrorism, and a major drug-producing/transit country. Additionally, a U.S. national emergency declaration remains in effect for Iran, although some of the controls under that measure have been removed since it was instituted in 1979. Current U.S. policy towards Iran is aimed at "changing the behavior of the Iranian government."[89]

This chapter examines the possible motivations behind Iran's acquisition of these submarines to see if balancing the U.S. naval presence in the region has played a

[88] Cordesman and Hasim, *Iran: Dilemmas of Dual Containment*, 255-258.

[89] The White House, *A National Security Strategy for a New Century* (Washington, D.C.: U.S. Government Printing Office, May 1997), 27.

role. The chapter begins with an overview of Iran's relevant national statistics and those of its navy, and then takes a detailed look at both the support and operations of Iran's submarine force. After examining Iran's submarine capabilities and proposed methods of employment, the Iranian motivations for acquiring submarines are inferred.

1. Relevant Statistics

Iran is the largest Islamic fundamentalist state and one of the dominant powers in the Gulf region. It has definite regional aspirations including consolidating its naval superiority in the Persian Gulf and controlling the Straits of Hormuz.[90]

Iran has a population of 66,769,800 and territories stretching over 1,648,000 square kilometers. Iran's GDP in 1995 was $62.5 billion or approximately $4,900 per capita. Iranian defense expenditures in 1995 were $2.5 billion and the 1996 defense budget was increased 38 percent to $3.4 billion, the largest increase in the region. The Iranian military has 513,000 personnel of which 18,000 comprise the Iranian Navy.[91]

Iran's coastline extends over 3,180 kilometers running the entire length of the Persian Gulf and extending 600 kilometers along the Gulf of Oman. The Persian Gulf, which covers about 240,000 square kilometers and stretches 990 kilometers from

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[90] Office of Naval Intelligence, *Worldwide Submarine Challenges* (Washington, D.C.: U.S. Government Printing Office, 1997), 29.

[91] International Institute for Strategic Studies, *The Military Balance 1996/97*, 131-133.

Shatt al-Arab to the Straits of Hormuz, is dominated by the Iranian navy. The Gulf is about 340 kilometers wide at its maximum width and about 225 kilometers wide for most of its length.[92] Its average depth of only 26 meters and its maximum depth of 88 meters makes both submarine and ASW operations difficult.

Iran also occupies the strategic north shore along the length of the Straits of Hormuz which join the Persian Gulf and the Gulf of Oman. The Straits of Hormuz are about 180 kilometers long and range from 60 to 100 kilometers wide.[93] These straits are strategically significant because over 20 percent of the world oil supply flows through them.[94]

2. The Iranian Navy

Not unexpectedly, Iran possesses the largest navy of all the Gulf states. Its surface component consists of five major combatants including two destroyers and three frigates, and forty-eight patrol and coastal combatants. The Iranian navy is the only Gulf navy aside from Oman to conduct extensive and meaningful training. In 1993, the Iranian navy conducted 36 exercises. That number was increased to 49 in 1994, and to 57 in 1995. The Iranian submarines participated in these exercises for the first time in 1995.

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[92] *Academic American Encyclopedia* (Danbury, Conn.: Grolier, 1994), 187.

[93] Ibid. 238.

[94] Office of Naval Intelligence, *Worldwide Submarine Challenges*, 30.

The Iranian Navy is by no means a blue water navy, but it is consolidating its naval presence in the Persian Gulf and increasing its ability to control the Strait of Hormuz. Admiral Shamkani, Head of the Iranian Navy, has said that the recently acquired submarines will "allow the consolidation of Iranian naval superiority in the entire Persian Gulf and the Strait of Hormuz."[95] Although it is unlikely that the Iranians will be able to accomplish complete sustained control of the Straits in the near-term, they certainly will be capable of inflicting significant disruption of commercial traffic until the submarine threat is neutralized or eliminated.

3. The Iranian Submarine Force

The possession of three 877EKM *Kilo* submarines purchased from Russia significantly enhances the Iranian navy's ability to dominate the Gulf and perhaps control the Straits by introducing a whole new dimension to Iranian naval capabilities. Iran took delivery of its first *Kilo* in November 1992, the second in August 1993, and the third in January 1997. This last submarine was launched in 1994, conducted sea trials in the Baltic Sea, and left Russia in late November 1996. It transited under a Russian flag with a combined Russian/Iranian crew.[96] The *Kilos* currently are stationed at Bandar Abbas in the Strait of Hormuz, but are scheduled to be moved to a

[95] Office of Naval Intelligence, *Worldwide Submarine Challenges*, 29.

[96] Ibid., 31.

specially constructed base in Chah Bahar on the Gulf of Oman 110 kilometers west of Pakistan and 400 kilometers east of the Straits of Hormuz.

a. Support

The Iranian infrastructure supporting its submarine force is definitely lacking. Currently, Bandar Abbas is the only port which can accommodate submarines and submarine maintenance, so all support is provided from this one facility. A specially built submarine base is being constructed in Chah Bahar; it will eventually be the main support facility for the three submarines. It is believed that once stationed at Chah Bahar, the submarines will operate predominately in the less constrictive waters of the Gulf of Oman and the Indian Ocean.[97]

Iran's introduction of its submarine capabilities has not been without difficulties. Iranian submarine operations were limited in 1996 due to "significant operational problems" including battery and other material problems.[98] The Russian made batteries supplied with the submarines were not designed to operate in the warm waters of the Gulf. Iran turned to India which experienced similar problems

[97] "Iran's Naval Forces: A Shadow across the Gulf?" *Jane's Navy International* 102, no. 2 (1 March 1997), 14.

[98] A.D. Baker III, World Navies in Review, *U.S. Naval Institute Proceedings* 123, no. 3 (March 1997): 88-103.

with its *Kilos* in the late 1980s for help. New batteries have been imported from India and already may have been replaced in the first two submarines.[99]

Although Iran has had some difficulty instituting its submarine capabilities, the Iranians are working to overcome these setbacks and are improving their infrastructure to support a more robust operational schedule. Eventually, Iran may have the capability to surge-deploy all three *Kilo's* during a crisis or, alternatively, maintain a near continuous at-sea presence with at least one unit.[100]

b. Operations

On 5 March 1995, Iran conducted full scale naval maneuvers including its *Kilo* submarines for the first time.[101] The *Kilos* have participated in many exercises conducted by Iran including the latest military maneuvers in February 1997 in and around the Gulf of Oman. This was a large naval exercise of over 2000 naval personnel including the naval division of the Islamic Revolutionary Guards Corps.[102] The submarine operations have continued to become increasingly complex, and Iran

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[99] "Iran Woos India, Looking for Options in Asia," *Jane's Intelligence Review* 2, no. 9 (1 September 1995), 6, and "Third 'Kilo' delivered to Iran's Gulf naval base," *Jane's Defense Weekly* 27, no. 4 (29 January 1997), 16.

