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Argentina's Geopolitics and Her Revolutionary Diesel-Electric Submarines

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Rarely has the delivery of a warship to a "lesser developed" nation generated as much discussion in naval circles as that created by the December 1984 arrival in Argentina of the ARA-type (Armada República Argentina) TR1700 submarine *Santa Cruz*. Built specifically for ocean operations using hydrotechnology previously found only in nuclear submarines, the *Santa Cruz* is the first of a wave of third-generation diesel-electric submarines—boats having the potential to revolutionize the navies that acquire them. Beyond any doubt, the TR1700 (the name indicates its actual displacement) is a "diesel submariner's dream," as it is vastly superior to any other conventional submarine currently in service and possesses operational characteristics close to those of a nuclear submarine. The importance of this new design has been reflected in the numerous overt (and probably covert) attempts by Great Britain and other Eastern and Western bloc nations to gather detailed intelligence on its acoustic signature and performance characteristics during its sea trials in the North Sea and transit to Buenos Aires. This intelligence collection process was repeated during the transit (December 1985-January 1986) of the second Argentine TR1700, the *San Juan*, from Germany to Mar del Plata.[1]

Capabilities and tactical/strategic implications notwithstanding, the TR1700 sale to Argentina is also interesting from an arms transfer perspective. In 1977, one year after the military assumed control of the government, the Argentine Navy called for bids on the building of a new series of submarine. Thyssen Nordseewerke (TNSW), one of the two major

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West German submarine design and production firms, soon began work on the TR1700 program in response to that bid.[2] Argentina contracted with TNSW in 1979, one year after a near-war with neighboring Chile, for the construction of six TR1700s, a deal reportedly worth up to DM2,000 million.[3] Two of the submarines, the *Santa Cruz* and the *San Juan*, were constructed in Emden and have since been delivered. The next four are being built at the new Astillero Ministro Domecq Garcia shipyard in Buenos Aires, which was established with the assistance of (and is 25 percent owned by) TNSW.[4] The Falklands debacle, Argentina's subsequent transition to democracy, and the country's severe economic crisis since 1982 have generated major cuts elsewhere in the defense budget, but all indications are that the TR1700 contract remains inviolate within the corridors of power in Buenos Aires. There is some, although by no means firm, evidence that the Argentine Navy may now be attempting to sell one or more of the indigenously constructed TR1700s due to budgetary problems, implying a temporary force reduction for the Argentine Navy, but not a repudiation of the TR1700 program.

The brief history sketched above begs several questions. First, why did the Argentine military initially contract with TNSW for six TR1700s? Second, why is the TR1700 program surviving in an era of relatively ruthless cuts in the defense budget? This paper purports to delve into the "black box" that is Argentine defense decision making and identify those recipient demand factors responsible for the sale and the post-1982 continuation of the contract. As such, it is primarily an analysis of the dynamics occurring at the nation-state level, and will discuss applicable dimensions of the international arms transfer system only peripherally until the concluding section.

The specific demand factors which drove Argentina's decision to buy the TR1700 can be characterized as follows:

- Perception of regional leadership and territorial dissatisfaction that contains a specific maritime focus.
- Assessment of, and relationships with, the perceived threats of other regional powers.
- Capabilities of Argentine naval forces to meet those threats.
- Temporary dominance of the military over the budgetary process and a high degree of bureaucratic autonomy enjoyed by the navy during that period.
- Capability and quality of the product, and reputation of the producer.
- A desire to decrease dependence on outside sources for sophisticated naval systems.

This article explores the dynamics of each of the above and shows how they relate to the TR1700 arms transfer.

With regard to the second question, that of program maintenance in an unfavorable domestic environment, evidence suggests that the recent experience of the Falklands war has acted as an intervening variable, exacerbating tendencies in Argentine naval policy which give the submarine arm a much more significant place in the fleet than before. That is, an examination of the sinking of the Argentine cruiser *General Belgrano*, operations of the Argentine Type 209 submarine *San Luis* near the British naval task force, and the subsequent increased interest in both Argentina and Brazil of constructing nuclear-powered submarines will show why the survival of the TR1700 program has taken on increased importance. Although the Argentine case is in many ways unique, this paper will, in addition to addressing the two previously mentioned questions, draw some general conclusions that may be applicable to the sale of submarines and the transfer of submarine-building technology elsewhere in the Third World.

Geopolitics, Regional Goals, Maritime Interests, and Threat Perceptions

As a starting point, it is convenient to look at Argentine military perceptions of the international system and specifically at the geopolitical currents which have dominated military thinking in Argentina since the 1930s. Essentially a conflict-oriented body of thought, Argentine geopolitics combines "organicist" conceptions of the world borrowed from the German school of the 1930s with the historical perception that Argentina has suffered geopolitical aggression from its neighbors (Brazil and Chile) and extra-regional powers (Great Britain) in order to develop the dominant theme that Argentina must restore its rightful place in the world. This restoration has a very important maritime thrust which includes recovering large parts of Antarctica, the Beagle Channel Islands, the Malvinas/Falklands, South Georgia, South Sandwich, South Orkney, and South Shetland Islands as part of its vision of what should constitute the Argentine sphere of dominance. This view, in turn, places an emphasis on naval power.

While it is not possible here to discuss in any detail the historical influences on the formulation of Argentine foreign and national security policy, it should be noted that the post-1930s Argentine historical experience has created among Argentine foreign policy elites a "profound sense of lost status and continuing national crisis" which tends to color Argentine strategic thinking.[5] Essentially, these elites see the pre-1930s Argentine "golden age" of continuous economic growth and prosperity as having been replaced by an era of political instability, economic fragility, and lost power relative not only to Europe and the United States, but also to regional rival Brazil and other Latin American nations. Because Argentina has lost relative

international status since 1930, it has been increasingly unable to secure its political, social, economic and foreign policy objectives. This, in turn, tends to reinforce these perceptions of Argentine weakness and increase its vulnerability to an international system viewed as hierarchical, violent, and unfriendly.[6]

The underlying theoretical current in most Argentine geopolitical writings, one which is entirely consistent with and reinforces the above interpretation of the Argentine historical experience, is the "organic theory of the state." Essentially, this theory argues that the nation-state is analogous to a living organism that requires living space, resources, etc., and possesses a limited life cycle in which it is born, matures, declines, and eventually dies. Since other organic nation-states are presumed to compete for the same life-giving resources, geopoliticians generally portray the international environment in competitive, if not Darwinian, terms. Indeed, because the international environment is viewed as a dangerous place where aggressive nation-states compete for scarce resources and territory, a movement toward geopolitical greatness is almost required to ensure national survival.[7]