[100] Office of Naval Intelligence, *Worldwide Submarine Challenges*, 31.

[101] Cordesman and Hasim, *Iran: Dilemmas of Dual Containment*, 257.

[102] "Iran Navy launches maneuvers in Sea of Oman," *Xinhua News Agency* (12 February 1997).

has indicated that it has successfully test fired both advanced wake-homing and wire-guided Russian torpedoes.[103]

Although the Iranians have not revealed their adopted tactics, it is reasonable to assume that they are similar to that of the Russians because the Iranian submarine crews were all trained by the Russians. It is also possible that the Iranians have adopted some tactics of the Indians because of the close association between those two countries with regard to submarine matters.

Possible missions for the submarines include coastal defense, special operations, mining, and commerce raiding. Although it is likely to be several years before Iran's submarine crews can be considered experienced enough for the full range of combat operations, the U.S. Navy believes that Iran has at least one crew capable of undemanding missions such as mine-laying.[104] This capability is of considerable consequence considering the Iranian submarine purchase included some 1,800 Russian mines, bringing the Iranian mine inventory to several thousand older Russian and Yugoslavian-built models.[105] Although these may be older models, it must be remembered that it was World War II vintage mines that caused such tremendous damage to USS Samuel B. Roberts (FFG-58) during the U.S. intervention in the Iran-

[103] Cordesman and Hasim, *Iran: Dilemmas of Dual Containment*, 255-258.

[104] "Third *Kilo* delivered to Iran's Gulf Naval Base," *Jane's Defense Weekly*, 16.

[105] "Iran's Naval Forces: A Shadow across the Gulf?" *Jane's Navy International*, 14, and *Periscope's USNI Military Database* (United Communications Group, 1997).

Iraq War and to the USS Princeton (CG-59) and USS Tripoli (LPH-10) during the Gulf War.[106]

Iran's submarine force provides a significant new dimension to its layered littoral warfare strategy. Iran's mix of surface ships, land based aircraft and missiles, and its three *Kilo* submarines not only provides a credible defense against attack by Iran's Gulf neighbors, these forces can threaten and intimidate shipping in the Gulf and cause significant initial or short-term damage. A recent report indicates the Iranian Defense Ministry believes Iran is able to control the Persian Gulf.[107] Although the ability to control the Gulf is debatable for the time being, the three *Kilos* acquired from Russia will play an important role in any Iranian plans to interdict ship traffic in the Strait or in defending their coastline from seaborne attack.

B. IRANIAN MOTIVATIONS BEHIND SUBMARINE ACQUISITION

It must be understood at the outset of this discussion that documented evidence of motivations for Iranian weapons acquisitions is simply not available. It may be possible, however, to infer the motivations behinds certain weapons acquisitions by examining the proposed methods of employment of the weapon. The inevitable gap between Iranian statements and actions and Iran's support of terrorism

[106] The USS Samuel B. Roberts had to be heavy lifted back to the United States and was out of action for 20 months; the costs of repairs were estimated at $96 million. The USS Princeton was out of action for 10 months, costing $24 million to repair and refit, and the USS Tripoli was out of action for 30 days and cost $3.5 million to repair.

[107] Office of Naval Intelligence, *Worldwide Submarine Challenges*, 29-31.

and extremism make inferences difficult. However, it may be possible to illuminate some of the motivations behind their recent submarine acquisition.

Iran's submarine acquisition has some aspects of prestige. Iran possesses the largest navy of all the Gulf states and is currently the only one which operates submarines. However, the prestige associated with Iran's submarines is probably more a result of the acquisition rather than a motivating factor for it. The stated objectives of the Iranian navy are to consolidate its naval superiority in the Gulf and to control the Straits of Hormuz. While it is certainly prestigious to possess regional naval superiority the and ability to control the Straits of Hormuz, unfortunately for Iran, its regional superiority is blunted by the presence United States. The United States remains by far the largest naval presence in the region and would certainly not tolerate disruption of oil flow through the straits.

Although no formal alliances exist between Iran and Russia and there is little likelihood of direct military assistance in the event of an actual war, the purchase of these submarines certainly fosters friendship on both sides. Russia is on the receiving end of desperately needed hard currency, and Russian support personnel provide a Russian presence in Iran that could be exploited for future political influence. Iran receives weapons capable of affecting the balance of power in the region and the technical assistance to maintain their operation. Because the Iranians chose the Russian model over the available western models also suggests an alignment juxtaposed to the United States.

Iran's submarine purchase from Russia did not include the technological transfer required for future licensed production of submarines in Iran; however, a considerable amount of technology transfer was included in the deal. The maintenance support required for these submarines is not trivial and Russia, desperate to remain a major supplier on the world market, is driven to provide the assistance Iran requires.

Although there may be bureaucratic motives for Iran acquiring these submarines; evidence is lacking, and the magnitude of the other factors involved suggests that even if present, bureaucratic motives are not one of the principal factors.

Security concerns appear to be the primary motivation for Iran's submarine acquisition. Iraq remains Iran's primary regional security concern, but the threat posed by Iraq does not contain a naval component. While Iran also shares borders with Turkey, Armenia, Azerbaijan, and Afghanistan, and relations with each of these is far from cordial, the threat posed by each of these countries is also non-naval in character. Iran also shares a border with Pakistan, but relations between Iran and Pakistan are quite good. Iran and Pakistan conducted joint naval maneuvers in the Gulf of Oman in 1994, the first such exercise since the 1979 Islamic revolution in Iran. Two Iranian warships conducted port visits in Pakistan in February 1996, and Iranian and Pakistani naval units are scheduled to hold joint maneuvers in Iranian waters in mid 1997.[108]

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[108] "Iran's Naval Forces: A Shadow across the Gulf?" *Jane's Navy International*, 14.