These neo-Darwinian assumptions about the nature of the international system and the congruence of organicist theory with the previously mentioned perceptions that Argentina must return to the pre-1930s halcyon days have provided the impetus for the development by Argentine geopoliticians of several unique maritime ideas. These emphasize the significance of the South Atlantic and the need to safeguard Argentine claims in Antarctica. As Jack Child has pointed out, two of the most illuminating concepts are the oceanic hemisphere and Atlantárdita.[8] In the former case, geopolitician Jorge Atencio has argued that Argentina is primarily a maritime nation, claiming that Argentina and its Antarctic claim hold the doorway position between the Atlantic and Pacific Oceans. By employing a projection of the globe centered on New Zealand (ironically not unlike that used by the Lange government to downplay their strategic importance and thus explain their antinuclear stance) which displays a maximum amount of water and a minimum amount of land, Atencio demonstrated that Argentina is the guardian of access to and from the oceanic hemisphere.[9] A more all-encompassing view of the importance of the maritime arena was later presented in the book *La Atlantárdita: Un Espacio Geopolítico*, edited by Admiral Fernando Melia. This work introduced the concept of the "Argentine Sea," the geopolitical glue which would hold together an integrated, tricontinental Argentina consisting of the Argentine mainland, Antarctica, and a third "island continent" composed of the geopolitically crucial Malvinas, South Georgia, South Sandwich, South Orkney, and South Shetland Islands.[10]

Thus, many Argentine elites, and particularly military officers, believe that it is only through the full integration of all its national territories and complete exploitation of ocean and other resources within those boundaries that Argentina can regain its former place in the world and reduce its vulnerability to the internal and external threats which they believe to be the cause of the more or less incessant national instability experienced since the 1930s. The violation of the tricontinental unity of Argentina by foreign territorial aggrandizement is taken as conclusive proof that if Argentina does not take steps to project its power into the Argentine Sea, other organic states searching for life-giving resources will get there first at Argentina's expense.[11] The logical consequence of these suppositions is that by defining its nationality in terms of sovereignty over the South Atlantic, the islands, and a sizeable chunk of Antarctica, the Argentine military can identify any threat to any of those claims as a threat to national survival.

Both Great Britain and Chile are perceived as posing a significant threat to Argentina as both doorkeeper and tricontinental nation, the former because it holds territory in the "Argentine Sea" and has overlapping Antarctic claims with Argentina, the latter because its hold over the Beagle Channel islands of Picton, Lennox, and Nueva represents an intrusion into the very sensitive area of the eastern approaches to the Strait of Magellan. An additional major threat historically identified by most Argentines has been Brazil. Argentine geopoliticians have carefully noted the analyses of prominent Brazilian geopolitical writers such as General Meira Mattos, Golbery do Couto e Silva, and Terezinha de Castro, who have spoken of Brazil as an emerging world power that must inevitably project power into the South American continent, the South Atlantic, and Antarctica, while using their own desired Antarctic territory, a 200-mile territorial sea, and Brazil's Atlantic islands as "the forward line of defense in the South Atlantic."[12] Though the Argentine army has generally been more concerned with the threat of Brazilian territorial expansion, it is apparent even in a cursory perusal of Argentine geopolitical works that the Brazilian threat is perceived to exist both on land and at sea.[13]

Military Government and the Search for Increased Capabilities

The attitudes/beliefs inherent in the discipline of geopolitics become particularly significant when geopolitically influenced individuals assume positions of national leadership and begin to base policy on geopolitical assumptions, strategies, and designs.[14] This is precisely what happened in Argentina in 1976 when the armed forces ousted Isabel Peron and began their abortive attempt to reconstruct Argentine society and purge it of the perceived vices of the previous populist era. Within the military

bureaucratic-authoritarian regime of 1976-83, civilian input to the decision-making arena was essentially eliminated in favor of what has been labeled a virtual "colonization" of the state by the armed forces.[15] One dimension of this dominance was control of the budgetary process, as attested by the rapid growth of the military budget during the period of military rule. Within the authoritarian reality of military-led government, more sophisticated weaponry deemed necessary by the possibility of armed conflict with three nations was easily acquired by manipulation of the national budget. Indeed, military spending as a percentage of government spending rose from 9.7 percent in 1975 to a staggering 64.2 percent in 1981.[16] Per capita military expenditures rose to $56 in the late 1970s, placing Argentina behind only Cuba in the Latin American military expenditure ranking.[17] Other statistical examples abound, but the above are sufficient to illustrate that the purchase of the TR1700 must be seen as part of an overall process of military buildup facilitated by military control of the government. Thus, while the previous Peronist government had in 1974 approved a navy plan calling for an increase in the submarine force, no action was taken to buy more subs until the period of military rule.[18] After 1976, what had previously been merely an item on the military wish list became a concrete possibility.

Another dimension of this colonization process relevant to the procurement of the TR1700 is that the peculiar nature and extent of the militarization of the upper echelons of the state apparatus during the period 1976-81, particularly the individualized control of leading state agencies by specific branches of the armed forces, provided a high degree of autonomy to the Argentine navy and protected the TR1700 program from non-navy encroachments. First, navy control of the Ministry of Foreign Affairs, awarded on the criterion that the navy had the most external orientation of the three services, gave the navy a preponderant position in formulating the priority of threats and framing the general nature of the foreign policy debate. Second, navy control of non-defense related ministries, such as the Ministry of Social Welfare, meant that significant financial resources could be transferred from areas such as housing, public health, and social security to procurement of naval weapons systems.[19] Objections by the other armed services, particularly the dominant army, were not likely to be raised since the regime's social project, the dismantlement of populist social organs, was being fulfilled by these navy resource transfers. The junta's need to present a united front also meant that the other armed services could not afford a naval withdrawal from the regime over what would have been a relatively minor inter-military dispute.[20] Thus, while the closed nature of the regime tends to impede efforts to illuminate the "black box" of Argentine defense

decision making, all evidence suggests that the navy could pursue its submarine program with virtual carte blanche.

Even assuming a virtually unlimited capability to buy military equipment and a relatively insulated naval service, why did the Argentine navy opt for diesel submarines? The maritime thrust in Argentine geopolitical thought and the crucial importance given to the ability to project power into the Argentine South Atlantic *mare nostrum* have already been noted. Even before the Falklands war, Argentina's admirals had decided that an increase in the number of modern submarines from two to eight was essential to the mission of the Argentine navy: sea control and denial in the South Atlantic. That is not to say that an expanded submarine force was viewed by the naval hierarchy as an alternative to the traditional surface fleet, since there are many tasks which a submarine cannot perform and for which larger surface units are indispensable (such as merchant ship escort duties and amphibious support/shore bombardment roles), but rather that they were considered desirable platforms given the favorable domestic environment and the capabilities of Argentina's potential foes.[21]

Diesel-electric submarines can help wrest a limited maritime area from an opponent, or protect a maritime area already controlled by one's own forces. In the first case, diesel subs would normally concentrate on choke points and enemy sea lines of communication, hoping to profit from the expected higher density of shipping targets there. In the latter case, the employment of the submarine force would likely take the form of a classic submarine barrier operation designed to intercept any enemy naval forces attempting to penetrate the friendly bastion.[22] An expanded Argentine submarine arm could therefore operate in the sea-lanes south and east of mainland Brazil and interdict Brazil's considerable merchant shipping or act in a picket role in the restricted areas of the Straits of Magellan and the relatively shallow waters around the Falkland Islands against a Chilean or British naval task force with equal efficacy.

Within such roles, however, post-World War II diesel submarines (even second generation boats such as the West German-built Type 209 and the British-built *Oberon*) face basic tactical limitations. In general, the submarine must operate at low speed, acting much as an "intelligence mine." The submarine commander must pay constant attention to the state of battery charge. Battery-charging is accomplished by snorkeling (raising a snorkel above the surface to recharge batteries with diesel generators) whenever feasible. As large amounts of electric power are expended in high-speed dashes, the prudent submarine commander tends to approach a target at low speed, reserving electrical power for any high-speed dashes required to evade a post-strike counterattack. Sustained snorkeling, which could provide long-haul, submerged speed, is avoided because it invites detection.[23] Thus, diesel subs not only take more time to arrive on-station in their patrol area

but are generally incapable of pursuing fast enemy ships over an extended period.

The Argentines had possessed two Type 209 submarines, the *Salta* and *San Luis*, since the early 1970s and were certainly aware of the tactical limitations of those platforms. While generally satisfied with the performance of the Type 209s (and, as shall be seen, well-satisfied with other aspects of dealing with the West German government and submarine-building industry), the Argentine navy experienced a number of other related shortcomings. For example, in the Type 209 the torpedo magazine is located at the lower deck level in the bow section, beneath the crew's quarters. It was for this reason that in the midst of the Falklands conflict the *San Luis* reportedly had to dive to the seabed in order to reload torpedo tubes, a process necessitating removal of bunks and other pieces of equipment and restowage in already confined central spaces, lifting of the flooring, raising of the torpedoes with a portable hoist, and manual loading into the tubes.[24] That this would be tactically inconvenient, if not potentially fatal to the sub's survival, should be obvious.

Thus, when Argentina called for bids in 1977, the discussion with TNSW and other builders was for an oceangoing attack submarine able to meet the operational requirements of great endurance, long operational deployment time, high average transit speed, large weapons capacity, and low indiscretion rate (amount of time spent snorkeling in proportion to total cruising time). These operational considerations, in turn, determined the technical requirements of a high-powered motor for great underwater speed, large fuel storage for long endurance, large battery for long underwater autonomy, large torpedo storage, and very high accommodation standards for the crew. Modification of existing designs to meet the technical requirements was impossible, mainly because lengthening of the pressure hull necessary to accommodate more and more advanced equipment would have exceeded certain ratios of diameter-to-length determined by hydrodynamic and weapons systems principles. Since such a platform was not then in production, the Argentines sought a new, large oceangoing submarine of at least 1,700 tons standard displacement.[25] TNSW, with its TR1700 design, soon emerged as the most likely candidate to fill the Argentine requirement. TNSW's major West German competitor, Howaldtswerke-Deutsche Werfte (HDW) of Kiel, builders of the popular Type 209, could offer at that time only their IKL1500 design. While bigger than the largest stretched Type 209, the IKL1500 was not considered large enough by the Argentine navy even though it was cheaper than the TR1700. The French *Daphne* and Italian *Sauro* were also proposed, but were rejected, the former because it was considered a dated (1960s vintage) design while

the latter, although large and modern, was designed specifically for a Mediterranean environment.[26]

The end result of this development process was the TR1700, a submarine of operational qualities which have already been alluded to as impressive. The TR1700's endurance enables it to remain submerged for 70 days, allowing for a 20-day patrol period in areas as distant from Argentina as the latitude of Quito, Ecuador in the Pacific or the mouth of the Amazon in the Atlantic.[27] At the time of the decision to procure the TR1700 (1977), acquisition of six TR1700s clearly would have made the Argentine submarine force the most potent in South America, exceeding in capability even that of Peru, a traditional regional ally which then possessed six Type 209s. The most modern submarines then in the Brazilian and Chilean inventories, the British-built *Oberon* class (Brazil had three in the late 70s, Chile had two), was quite inferior to the TR1700. For example, the top submerged speed of the TR1700, which enables the submarine to get into a firing position against a fast-moving target, is understood to be 25 knots for one and a half hours, significantly higher than the *Oberon's* 17 knots over one hour. Even assuming that the Brazilians and Chileans would modernize their submarine forces in the early 1980s by purchasing the popular Type 209, Argentina would retain a qualitative (and probably quantitative) edge into at least the 1990s. As has been noted, the TR1700 compares favorably against even the relatively capable Type 209. In the area of torpedo reloads, for example, the TR1700 carries 16 as opposed to the Type 209's six. The TR1700 also has a large battery and battery-charging capacity, reducing the indiscretion rate below the already impressive 10-20 percent for the Type 209, thus making the TR1700 a more covert platform.[28]

Of course, any evaluation of the TR1700's impact on the regional military balance must consider its potential performance against enemy non-submarine, antisubmarine warfare (ASW) forces. In this regard, the capability of Brazil and Chile must be considered extremely limited. Since neither nation (nor Great Britain in the South Atlantic) possessed an SOSUS-type (Sound Surveillance System) system of hydrophones implanted in the seabed that could effect long-range detection of a submarine and cue tactical ASW forces, and since they did not possess sufficient tactical ASW forces (surface ships, land-based aircraft, carrier-based aircraft, or submarines) to conduct intensive area searches, they would be forced to adopt an essentially defensive, local area ASW posture. While such local-area ASW skills have been improved by years of participation in the U.S.-sponsored, ASW-oriented "Unitas" exercises, it is nonetheless understood that a modern submarine's on-board sensors (such as those on the TR1700) can, depending on the sea state and acoustic conditions, detect medium-sized surface ships at distances as great as 60 to 100 miles and, in any event, almost always long before any surface combatant's sensors can detect the sub.[29] Given that

the TR1700's burst speed is equal to that of most surface combatants, it is not inconceivable that it could easily position itself for a first shot at a "high value unit" (such as the Brazilian ASW carrier *Minas Gerais*) of an approaching enemy naval task force. British naval forces would undoubtedly be more difficult to tackle—after all, the modern Royal Navy is essentially an ASW-oriented force, albeit not in a South Atlantic environment. Nonetheless, a force of eight modern submarines (two Type 209s and six TR1700s) could make the ASW problem extremely complex for any British task force operating in the Argentine *mare nostrum*. Thus, it is likely that the known, or suspected, ASW limitations of Argentina's potential foes in the region made the TR1700 look even more attractive.