The long-standing ideological, political, and strategic tensions between Iran and Saudi Arabia present a major security concern. A naval component to the threat posed Saudi Arabia does exist; however, Iran's naval forces are definitely superior to those of Saudi Arabia. Much to Iran's distaste, Saudi Arabia continues to receive backing from the United States; and the United States continues to be the largest naval presence in the Gulf. Because the United States is the only naval power in the region capable of inflicting its will on an unwilling Iran, the Iranian submarine acquisition can be seen as an attempt to balance the overwhelming U.S. naval presence in the Gulf.

Iran has stood by and watched not only the overwhelming defeat of Iraq by the United States during the Gulf War, but the steady buildup of U.S. naval forces deployed to the Persian Gulf since the war's end. In 1992, the regional U.S. command was upgraded to a three-star admiral's post, and in 1995, the U.S. Navy reconstituted the force as the U.S. Fifth Fleet, which was disbanded in 1947. Designating the naval force in the Persian Gulf as a numbered fleet elevated its status to that of the U.S. Sixth Fleet in the Mediterranean and the U.S. Seventh Fleet in the Western Pacific. Currently, the United States routinely operates 20 to 35 warships including an aircraft carrier in the Persian Gulf.

Along with the U.S. naval buildup in the Gulf, the United States continues to pursue policies aimed at changing Iran's behavior. The United States has levied numerous sanctions aimed at Iran, including both import and export sanctions. The freeze of assets instituted in 1979 remains in effect, and there is also a ban on indirect

assistance, and bans on bilateral assistance. As stated in the latest U.S. Security Strategy document,

> [U.S.] policy is aimed at changing the behavior of the Iranian government in several key areas, including its efforts to obtain weapons of mass destruction and missiles, its support for terrorism and groups that oppose the peace process, its attempts to undermine friendly governments in the region, and its development of offensive military capabilities which threaten our Gulf Cooperation Council (GCC) partners and the flow of oil. Pending changes in Iran's behavior, our goal is to contain and reduce its ability to threaten our interests. We also seek to coordinate with key allies to maximize pressures on Iran to change its course.[109]

And finally, Iran has witnessed three separate U.S. cruise missile attacks on Iraq since the end of Gulf War. It is obvious that Iraq could do nothing to prevent these strikes, and it is just as obvious the United States could as easily attack Iran. Or could it?

The Iranian submarines add a whole new dimension to Iran's layered littoral defensive strategy against possible U.S. cruise missile attacks from naval vessels. As discussed earlier, by operating these submarines, Iran might be able to raise the threshold for U.S. intervention in Iranian regional affairs and thereby deter the United States from conducting cruise missile attacks on Iran in situations short of actual war.

The official Iranian stated position is that the submarines are for defensive purposes only. Rear-Admiral Ashkbus Danehkar, a senior Iranian navy commander,

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[109] The White House, *A National Security Strategy for a New Century* (Washington, D.C.: U.S. Government Printing Office, May 1997), 27.

has rejected reports from foreign media sources that the Iran acquired the submarines to satisfy offensive objectives saying, "the navy of the Islamic Republic of Iran will never be a threat to friendly and neighboring countries."[110] The Commander of Iran's ground forces, General Ahmad Dadbin, reinforced that the submarines were strictly defensive in nature saying the submarines are "not a threat to any country and Iran will only use them for defensive purposes," but he went on to say Iranian forces were "ready for reprisal action" against the United States.[111] Another Iranian armed forces command official reinforced this notion by saying, "The Iranian armed forces have reached the peak of their combat readiness and are capable of repulsing any U.S. provocation in the Gulf zone."[112]

C. CONCLUSION

Iran aspires to be a major regional power, and as such can be expected to continue to expand its naval capabilities. Although prestige, political influences, technological transfer, and bureaucratic motives all may have played some role in Iran's decision to acquire submarines, the primary motives were security concerns. Iranian security concerns are primarily non-naval in nature with the exception of the

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[110] "Senior Navy Commander says new submarine no threat to neighbors," *BBC Summaries of World Broadcasts* (27 January 1997).

[111] "Russian-Made Submarine Delivered," *Arab Press Service Diplomat Recorder* 46 no. 4 (19 January 1997).

[112] "Iran Takes Delivery of Third Submarine Bought from Russia," *BBC Summaries of World Broadcasts* (28 January 1997).

United States. Iran's acquisition of these submarines is the best case of a regional power attempting to balance the overwhelming superiority of the United States.

The Iranian submarines possess an offensive capability, however, initiating any kind of offensive naval action such as securing the straits would bring swift defeat. Additionally, it is highly unlikely that Iran would seriously consider closing the straits because Iran must transport oil through the straits as well. Currently, Iran is not capable of preventing other traffic through the straits while maintaining its own.

The defensive nature of these submarines, particularly when combined with Iran's layered littoral defenses, may possibly deny the United States the ability to exercise its cruise missile diplomacy with the ease it has with Iraq. Iran is ideologically opposed to the United States and is well aware of U.S. capabilities; therefore, it must be prepared to balance the United States or "pay the price of weakness."

VI. AFFORDING CONVENTIONALLY-POWERED SUBMARINES

A. INTRODUCTION

Supply-side and demand-side factors are not the only issues involved in the acquisition of conventionally-powered submarines; the ability of the recipient to afford them is also an issue. Although economic constraints can be overcome when a nation is highly motivated to acquire expensive conventional weapons to counter perceived security threats, economic considerations can play a role in a nation's decision to acquire submarines. By using statistical analysis, this chapter lays the foundation for building a predictive model of when emerging countries will be able to afford submarines if they are so motivated.

B. METHODOLOGY

The basic concept for this study came from research conducted by David Norris in which he determined that economic variables could be used to classify a country's naval strength.[113] In that study, Norris first classified countries according to naval strength based on technological complexity, size, and quantity of fleet assets. Countries were first classified as being landlocked, or possessing an insignificant navy, a small navy, or a large navy. Countries with large navies were further divided into four tiers based on

[113] David Norris, "Predicting Naval Strength of Latin American Countries from Economic Variables," *Defense Analysis* 4 no. 2 (1988): 147-152.

Norris' "professional judgment as a nuclear submarine officer."[114] First tier navies were those possessing aircraft carriers, nuclear attack submarines, and ballistic missile submarines. Second tier navies were those possessing aircraft carriers and China because although they did not possess aircraft carriers, they did have nuclear-powered submarines. Third tier navies were those possessing conventionally-powered submarines and frigates, and so on.