Supplier Reputation, Technology Transfer, and Decreasing Dependency

The Argentine navy's decision to "buy German" was probably also influenced to some extent by the long tradition of good design and quality of German submarines. The Argentine navy has not traditionally fostered a great love for things German, technical or otherwise. Unlike the Argentine army, which maintained close ties with Germany and Italy before World War II, the navy historically maintained close relations with Great Britain and the United States. Argentina's first admirals purchased English ships and copied Royal Navy organization, and even recruited the sons of wealthy anglophiles to the naval service.[30] Indeed, the navy's distaste for the Argentine army's German link is accurately represented by one naval officer's statement that "we spell nacionalismo of the army with a 'z' (nazionalismo)."[31]

Nonetheless, by the time of the TR1700 purchase the Argentine navy had over ten years of favorable experience with the HDW-IKL consortium, the most successful supplier of submarines for export in the world and builder of the Type 209s, *Salta* and *San Luis*, which were ordered as follow-ons for two aging, U.S.-built Guppy-class subs in their inventory. While TNSW was at that time well behind HDW-IKL in terms of the numbers of subs supplied to a wide variety of clients, it also boasted a long history of high-quality service. Established in 1903, TNSW started building submarines during World War II. Since then, it has built some 60 submarines, including 30 of the VII-C type U-boats during the war, 15 *Kobben*-class boats for the Norwegians from 1962 to 1967, and ten Type 206s for the West German navy during the early 1970s. TNSW could also point to the advantages of a large design team and a stable, highly skilled work force which averages 20 years of employment.[32]

More fundamental than intangibles such as reputation, the issue of technology transfer undoubtedly played a crucial role in the sale of the TR1700 to Argentina. As essential backround, it should be noted that the United States placed an arms embargo on Argentina in 1977, shortly after the ousting of Isabel Peron and in response to reports of extensive human rights violations. This embargo anticipated the initial discussions with foreign firms regarding the navy's desire for a new, oceangoing submarine. The effect of the embargo soon became apparent to the navy, as parts were no longer available for its two Guppy-class subs, which subsequently experienced decreased operational readiness, particularly in the areas of sensors and batteries.[33] Realizing that the ill effects of any arms embargo could be ameliorated, if not eliminated, by the creation of an indigenous submarine building and maintainance capability and infrastructure, the Argentine negotiators made this an important item on the agenda during 1977 to 1979.

Observers of the international arms trade have noted that West German successes in international markets have been related largely to the use of coproduction arrangements and the generous sharing of technical know-how. That is, the majority of large transfers of sophisticated and relatively expensive arms are somehow tied to massive technology transfers. In the majority of submarine sales, for example, the buyer participates in German submarine technology: the boats are delivered in parts and assembled in the Third World. It was precisely this kind of arrangement, the first of its kind, which Argentina held with HDW in the purchase of its two Type 209s: the submarine hull sections were built in Kiel and shipped to Argentina for assembly at Tanador Shipyard, Buenos Aires. Industrial participation of the buyer, however, need not be restricted merely to assembly. Indeed, Argentine commentators have stated with satisfaction that the Germans have offered them "the full spectrum of submarine technology."[34]

What this has meant in practical terms for the Argentines is not only development of expertise in the complete construction of the final four TR1700s in Argentina, but also assistance in the creation of a brand-new shipbuilding yard, the Astillero Ministro Manuel Domecq Garcia, at the southern entrance to Buenos Aires harbor. It is considered to be the most advanced submarine construction and repair facility in the Western Hemisphere outside the United States, possessing building berths for the simultaneous construction of two submarines side-by-side, sheet metal, metal-cutting, welding, and electrical workshops, and a U.S.-made 30,000-ton capacity synchrolift (said to be the largest in the world) for launching purposes.[35] Capable of sustaining series construction of submarines up to 4,000 tons, it is equipped with ultramodern equipment and is said to apply quality control standards as stringent as those in Europe. A labor force of 800, which would be increased to 1,000 in case of full-capacity production,

is currently employed. TNSW maintains a force of 12 to 15 engineers in Buenos Aires for the provision of technical assistance.[36] While lack of funds has slowed production of the indigenously built TR1700s, the Argentines are undoubtedly acquiring valuable experience in submarine construction. As of early 1987, TR1700 No. 3 was fitting out, No. 4 was in section fabrication, and steel had been cut for No. 5.[37] The Manuel Domecq Garcia facility can reportedly handle production of the original batch of four and, without prejudicing the Argentine sub program, simultaneously accept orders from abroad. There is evidence that a number of Latin American countries and Taiwan have expressed interest in buying the TR1700 from Argentina.[38] While the sale of Argentine-built TR1700s to a third country will undoubtedly necessitate consultation between Bonn and Buenos Aires over their licensing arrangement, there is little doubt that Argentina is in the process of decreasing its dependence on outside sources to supply and maintain the needs of its own submarine force.

Program Survival Amidst Budget Cuts: The Falklands Experience and the Nuclear Issue

The humiliating Argentine defeat in the Falklands war, public dissatisfaction with seven years of authoritarian rule, and unprecedented economic chaos all contributed to the military's decision to step down and permit the democratic election of President Raul Alfonsin in 1983. Alfonsin inherited an economy that was in the fourth year of a deep recession and buffeted by an annual inflation rate that rose from 400 percent to more than 600 percent during his first six months in office. Moreover, the public sector deficit had risen to 20 percent of the gross national product, unemployment was 10 percent, and dollar reserves of the Central Bank were nearly depleted. Argentina faced a record foreign debt of $46 billion, which it was incapable of servicing.[39]

Within this context of economic disarray and military disrepute, the ability of the armed forces to put pressure on civilian presidents to allocate large portions of scarce resources for military equipment was seriously reduced. Although the military was allowed to rearm immediately after the Falklands war, the democratically elected government has subjected them to a series of stringent budget cuts since 1984. For example, in 1985 the navy was allocated enough funding for only 20 days of at-sea training during the entire year. The proposed 1986 Argentine Defense Bill called for a further reduction in defense spending which would approach its historic (pre-1976) level of approximately 2.1 percent.[40] Accordingly, the navy is currently attempting to sell its two British-built Type 42 destroyers, the *Hercules* and

Santisima Trinidad, as well as making further adjustments in the areas of personnel, training, and new equipment.

Even so, all indications are that the yet uncompleted TR1700 contract has remained virtually untouched by the belt-tightening process. Referring to the local building of the TR1700s, Defense Secretary Jose Horacio Juanarena pointed out that the contract was "approved eight years ago and it is not easy to break."[41] Similarly, responding to rumors that one or more of the TR1700s were for sale to a third country, Juanarena's predecessor, German Lopez, stated in December 1987 that there were no plans to sell any of the TR1700s.[42] Even if one TR1700, the figure used in most "reports" of a possible sale, were sold to a third country, the remaining force of seven modern submarines would still provide enough capability to dominate regional foes and greatly impede any Royal Navy operations in the South Atlantic.

The reason why Argentine naval leadership has been willing to make significant sacrifices in other mission areas while holding fast to the concept of a powerful submarine strike component can be understood by examining the intervening variable of the Falklands experience, which appears to have strongly influenced Argentine naval policy in favor of an expanded submarine force at the expense of the traditional overwhelming emphasis on surface ships. That is, despite the 1982 regime change, Argentine naval officers and civilian authorities alike are convinced that what was fundamentally a luxury item in 1977 is now essential to Argentine security interests.

Shortly after the war's conclusion, Argentine naval planners proposed a modernized navy organized in three separate sections: a task force centered around a carrier equipped with "Super Etendard" attack aircraft, plus two Type 42 destroyers and four German-build Meko 360 frigates; a convoy and escort force composed of three A69 and six Meko 140 corvettes; and a submarine arm composed of the two Type 209s and six TR1700s.[43] The elevation of the submarine element of the triad to equality status after the war is itself significant. Moreover, as funds available since 1983 have not only ruled out any expansion, but in effect called for a contraction of the fleet, Argentina's naval leaders are being forced to make hard decisions which will undoubtedly determine the future shape of the navy. In that regard, actions such as the sale of the two Type 42 destroyers and maintenance of at least a seven-boat submarine force suggest that the latter will continue to survive in a zero-sum budgetary environment. Such an outcome would not be inconsistent with a Falklands experience conditioned primarily by the sinking of the cruiser *General Belgrano* by the British nuclear submarine *Conqueror* and the operations of the *San Luis* in the vicinity of the British task force—events which seem to imply the primacy of the submarine over surface vessels in the oceans adjacent to the Southern Cone. A brief

look at the composition of the Argentine navy prior to the war and the Falklands campaign itself will help illustrate this point.

Argentina's naval planning, fleet development, and procurement since the navy's inception have been guided by the concept of surface warfare as the decisive element in the naval environment. Between the end of World War I and the end of World War II, firepower and survivability in the form of large, armored battleships were seen as the ideal means of winning surface engagements and, indeed, war at sea. Organized around its two 12-inch gun battleships, the *Moreno* and *Rivadavia*, the Argentine navy was easily superior to the other nations of Latin America and occupied an impressive eighth position on a world scale. With the demise of the battleship and the rise of the aircraft carrier as the "queen of the seas," Argentina abandoned the large surface fleet in favor of a more modestly sized surface task force centered around a light carrier—initially the *Independencia* and later the *Veintecinco de Mayo*. While the 1970s brought the replacement of the obsolete Guppy-class subs (whose only real purpose in recent years had been to act as cooperative targets during ASW exercises) with the modern Type 209s and placement of orders for the TR1700s, the Argentine navy was still fundamentally a surface warfare-oriented force at the outbreak of the Falklands conflict.[44]

The Falklands campaign soon placed the policy of emphasizing surface ships in serious doubt. The inability of the Argentine surface fleet to protect itself against the British nuclear submarine force became apparent on 2 May, when H.M.S. *Conqueror* torpedoed and sank the cruiser *General Belgrano* southwest of the Falklands with the loss of 321 lives. Although the *Belgrano* was screened by the destroyers *Bouchard* and *Piedra Buena*, the *Conqueror* was apparently able to attack completely undetected. A subsequent counterattack by the two destroyers proved fruitless.[45] For the Argentines, the problem was essentially one of employing inferior sonar equipment against a quiet enemy platform with long-range torpedoes. Given that tactical reality, and the unpalatability of having to completely avoid detection in order to operate at all, the decision was made to recall all surface ships to port. As a result, the British effectively neutralized the entire Argentine surface force in a single stroke.

As for the Argentine submarine force, the only modern submarine to be deployed operationally was the Type 209 *San Luis*, which operated in a free fire zone north of the Falkland Islands with orders to act offensively and attack enemy naval units. The *San Luis* succeeded in making attacks against British surface ships on two separate occasions and may have also launched a torpedo against a British nuclear submarine operating in that area. In the first attack against surface ships, the Type 209 apparently penetrated the escort screen around one of the two British VSTOL carriers and fired

torpedoes against a target (which was not identified, since the submarine was using sonar only and not its periscope). Due to technical difficulties, the torpedoes missed their target(s) and the British launched an extensive, 20-hour counterattack replete with ASW helicopters dropping depth bombs and at least one torpedo.[46] In this engagement, the *San Luis* showed that it was capable of penetrating to within firing distance of a surface target and evading the counterattack carried out by a navy whose primary mission is ASW. British ASW efforts were hindered throughout the campaign by the heavy winter seas so common to South Atlantic latitudes, reducing the effectiveness of surface ship bow-mounted sonars and making ASW helicopter takeoff, recovery, and hovering to deploy the dipping sonar extremely hazardous.[47] The large expenditure of ASW ammunition by the British surface ships also suggests a high false-alarm rate and the creation of a sense of nervousness within the force.[48] On balance, then, the Argentine submarine force seems to have exerted an effect on British operations by their very existence, even if it did not achieve any tangible results.

Given the above developments during the campaign, one could speculate that even if Argentina had possessed four times the number of missile-armed surface ships (which would have given them a sizeable fleet of 20 combatants), the outcome would not have been very different. In an encounter with enemy forces, many such vessels would likely have been sunk by British submarines long before they would have been able to engage the Royal Navy's surface force. On the other hand, with half a dozen modern submarines it is not inconceivable that Argentina might have been able to inflict serious losses on the British fleet, and even frustrate the enemy's invasion plans or, at a minimum, greatly complicate operations planning.