Applying this classification scheme to Latin America and then using discriminant analysis, Norris showed that economic variables could correctly predict a country's classification about 65 percent of the time. The six economic variables best able to discriminate between the groups were arms exports, arms imports, arms exports/total exports, GNP per capita, GNP, and military expenditures/GNP.[115]

Discriminant analysis generates a discriminant function based on linear combinations of predictor variables (in Norris' case economic variables) that provide the best discrimination between the groups (naval strength). The functions are generated from a sample of cases for which group membership (naval strength) is known, and can then be applied to new cases with measurements for the predictor variables but unknown group membership.[116]

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[114] Norris, "Predicting Naval Strength of Latin American Countries," 148.

[115] Ibid., 149-150.

[116] *SPSS Base 7.5 for Windows User Guide* (Chicago: SPSS Inc., 1997), 245.

The present study is similar to that of Norris' except country classification is based on the possession of conventionally-powered submarines and not professional judgment. *Jane's Fighting Ships, 1970, 1975, 1980, 1985, and 1990*, were used to determine which countries had conventionally-powered submarines in commission. If a country was not listed as having a navy in the 1997 edition of *Jane's* it was assumed to be landlocked and withdrawn from the analysis. To further focus on emerging nations, all NATO countries, USSR, China, Japan, and Australia were excluded from the analysis. Using discriminant analysis, the possession of conventionally-powered submarines was predicted with U.S. Arms Control and Disarmament Agency (ACDA) economic variables in a SPSS database.[117] The following economic variables were used in the analysis:

Armed forces per 1000 population
GNP gross national product (current $)
ME/GNP Military expenditures share of GNP (%)
ME/CGE Defense budgetary share (%)
Arms imports share of total imports (%)

The analysis was repeated on the data sets for 1970, 1975, 1980, 1985, and 1990 to determine the validity of this model for determining when a country might be able to afford conventionally-powered submarines. Analysis of 1995 was not possible because ACDA economics data for 1995 is not yet available.

[117] Data obtained from U.S. Arms Control and Disarmament Agency, *World Military Expenditures and Arms Transfers* (Washington, D.C.: U.S. Government Printing Office) various editions.

C. RESULTS AND ANALYSIS

The five economic variables correctly classified the countries an average of 80 percent of the time. The same 105 cases were processed during each analysis. Cases were excluded if they were missing data from any discriminating variables. Tables 3 through 7 give the results of each analysis.

Table 3. Results of Discriminant Analysis, 1970

Submarines in Commission, 1970	No. of Countries 87 Total	Predicted Yes	Predicted No
Yes	14	9 (64.3%)	5 (35.7%)
No	73	13 (17.8%)	60 (82.2%)

Table 4. Results of Discriminant Analysis, 1975

Submarines in Commission, 1975	No. of Countries 86 Total	Predicted Yes	Predicted No
Yes	16	12 (75.0%)	4 (25.0%)
No	70	11 (15.7%)	59 (84.3%)

Table 5. Results of Discriminant Analysis, 1980

Submarines in Commission, 1980	No. of Countries 87 Total	Predicted Yes	Predicted No
Yes	17	10 (58.8%)	7 (41.2%)
No	70	9 (12.9%)	61 (87.1%)

Table 6. Results of Discriminant Analysis, 1985

Submarines in Commission, 1985	No. of Countries 77 Total	Predicted Yes	Predicted No
Yes	19	11 (57.9%)	8 (42.1%)
No	58	9 (15.5%)	49 (84.5)

Table 7. Results of Discriminant Analysis, 1990

Submarines in Commission, 1990	No. of Countries 61 Total	Predicted Yes	Predicted No
Yes	16	10 (62.5%)	6 (35.3%)
No	45	7 (15.6%)	38 (86.4%)

During the 20 year period covered by this analysis, 15 countries acquired submarines. Of those 15 countries, 13 were classified correctly. Some definite patterns emerge in the misclassified countries. Iran was predicted as having submarines each time, although it has only recently acquired submarines. Czechoslovakia and Mexico were also consistently misclassified as having submarines. Both Saudi Arabia and UAE were misclassified 4 out of 5 times as having submarines. Thailand and Singapore were misclassified as having submarines for 1985 and 1990. Chile was consistently misclassified as not having submarines, and Colombia was misclassified as not having submarines 4 out of 5 times.

Of the economic variables used in this analysis, only GNP was consistently statistically significant according to partial f-test. Running the analysis using GNP as the only discriminating variable gave a similar overall result of about 80 percent classified correctly; however, this was weighted towards the non-submarine countries. More

countries were correctly classified as not having submarines and fewer countries were correctly classified as having submarines. Although the variation in GNP within each group (submarines yes/no) was quite large, the mean was consistently about 4 times larger for those countries possessing submarines than those that did not.

D. CONCLUSION

Although this study is intended as a framework for future analysis, the results suggest that it may be possible to develop a model using economic variables to predict when countries are able to afford submarines. With some refinement, this economic model may prove useful. One refinement could be accomplished by conducting a yearly analysis based on when countries actually pay for their submarines as opposed to five year increments based on submarines in commission. It may also prove useful to differentiate between surplus submarine acquisitions and new construction acquisitions. Accounting for other non-economic variables (such as prestige, political influence, security concerns, etc.) and supply-side factors may help explain the consistent misclassification of certain countries. Although it is beyond the scope of this study to pursue these issues, this study provides a basic framework in which to continue research in this area.

VII. CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

A. CONCLUSIONS

A number of conclusions can be drawn from this study. First, the strong supply-side factors affecting transfers of expensive advanced conventional weapons, such as submarines, have converged making it a "buyers' market." Whether the supplier states are motivated to maintain their technological base, produce arms for economy of scale, or raise hard currency from foreign sources, they are actively seeking markets for their conventionally-powered submarines. Suppliers are making attractive deals including the most advanced technology, training, support, and weapons to attract foreign buyers. Conditions are such that it appears likely to remain a "buyers' market" with respect to conventionally-powered submarines for at least the next few decades.

Secondly, the United States presents a security threat to some countries. Balancing U.S. cruise missile diplomacy has emerged as a motivating factor for countries to acquire conventionally-powered submarines since the end of the Cold War. Although not one of India's primary security concerns, evidence presented here suggests that balancing the U.S. naval presence in the region may have played a small role in their recent decision to purchase additional conventionally-powered submarines. In the case of Iran, although prestige, political influences, technological transfer, and bureaucratic motives may all have played some role in Iran's decision to acquire submarines, the primary motives were security concerns focused on the United States.

Third, the rapidly growing economies of emerging nations will allow more countries to afford conventionally-powered submarines in the near future. Singapore, and Thailand, which were predicted to possess conventionally-powered submarines by the preliminary economics model presented in this study, have been negotiating deals for submarines.[118]

B. IMPLICATIONS

The above conclusions have definite implications for future U.S. foreign policy in general and for U.S. naval strategy in particular. The supply-side factors making it a "buyers' market" coupled with increasing numbers of countries motivated to acquire and able to afford conventionally-powered submarines, suggest that conventionally-powered submarines will continue to proliferate, not only in numbers, but also the number of countries operating them.

The proliferation of conventionally-powered submarines could significantly impact U.S. foreign policy by presenting higher risks and increasing the potential costs of conducting cruise missile diplomacy against a determined adversary. The conventionally-powered submarine presents a difficult ASW target. According to the U.S. Navy *ASW Assessment, 1996*, the submarine problem in regional conflicts is not simply a subset of the global problem which the former Soviet Union presented.[119] Additionally, there is considerable uncertainty in the state of current and future U.S. ASW advantage:

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[118] "Conventional Submarine Proliferation," *Jane's Defense Weekly* 27 no. 7 (February 19, 1997), 22.

[119] Department of the Navy, *ASW Assessment, 1996* (U), 1 (SECRET document).

> First, the world has changed dramatically in the past five years. While the threat of global war is certainly diminished, the threat of regional conflict is on the rise. Second, the dissemination of technology as a necessary part of world commerce is occurring at a rapid pace. The technology embedded in commercial products no longer lags the technology in military systems.[120]

Also according to the *ASW Assessment*, "The most difficult problem is now and always been the initial detection and classification." [121] The proliferation of modern conventionally-powered submarines makes this even more difficult. Current detection methods include: undersea and towed listening arrays, airborne detection, shipborne detection, and submarine detection. Each of these has its limitations. Undersea and towed listening arrays were designed to detect high speed transiting nuclear submarines and are not always available in littoral regions. Airborne detection is based primarily on visual or radar detection of submarine masts while the submarine is at periscope depth or snorkeling to recharge its batteries. The latest generation conventionally-powered submarines, equipped with air independent propulsion, spend even less time near the surface than the Argentinean Type-209 did during the Falklands War.

Both surface ships and submarines depend on acoustic detection. Although there is potential for improvement in every aspect of ASW, poor acoustic detection remains the U.S. "most critical shortfall."[122] For U.S. surface ships,

- Active sonars have historically been optimized for long-range detection of high doppler (high speed) targets in deep water. Modern diesel submarines have very low target strengths (primarily due to their smaller size) and present insufficient doppler for reliable detection.

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[120] *ASW Assessment, 1996,* (U) 14.

[121] Ibid., 15.

[122] Ibid., 40.

- Submarines take maximum advantage of the thermal layer and downward refraction and benefit from the surface ship's inability to conduct continuous, 360 degree active search. Baffle areas provide one impediment and higher power search is generally limited to specific, rotating search areas.
- Variable depth active sonar was abandoned due to limited availability, reliability problems, and poor training readiness caused by exercise restrictions.
- Active dipping helos, which have been very effective, [are] constrained primarily to CV defense.
- Towed array performance is constrained by the radiated noise of own ship and flow noise associated with the tactical; speeds of the multi-mission combatant. At the same time submarines have been getting steadily quieter.
- Passive processing suites have been focused on narrow band observables which diesel submarine technology has reduced.[123]

For U.S. submarines,

- The ability of the submarine force to make initial detection of the latest Russian nuclear submarines or *modern diesel submarines,* at tactically significant ranges, is the major submarine ASW deficiency existing in the fleet today. Even with the programmed acquisition, detection advantage against front line nuclear or diesel submarines is lacking. (Emphasis added) [124]

Complicating the issue further, not only do conventionally-powered submarines present a difficult ASW problem, preemptively eliminating such a hazard is an act of war and could certainly not be justified in the pursuit of diplomacy with cruise missiles.

[123] *ASW Assessment, 1996* (U), 40.

[124] Ibid., 63.

C. RECOMMENDATIONS

Three recommendations emerge from this study. First, U.S. policy makers must seriously consider the higher risks and increased costs involved engaging in cruise missile diplomacy with a country that possess conventionally-powered submarines.

Secondly, the United States should pursue policies that minimize other nation's perception of U.S. ability and willingness to use cruise missiles in the pursuit of diplomacy. The development of the arsenal ship is directly contrary to this goal. Any platform developed solely for the purposes of "inflicting overwhelming, punishing damage" can be nothing but provocative. The U.S.-Soviet nuclear arms race resulting from the U.S. pursuit of the nuclear weapons provides an illustrative example of the consequences of developing such weapons.

And finally, although according to naval expert Norman Freidman, conventionally-powered submarines are counterable,

> None of this is to say that foreign diesel submarines operating in the littoral waters would necessarily be pushovers. They would be close to their bases, so endurance would not be so important for them. They would lack speed, but weapons could make up for that. Moreover, such submarines lying on the bottom in ambush might be extremely difficult targets.[125]

The U.S. Navy should take the threat posed by conventionally-powered submarines operated by emerging nations seriously and continue to shift its ASW focus from the open ocean anti-nuclear submarine problem, to the much more likely problem presented by conventionally-powered submarines operating in the littorals.

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[125] Norman Freidman, "World Naval Developments Review," *U.S. Naval Institute Proceedings* 122, no. 5 (May, 1996), 112.

APPENDIX. CURRENT INVENTORIES[126]

The current worldwide inventories of conventionally-powered submarines grouped by region. The approximate year or period of commissioning is designated in parentheses.

NATO (total 93)

Canada	3	*Oberon* class (1965-68)
Denmark	3	Type 207 (1964-66)
	2	*Narvhalen* class (1970)
France	3	*Agosta* class (1977-78)
	1	*Daphne* class (1966-70)
Germany	12	Type 206 A (1974-75)
	5	Type 206 (1973-74)
	2	Type 205 (1968-69)
Greece	8	Type 209-1100/1200 (1971-80)
Italy	4	Improved *Sauro* class (1988-95)
	4	*Sauro* class (1979-82)
Netherlands	4	*Walrus* class (1990-94)
Norway	6	Type 210 (1989-92)
	6	Type 207 (1964-66)
Portugal	3	*Daphne* class (1967-69)
Spain	4	*Agosta* class (1983-83)
	4	*Daphne* class (1973-75)
Turkey	4	Type 209-1400 (1994-99)
	6	Type 209-1200 (1976-90)
	7	*Guppy* class (1940s)
	2	*Tang* class (1950s)

[126] "Conventional Submarine Proliferation," *Jane's Defense Weekly* 27, no. 7 (February 19, 1997), 23.