This does suggest that the entire Argentine surface force will soon be auctioned off in favor of submarines. For example, the aircraft carrier *Veintecinco de Mayo*, which has been the core of the surface fleet for the past three decades, is currently scheduled to undergo an extensive modernization program. Although this undertaking will involve a significant expenditure of time and money, the means will likely be made available to extend the operational life of the carrier and avoid a near-term scrapping of the carrier-air concept (a 30-year investment which could not be easily rebuilt). Some surface forces will of course remain to protect that investment. Nonetheless, the previously cited Type 42 destroyer sale and post-Falklands development of a force triad clearly indicate that Argentine naval planners will no longer rely solely on a small surface task force whose efficacy hinges upon the survival of one aircraft carrier. Such a risk might be worth taking if Argentina had only to face other Latin American nations possessing a handful of diesel submarines. However, if Argentina plans to generate sufficient striking power to worry the British (who can likely deploy a force of six or more nuclear attack submarines to the South Atlantic in a crisis) into

accepting a negotiated solution to the Falklands dispute, a submarine-weak force structure hardly appears acceptable.[49] For these reasons, any decisions taken by Argentina's naval staff with regard to future policy are likely to maintain the trend toward giving the submarine, a platform of proven lethality, a more significant place in the fleet than before.

An interesting spin-off development of the Falklands campaign which has had some effect on the TR1700 program is the heightened interest within Argentina and Brazil in acquiring nuclear-powered submarines. As a few nuclear attack submarines were able to neutralize the Argentine surface fleet, one important lesson arising from the Falklands campaign was that the Argentine navy must find a way to deal with the nuclear submarine threat. It is commonly recognized in naval circles that the most effective, although by no means the only, platform which can neutralize a nuclear submarine is another nuclear submarine. However, a nuclear submarine is extremely expensive: the purchase price of one is generally at least twice as high as that of a diesel-electric submarine. Nuclear subs also require additional expensive infrastructure ashore for training, disposition of radioactive waste, and for maintenance of the plants in a manner consistent with existing legal environmental safety requirements.[50] At least one naval analyst has suggested that a better alternative for Argentina than indigenous production of a nuclear-powered submarine might be the development of an SOSUS long-range detection barrier supported by long-range, fixed-wing ASW aircraft like the U.S. P-3 Orion and ASW helicopters, noting that the entire proposed system—aircraft, SOSUS, etc.,—would probably cost less than one nuclear submarine.[51]

Nonetheless, shortly after the conclusion of the Falklands conflict, then-head of Argentina's atomic energy program, Vice Admiral Carlos Castro Madero, announced that Argentina would begin conducting feasibility studies of the possibility of developing a nuclear submarine and that it now would reserve the right to withdraw material used in naval propulsion from international safeguards and inspections.[52] While this statement was undoubtedly made for political purposes as a public retaliation for the perceived British violation of the Nuclear Nonproliferation Treaty, the security motivation behind it, that possession of nuclear-powered submarines could shift the balance of power in the region away from Britain, also seems undeniable.

Although at this point secondary to the realities of weapons capability, there is also the issue of prestige. The first nation in Latin America to start a nuclear power program, Argentine leaders have long sought to advertise their nuclear achievements internationally. If it develops a nuclear-powered submarine, Argentina would become the first nation outside the traditional "Big Five" (the United States, U.S.S.R., China, Great Britain, and France)

to possess an indigenously produced nuclear submarine. The prestige factor is particularly important with regard to Argentina's traditional rivalry with Brazil, a competition which has long spurred Argentine nuclear efforts. The competition dates to the 1950s when each government tried to become the first to build a research reactor in Latin America. In 1957, Argentina won that race and has continued to lead Brazil ever since, primarily due to the high priority accorded the nuclear program in Buenos Aires.[53] Given this trend, it is unlikely that the Argentines will allow a Brazilian effort to build a nuclear sub to go unchallenged—improvements in Brazilian-Argentine relations during the 1980s notwithstanding.[54]

This is precisely where the Brazilians seem to be heading. In early 1984, the Brazilian government announced plans to build a nuclear-powered sub at a cost of $200 million. The project was to take 6 to 8 years, be supervised by West German specialists, and be driven by a reactor built at the Institute for Nuclear Energy and Research in São Paulo.[55] During the same period the navy submarine research facility in Rio de Janeiro was reportedly upgrading its capability to absorb nuclear technology.[56] More recently, (December 1986), Brazil's Nuclear Energy Commission announced that Brazil had mastered laboratory techniques for producing small amounts of plutonium. According to the commission, this research will significantly speed development of a nuclear reactor for marine propulsion. A nuclear attack submarine prototype, the NUC-1, with a submerged displacement of about 2,700 tons and powered by a locally developed 12-megawatt integrated reactor/exchanger with turboelectric drive, is reportedly being designed and might be in service by 2010 if sufficient funding is made available.[57] Whatever the outcome of Brazil's nuclear propulsion efforts, the Argentine military will undoubtedly continue to watch Brazilian progress with keen interest and is likely to put considerable pressure on the civilian government for resources to at least match any tangible Brazilian attempt to build such a platform.

Argentine acquisition of the TR1700 is relevant to the nuclear propulsion issue for a number of reasons. First, the operational characteristics of the TR1700 are close to those of a nuclear submarine, the higher speed of the latter being somewhat offset by the greater quietness of the TR1700 when operating on the battery. Should the Argentine navy be prohibited from pursuing construction of an SSN due to domestic political and economic constraints, the TR1700, although it probably could not successfully screen the Argentine surface force against marauding SSNs, at least provides the means to somewhat even the balance by threatening the enemy's surface forces. Also, Admiral Castro Madero has noted that it is technologically feasible to install a nuclear reactor in the TR1700 hull. Its length and diameter would have to be increased and its displacement increased by about 25 percent, but such a move might be a cheap and quick means of joining the

nuclear submarine club and balancing the "threat" of a Brazilian or British SSN.[58] In addition, Argentine submariners are already gaining valuable experience by operating the extremely sophisticated TR1700. It is, then, already serving as a sort of stepping-stone should Argentina feel the need to graduate to the more advanced level of operating and fighting nuclear submarines at sea. Whether the Argentines feel they need an SSN in order to beat the British next time or merely to counterbalance the Brazilian program, the TR1700 is important both as a potential nuclear platform itself and as a training platform for the crews operating any future SSN.

Having discussed in depth most aspects of the TR1700 sale to Argentina, it is now time to ask what has been learned from that exercise and attempt to draw some conclusions regarding the future of the submarine in the international arms trade. That is, how applicable is the Argentine TR1700 experience to the other developing nations and what are its implications? While one must be careful in generalizing from a specific case and transcendiug the spatial domain of the nation state of Argentina to the developing world in general, there are a few observations which can be made with relative safety.