Non-NATO Europe, including Russia (total 77)

Albania	1	*Whiskey* V class (1960-61)
Bulgaria	2	*Romeo* class (1958-61)
Croatia	1	midget submarine
Poland	1	Type 877E *Kilo* class (1986)
	2	Type 641 *Foxtrot* class (1966)
Romania	1	Type 877E *Kilo* class (1986)
Russia	24	*Kilo* class (1979-95)
	16	Type 641B *Tango* class (1973-82)
	6	Type 641 *Foxtrot* class (1960s)
Serbia & Montenegro	2	*Sava* class (1978-81)
	2	*Heroj* class (1968-70)
	9	midget submarines
Sweden	3	A 19 *Gotland* class (1996-97)
	4	A 17 *Vastergotland* class (1987-90)
	3	A 14 *Nacken* class (1980-81)

Middle East/Gulf (total 35)

Algeria	2	Type 877E *Kilo* (1987-88)
Egypt	2	Type 209 (planned)
	4	*Romeo* (1966-84)
Iran	3	Type 877EKM *Kilo* (1992-96)
	9	midget submarines
Israel	3	*Dolphin* class (planned)
	3	Gal class (1977)
Libya	4	*Foxtrot* (1976-83)
	6	midget submarines
Syria	1	*Romeo* (1961)

Asia Pacific (total 228)

Australia	6	*Collins* class (1995-99)
	2	*Oberon* class (1969-78)
China	4	Type 877EKM *Kilo* (1995-)
	3	Type 039 *Song* (1994-)
	13	Type 035 *Ming* (1971-92)
	38	*Romeo* class (1962-84)
India	4	Type 209-1500 (1986-94)
	8	Type 877EM *Kilo* (1986-91)
	6	Type 641 *Foxtrot* (1970-75)
Indonesia	2	Type 209-1300 (1981)
Japan	7	*Harushio* class (1990-97)
	10	*Yuushio* class (1980-89)
	1	*Uzushio* class (1976-78)
North Korea	22	*Romeo* class (1974-95)
	20	*Sang-O* (1990's)
	50	midget submarines
South Korea	9	Type 209-1200 (1993-97)
	11	midget submarines
Pakistan	2	*Agosta* class (1979-80)
	4	*Daphne* class (1969-70)
	2	midget submarines
Singapore	1	*Sjoormen* (leased) (1960s)
South Africa	3	*Daphne* class (1970-71)
Taiwan	2	*Hai Lung* class (1987-88)

Latin America (total 34)

Argentina	2	Type TR 1700 (1984-85)
	2	Type 209-1200 (1974)
Brazil	4	Type 209-1400 (1989-99)
	3	*Oberon* class (1973-77)
Chile	2	Type 209-1300 (1984)
	2	*Oberon* class (1973-77)
Colombia	2	Type 209-1200 (1975)
	2	midget submarines
Cuba	3	Type 641 *Foxtrot* (1979-84)
Ecuador	2	Type 209-1300 (1977-78)
Peru	6	Type 209-1200 (1974-83)
	2	*Abtao* class (1954)
Venezuela	2	Type 209-1300 (1976-77)

LIST OF REFERENCES

Arms Control and Disarmament Agency, *World Military Expenditures and Arms Transfers* (Washington, D.C.: U.S. Government Printing Office, 1978, 1988, 1994).

Academic American Encyclopedia (Danbury, Conn.: Grolier, 1994).

Edward E. Azar and Chung-in Moon, eds. *National Security in the Third World: The Management of Internal and External Threats* (Aldershot, England: Edward Elger Publishing, Ltd., 1988).

A.D. Baker III, World Navies in Review, *U.S. Naval Institute Proceedings* 123, no. 3 (March 1997).

John R Benedict, "Future Perspectives in Antisubmarine Warfare." *APL Technical Review* 3, no. 2 (1992).

John R. Benedict, "Third World Submarine Developments," *Submarine Review* (October 1990).

John R. Benedict, "Undersea Weapons -- Technology Transfer with Anti-ship Implications" (brief prepared for CIA/OTE, May 1996 update).

Thomas A. Brooks, Rear Admiral, U.S. Navy (Ret.), "Whatever Happened to ASW?" *U.S. Naval Institute Proceedings* 122 no. 2 (February 1996).

"Building Conventional Subs in the United States," *Naval Forces* 15, no. 5 (1994).

Lara Cantuti, "Pakistan Looks to Russia, France for Advanced Aircraft and Subs," *Arms Control Today* 24 no. 10 (December 1994).

Christian Catrina, "Main Directions of research in the Arms Trade," *AAPSS Annals* 535 (September 1994).

Tom Clancy, *SSN* (New York: Berkley Books, 1996).

"Conventional Submarine Proliferation," *Jane's Defense Weekly* 27 no. 7 (19 February 1997).

Anthony H. Cordesman and Ahmed S. Hashim, *Iran: Dilemmas of Dual Containment* (Colorado: Westview Press, 1997).

Department of the Navy, *ASW Assessment* (U), Washington, D.C.: U.S. Government Printing Office, 1996 (SECRET document).

Department of the Navy, *Forward...From the Sea* (Washington, D.C.: U.S. Government Printing Office, 1995).

Department of the Navy, *Naval Warfare, Naval Doctrine Publication 1* (Washington, D.C.: U.S. Government Printing Office, 1994).

Dana P. Eyre and Mark C. Suchman, "Status, Norms and the Proliferation of Conventional Weapons: An Institutional Approach," in Peter J Katzenstein, ed., *The Culture of National Security: Norms and Identity in World Politics* (New York: Columbia University Press, 1996).

"The Future of Seapower," *Jane's Navy International* 101, no. 1 (January/February 1996).

Norman Freidman, "World Naval Developments Review," *U.S. Naval Institute Proceedings* 122, no. 5 (May 1996), 112.

Alexander L. George and Richard Smoke, *Deterrence in American Foreign Policy: Theory and Practice* (New York: Columbia University Press, 1974).

Michael R. Gordon, "Pentagon says Russia is Selling Subs to Iran," *New York Times* (24 September 1992).

J.R. Hill, *Anti-Submarine Warfare,* 2nd ed. (Annapolis, Maryland: Naval Institute Press, 1989).

"India plans to buy two Russian Subs," *North American Wire* Reuters, Limited, (8 January 1997).

"India to take two more *Kilo* class submarines," *Jane's Navy International* 102, no. 2 (1 March 1997).

International Institute for Strategic Studies, *The Military Balance 1996/97* (London: Oxford University Press, 1996).

"Iran's Naval Forces: A Shadow across the Gulf?" *Jane's Navy International* 102, no. 2 (1 March 1997).

"Iran Navy launches maneuvers in Sea of Oman," *Xinhua News Agency* (12 February 1997).

"Iran Takes Delivery of Third Submarine Bought from Russia," *BBC Summaries of World Broadcasts* (28 January 1997).

"Iran Woos India, Looking for Options in Asia," *Jane's Intelligence Review* 2, no. 9 (1 September 1995).

Jane's Fighting Ships (London: Jane's Information Group, Limited, 1996).

Nalini K. Jha, "India and the United States: Pursuit and Limits of Accommodation, *Strategic Analysis* 17 no 1 (April 1994): 89-107.

Brian L. Job, ed. *The Insecurity Dilemma: National Security of Third World States* (Boulder, Colo.: Lynne Reinner Publishers, Inc., 1992).

Joint Chiefs of Staff, *National Military Strategy* (Washington, D.C.: U.S. Government Printing Office, 1995).

Edward L. Katzenbach, "The Horse Cavalry in the Twentieth Century: A Study in Policy Response," *Public Policy* 8 (1958).

John Keegan, *The Price of Admiralty* (New York: Viking Penguin Press, 1988).

Keith Krause, *Arms and the State: Patterns of Military Production and Trade* (Toronto: Cambridge University Press, 1992).

Youry A. Lambert, "High Technology and Defense Industry Sectors Opening up in Russia and Ukraine," *Information Access Company, Newsletter Database*, World Trade Executives, Inc. (1 March 1997).

Edward J. Laurance, *The International Arms Trade* (New York: Lexington Books, 1992).

Karl Lautenschläger, "The Submarine in Naval Warfare," *International Security* 11 no. 3 (Winter 1986-87).

Andras de Lionis, "Pakistan's Naval Special Service Group," *Jane's Intelligence Review* 6, no. 3 (1 March 1994).

Lora Lumpe, "Clinton's Conventional Arms Export Policy: So Little Change," *Arms Control Today* 25 no. 4 (May 1995).

Vijay Madan, Lt. Gen., PVSM, VSM (Ret.), "The Defense Budget," *Indian Defense Review* 11, no. 4 (October-December 1996).

Talukder Maniruzzaman, "The Security of Small States in the Third World," *Canberra Papers on Strategy and Defense, No. 25* (Canberra, Australia: The Strategic and Defence Studies Centre, The Australian National University, 1982).

Robert K. Massie, *Dreadnought* (New York: Ballantine Books, 1991).

Sanjeev Miglani, "Russia to Revive India Reactor Sale," *Asia Times* (21 March 1997).

David Miller, "New Russian Submarine Hunts Export Market," *International Defense Review* 9 (1994).

David Miller, *Submarines of the World* (New York: Orion Books, 1991).

David Norris, "Predicting Naval Strength of Latin American Countries from Economic Variables," *Defense Analysis* 4 no. 2 (1988).

Office of Naval Intelligence, *Worldwide Submarine Challenges* (Washington, D.C.: U.S. Government Printing Office, 1997).

Office of Technology Assessment, *Technologies Underlying Weapons of Mass Destruction* (Washington, D.C.: U.S. Government Printing Office, 1993).

A.K. Pasha, "The Recent Gulf Crisis: India's Options," *Strategic Analysis* 17 no 10 (January 1995).

Periscope's USNI Military Database (United Communications Group, 1997).

Barry R. Posen, *The Sources of Military Doctrine* (Ithica, New York: Cornell University Press, 1984).

G.B. Reddi, Brigadier (Ret.), "Defense Preparedness -- Issues and Choices: An Agenda for the Twenty-First Century," *Indian Defense Review* 11, no. 2 (April-June 1996).

Edward Rhodes, "Do Bureaucratic Politics Matter? Some Disconfirming Findings from the Case of the U.S. Navy," *World Politics* 17 (October 1991).

Theodore Roscoe, *U.S. Submarine Operations in WWII* (Annapolis, Maryland: Naval Institute Press, 1949).

Rahul Roy-Chaudhary, "Advanced technology Submarines for Pakistan: Implications for the Indian Navy," *Strategic Analysis* 17 no. 9 (December 1994).

Rahul Roy-Chaudhury, "The Problem," *Seminar 448: Special Issues on Maritime Security* (December 1996).

Rahul Roy-Chaudhury, *Sea Power and Indian Security* (London: Brassey's Ltd., 1995).

"Russian-Made Submarine Delivered," *Arab Press Service Diplomat Recorder* 46 no. 4 (19 January 1997).

R.K. Jasbir Singh, PVSM, Lt. Gen. (Ret.) ed., *Indian Defence Yearbook 1997-98* (Dehra Dun, India: Natraj Publishers, 1997).

Sanjay J. Singh, LT, Indian Navy, "The Indian Navy is No Threat," *U.S. Naval Institute Proceedings* 117, no. 3 (March 1991).

"Senior Navy Commander says new submarine no threat to neighbors," *BBC Summaries of World Broadcasts* (27 January 1997).

Ed Smith, Capt. U.S. Navy, "They Can Buy It, But..." *U.S. Naval Institute Proceedings* 120, no. 3 (February 1994).

Konstantin Sorokin, "Russia's 'New Look' Arms Sales Strategy," *Arms Control Today* 23 no. 8 (October 1993).

Timothy F. Sparks, "The Dawn of Cruise Missile Diplomacy," (Thesis, Naval Postgraduate School, Monterey, 1997).

SPSS Base 7.5 for Windows User guide (Chicago: SPSS Inc., 1997).

"SUBCON '95," *Naval Forces* 16, no. 6 (1995).

"Swedish Submarine Technology," *Naval Forces* 15, no. 3 (1994).

Ashley J. Tellis, "Securing the Barrack: The Logic, Structure and Objectives of India's Naval Expansion, *Naval War College Review* 43 (Autumn 1990).

"Third 'Kilo' delivered to Iran's Gulf Naval Base," *Jane's Defense Weekly* 27, no. 4 (29 January 1997).