First, the market for diesel-electric submarines is likely to continue the present expansionary trend for some time. This is due in part to the growing perception in the developing world that submarines are cost-effective platforms. The Falklands campaign and more recent events in the Persian Gulf seem to suggest that surface ships are increasingly vulnerable to aircraft, missiles, submarines, and mines on the modern battlefield. Observers of the Falklands conflict also have noted that the knowledge of at least one Argentine submarine operating in the theater of operations imposed on the British fleet commander the need to allocate substantial ASW forces to ensure the safety of his main seaborne force and secure supply routes. Thus, the emergence of an increased emphasis on the submarine in Argentine naval policy is likely to be repeated in other LDCs possessing blue-water capability, particularly those facing financial constraints which prohibit expansion and modernization throughout the entire range of naval forces. While much will obviously depend on a given nation's geographic situation, potential foes, the state of modernization and serviceability of other deployed naval systems, the perceived role of the naval service in a range of conflicts, and other factors, the Falklands experience seems to have made it likely that a submarine will be chosen over a surface combatant in a zero-sum budgetary environment.

There are currently some 40 nations operating nearly 400 diesel-electric submarines.[59] The export-oriented builders such as HDW and TNSW already dominate a large portion of that export market. It is clearly in their

economic interest (and that of their competitors) to create a significantly more advanced product—such that their clients feel the pressure to replace even current modern systems. In this regard, the TR1700, as the first of the so-called third generation of post-World War II diesel-electric submarines, already represents the wave of the future. Its operational capabilities are clearly superior to those of the second-generation boats such as the Type 209 and *Oberons* currently in service in most developing nations. Thus, its acquisition by any one power in a given region has profound implications for the regional military balance of power. Other technological advances, such as submerged-launch antiship missiles, towed acoustic arrays, and a number of initiatives to further improve underwater speed and endurance will further increase the attractiveness of the submarine as a prime instrument of naval warfare, and they will also increase pressures on LDCs to upgrade their forces beyond the second generation level.

While conventional submarine producers have been careful to stress compactness and space-saving in their designs (for tactical, as well as financial, reasons), a significant increase in submarine displacement and, hence, cost, has been an undesirable side effect of increasing platform capability. The proliferation of new conventional submarine designs which approach the displacement of a small nuclear sub illustrates this trend. For example, the TR1700 (1,800 tons standard displacement), as well as the Walrus-class diesel sub produced by Rotterdamse Droogdock Mij (1,900 tons standard displacement), and the United Kingdom's Vickers Type 2400 design (1,850 tons standard displacement) all approach the French Nuclear submarine *Rubis* of 2,150 standard tons displacement.[60] HDW, which has used the small size of its Type 209 as a selling point in the past, more recently has concentrated on production of significantly enlarged Type 209s, such as the Type 1500 recently sold to India. HDW's entry into the competition for the Royal Australian Navy's New Construction Submarine Project is the new IKL design of 2,200 tons standard displacement.[61]

Because these new designs are larger and more sophisticated, they will be more expensive, even in relative terms, than their predecessors. This suggests that the trend of making sales more attractive by transferring submarine technology to recipient countries will continue or increase in scope. TNSW assistance in the construction and design of the Domecq Garcia shipyard and licensing of TR1700 production exemplifies technology transfer in practically its ultimate form, as Argentina is now capable of completely producing and exporting their own submarine products. Builders can be expected increasingly to advise customers on how to establish their own construction facilities or convert existing yards for submarine work, estimate construction costs, advise on materials purchasing, evaluate the level of local technology and skilled manpower available to support such an undertaking, and develop necessary training programs. In cases where

the recipient nation possesses or develops with supplier aid a sufficient degree of industrial development, sophisticated science and research facilities, competent workforce, and other requisite elements, it can go on to become a submarine exporter in its own right. Indeed, HDW's current technology transfer program with Brazil has significantly built up the latter's submarine construction facility in Rio de Janeiro, where it is envisioned diesel-electric submarines will eventually be constructed for export.[62] Argentina, Brazil, and India could all potentially become submarine exporters before the year 2000, further eroding the now-waning dominance of the traditional suppliers in a wide array of weapons markets. In cases where development of full production capability is obviously beyond a recipient nation's capability, indigenous production of components or final submarine assembly are more likely alternatives.

Finally, heightened interest among the more-developed Third World nations in acquiring nuclear submarines will probably continue for some time. It is interesting that the pragmatism and concern for cost-effectiveness displayed by these nations when discussing the role of the conventional submarine in naval policy is often overshadowed by the prestige issue when the discussion shifts to nuclear propulsion. Many Third World nations want a weapons system that will not be confined to operations within a regional context. Brazil's Naval Minister, Almirante-de-Esquadra Alfredo Karam, noted in a recent interview, "As far as the development of a nuclear-powered submarine is concerned, this seems to be the aspiration of most navies without one, so it is ours too."[63] India's recent leasing from the Soviet Union of a Charlie-class nuclear cruise-missile submarine with late-1960s vintage technology is another excellent example of this mentality. Whether such nations are willing to invest enough resources in the project to overcome the serious technical and financial problems inhibiting them is another matter, one that is largely problematic. However, should announced programs become more than rhetorical, conventional submarine acquisition in other relatively advanced Third World nations may be suspended in the hope of future nuclear purchases from politically uninhibited suppliers. If so, the desirability of third-generation conventional submarines (such as the TR1700) that are such a popular topic of conversation in naval circles would be reduced. Whatever the case, the area of submarine arms transfers is likely to remain dynamic in the years ahead. Given its potential impact on regional military balances and power arrangements, it bears careful watching.

Notes

1. Robert Scheina, "Latin American Navies," U.S. Naval Institute *Proceedings*, March 1987, p. 36.
2. "Thyssen Nordseewerke Special Submarine," supplement to *Naval Forces*, no. 3, 1985, p. 22.
3. Mark Hewish, "Special Submarine," supplement to *International Defense Review*, IRRV, 1986, p. 20.

4. Juan Carlos Murguizur, "The Future of the Submarine in Argentine Naval Policy," *International Defense Review*, no. 4, 1984, p. 454.

5. Edward S. Milensky, "Argentina," in Edward A. Kolodziej and Robert E. Harkavy, eds., *Security Policies of Developing Countries* (Lexington, Mass.: D.C. Heath, 1982), p. 27.

6. *Ibid.*, pp. 27-32. For a more complete analysis, see Edward S. Milensky, *Argentina's Foreign Policies* (Boulder, Colo.: Westview Press, 1978).

7. Jack Child, *Geopolitics and Conflict in South America* (New York: Praeger, 1985), pp. 20-21.

8. *Ibid.*, pp. 45-47, 128-130.