Sun Tzu, *The Art of War*, trans. Samuel B. Griffith (London: Oxford University Press, 1971).

Bhim S. Uppal, NM, VSM, Commodore, Indian Navy, (Ret.) "A Third World Submarine Perspective" brief prepared for American Systems Corporation (December 1994).

Kenneth N Waltz, "The Third Image: International Conflict and International Anarchy," *Man, The State and War: A Theoretical Analysis* (New York: Columbia University Press, 1959).

The White House, *A National Security Strategy of Engagement and Enlargement* (Washington, D.C.: U.S. Government Printing Office, February 1996).

The White House, *A National Security Strategy for a New Century* (Washington, D.C.: U.S. Government Printing Office, May 1997).

Richard L. Wright, Capt. U.S. Navy, "Arsenal Ship: Potent and Punishing," *Surface Warfare* 22, no. 1 (January/February 1997).

BIBLIOGRAPHY

Secretary of Defense Les Aspin, *The Bottom-Up Review* (Washington, D.C.: U.S. Government Printing Office, October 1993).

Bryan Bender, "U.S. Submarine Operations Rise Since End of Cold War," *Defense Daily* 193, no. 23 (1 November 1996).

Clay Blair, Jr. *Silent Victory; The U.S. Submarine War Against Japan* (New York: Bantom Books, 1976).

Jacob Borresen, "The Seapower of the Coastal State," *Seapower: Theory and Practice* (1994).

Nathaniel F. Caldwell, Jr., "Are We Shortchanging ASW?" *Armed Forces International* (July 1996).

"Conventional Submarines," *Naval Forces* 15 no.11 (1994).

Derek de Cundha, "The Need for Weapons Upgrading in Southeast Asia: Present and Future," *International Politics and Security* 1, no. 1 (1996).

"DSB Recommends Improvements to Strategic Mobility Mission," *Aerospace Daily* 180, no. 9 (11 October 1996).

Department of the Navy, *2020 Vision: A Navy for the 21st Century* , Revision 7 (Washington, D.C.: U.S. Government Printing Office, April 1996).

James Fitzgerald, Rear Admiral, U.S. Navy and John Benedict, "There is a Sub Threat," *U.S. Naval Institute Proceedings* 116 no. 8 (August 1990).

Norman Friedman, "Littoral Anti-Submarine Warfare," *International Defense Review* 6 (1995).

Patrick J. Garrity, *Why the Gulf War Still Matters* (Los Alamos, N.Mex.: Center for National Security Studies, July 1993).

Bates Gill and Taeho Kim, *China's Arms Acquisitions from Abroad* (Oxford: Stockholm International Peace Research Institute, Oxford University Press, 1995).

V.F. Holderness, Commodore, South African Navy (Ret.) "Relaunch the Non-Nuclear Boats," *U.S. Naval Institute Proceedings* 121 no. 6 (June 1995).

W.J. Holland, Rear Admiral, U.S. Navy (Ret.) "ASW is Still Job One," *U.S. Naval Institute Proceedings* 118 no. 8 (August 1992).

Ethan B. Kapstein, "Military Expenditures in the Developing World: Assessing the Data," *Peace Economics, Peace Science and Public Policy* 1, no. 1 (1993).

Andrew F Krepinevich, *The Bottom-Up Review: An Assessment* (Washington, D.C.: The Defense Budget Project, January 1994).

Julian Lake, Rear Admiral, US Navy (Ret.) "The Case for the Diesel-Electric Submarine," *U.S. Naval Institute Proceedings* 121 no. 6 (June 1995).

Geoffrey Lamb and Valeriana Kallab, eds., *Military Expenditure and Economic Development*, (Washington, D.C.: World Bank, 1992).

Bruce Linder, Captain, U.S. Navy, "ASW as Practiced in Birnam Wood," *U.S. Naval Institute Proceedings*, 122 no. 5 (May 1996).

Joris Jansess Lok, "Conventional Submarines: At the Forefront of Naval Developments," *Jane's Defense '96: The World in Conflict* (1996).

"Looking at ASW from the Surface," interview with James Fitzgerald, Rear Admiral, U.S. Navy, *Surface Warfare* (July/August 1990).

Robert E. Looney, "Defense Expenditures and Economic Performance in South Asia: Tests of Causality and Interdependence," *Conflict Management and Peace Science* 11, no. 2 (1991).

Robert E. Looney, "Economic Environments conducive to Indigenous Third World Arms Production," *Singapore Economic Review* 33, no. 2 (October 1988).

Robert E. Looney, "Economic Factors Affecting the Third World Arms Trade," *The International Trade Journal* 2, no. 4 (Summer 1988).

Robert E. Looney, "Economic Motivations for East Asian Defense Expenditures" (paper prepared for the Western Economic Association International Pacific Rim Conference, Hong Kong, January 1994).

A.F. Mullins, Jr. *Born Arming; Development and Military Power in New States*, (Stanford: Stanford University Press, 1987).

Office of Naval Intelligence, *Worldwide Submarine Proliferation in the Coming Decade*, (Washington, D.C.: U.S. Government Printing Office, 1996)

Rupert Pengelley, "Grappling for Submarine Supremacy," *Jane's International Defense Review* 29, no. 7 (1 July 1996).

Secretary of Defense William J. Perry, Annual Report to the President and the Congress (Washington D.C.: U.S. Government Printing Office, 1996).

Anthony Preston, *Submarines* (New York: W.H. Smith Publishers, 1982).

Anthony Preston, "Sweden Launches Second AIP Submarine," *U.S. Naval Institute Proceedings* 122 no. 5 (May 1996).

Daniel J. Revelle and Lora Lumpe, "Third World Submarines," *Scientific American* (August 1994).

Frank Rosenius, Rear Admiral, Royal Swedish Navy, "Littoral and EEZ Requirements Submarine Operations-Conventional" (unpublished presentation, 24 March 1994).

Geoffrey Till, "Maritime Strategy and the Twenty-First Century," *Seapower: Theory and Practice* JSS 3/ 94.

Micheal D. Wallace and Charles A. Meconis, "Submarine Proliferation in Regional Conflict," *Journal of Peace Research* 32, no. 1 (1995).

Kenneth Watman and Dean Wilkening, *U.S. Regional Deterence Strategies* (Santa Monica, Calif.: Rand Corp., 1995).

Richard L. Wright, Capt. U.S. Navy, "The 21st Century Surface Navy," *Surface Warfare* 22, no. 1 (January/February 1997).

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