9. Jorge E. Atencio, *Que es la Geopolítica?* (Buenos Aires: Ediciones Pleamar, 1966).

10. See Fernando A. Milia, ed., *La Atlantárdita: Un Espacio Geopolítico* (Buenos Aires: Ediciones Pleamar, 1978).

11. See, for example, Jorge A. Fraga, *El Mar y la Antárdita en la Geopolítica Argentina* (Buenos Aires: Instituto de Publicaciones Navales, 1980), p. 298. A post-Falklauds reiteration of the same theme can be found in Jorge A. Fraga, *La Argentina y el Atlántico Sur* (Buenos Aires: Ediciones Pleamar, 1983).

12. An example of the alarm with which the Argentines view the maritime thrust in Brazilian geopolitical thought can be found in General (retired) Juan E. Guglialmelli, "Golbery do Couto e Silva, el Destino Manifesto Brazileño y el Atlántico Sur," *Estrategia*, March-April 1976, pp. 4-24, in which Golbery's "decisive front for South American security" clearly overlaps the "Argentine Sea." For a concise discussion of perceived Chilean pretensions, see Colonel (retired) Florentino Diaz Loza, Geopolítica de Chile," *Estrategia*, September-October 1977, pp. 56-66.

13. See, for example, Juan E. Guglialmelli, *Geopolítica del Cono Sur* (Buenos Aires: El Cid Editor, 1979), pp. 201-221.

14. This process of translating geopolitical concepts into policy has been described as one of "applied geopolitics." See Howard T. Pittman, "Geopolitics and Foreign Policy in Argentina, Brazil, and Chile," in Jennie Lincoln and Elizabeth Ferris, eds., *Latin American Foreign Policies: Global and Regional Dimensions* (Boulder, Colo.: Westview Press, 1981).

15. See Alain Rouquié, *Poder Militar y Sociedad Política en la República Argentina* (Buenos Aires: Siglo XXI, 1982).

16. Dennis R. Gordon, "Argentina's Foreign Policies in the Post-Malvinas Era," in Jennie Lincoln and Elizabeth Ferris, eds., *The Dynamics of Latin American Foreign Policies* (Boulder, Colo.: Westview Press, 1984), p. 88.

17. Gary Wynia, *Illusions and Realities* (New York: Holmes and Meier, 1986), p. 112.

18. *Jane's Defense Weekly*, 22 March 1986, p. 808.

19. Indeed, public health and social security budgets were cut by more than half in the period 1976 to 1981 as the virulently anti-Peronist navy systematically dismantled government organs which had previously become bastions of Peronist patronage and political support. For more on the economic and social project of the regime, see Paul G. Buchanan, "The Varied Faces of Domination: State Terror, Economic Policy, and Social Rupture During the Argentine 'Proceso,' 1976-81." *American Journal of Political Science*, no. 2, 1987, pp. 336-382. More detailed empirical data can be found in Paul G. Buchanan and Robert Looney, "Relative Militarization and Its Impact on Public Policy: Budgetary Shifts in Argentina 1966-73, 1976-82," unpublished manuscript, November 1987.

20. For a concise discussion of junta dynamics in Argentina see Wynia, pp. 86-114.

21. Murguizur, p. 453.

22. Thyssen Nordseewerke Special Submarine, supplement, p. 8.

23. Norman Friedman, "Conventional Submarine Developments," *Naval Forces*, no. 6, 1985, pp. 120-121.

24. Murguizur, p. 453.

25. Thyssen Nordseewerke Special submarine, supplement, p. 20.

26. R.J.L. Dicker, "The German Submarine Industry: Will the Success Continue?" *International Defense Review*, no. 9, 1983, p. 1178.

27. Murguizur, p. 453.

28. Dicker, pp. 1288-1293.

29. Robert L. Scheina, "The Santa Cruz—A Record Setter," U.S. Naval Institute *Proceedings*, June 1985, p. 108.

30. Wynia, p. 87.

31. John Johnson, *The Military and Society in Latin America* (Stanford, Calif.: Stanford Univ. Press, 1964), p. 141.

32. Hewish, p. 20.

33. Robert Scheina, "Where Were Those Argentine Subs?" U.S. Naval Institute *Proceedings*, March 1984, p. 115.

34. Ulrich Albrecht, "The Federal Republic of Germany and Italy: New Strategies of Mid-Sized Weapons Exporters?" *Journal of International Affairs*, Summer 1986, p. 140.
35. Dicker, p. 1293.
36. Murguizur, p. 454.
37. *Jane's Fighting Ships*, 1986-87 (London: Jane's Publishing, 1987), p. 10.
38. Murguizur, p. 454.
39. Wynia, p. 176.
40. "Stringent Cuts for Argentina's Forces," *Jane's Defense Weekly*, 15 December 1986, p. 1051.
41. Andrew McLeod, "Argentina's Forces Look to External Threat," *Jane's Defense Weekly*, 22 March 1986, p. 808.
42. *Jane's Defense Weekly*, 6 December 1986.
43. Murguizur, p. 453.
44. *Ibid.*, pp. 451-452.
45. Robert L. Scheina, "The Malvinas Campaign," U.S. Naval Institute *Proceedings*, Naval Review Issue, 1983, pp. 106-107.
46. Scheina, "Where Were Those Argentine Subs?" pp. 117-120.
47. Murguizur, p. 452.
48. Norman Friedman, "The Falklands War: Lessons Learned and Mislearned," *Orbis*, Winter 1983, p. 914.
49. Murguizur, p. 452.
50. Thyssen Nordseewerke Special Submarine, supplement, pp. 9-10.
51. Scheina, "The Malvinas Campaign," p. 117.
52. Daniel Poneman, "Nuclear Proliferation Prospects for Argentina," *Orbis*, Winter 1984, p. 896.
53. *Ibid.*, p. 874. The importance of the nuclear program for Argentine geopoliticians and general paranoia regarding Brazilian advances can be gleaned from *Estrategia*, September-October 1976, which is devoted exclusively to discussion of nuclear issues. See especially Norman Gall, "Energia Atómica Para el Brazil, Peligro Para Todos," pp. 70-103.
54. Although relations between the two have been described as shifting toward the cooperative side of a "quality spectrum" ranging from essentially cooperative to largely hostile relations, acquisition or construction by either side is recognized as a trend which would clearly strain those new cooperative linkages. For a detailed analysis, see Wayne A. Selcher, "Brazilian-Argentine Relations in the 1980's: From Wary Rivalry to Friendly Competition," *Journal of Interamerican Studies and World Affairs*, Summer 1985, pp. 25-53.
55. John Hoyt Williams, "Brazil's Army Industry on the Move," *Armed Forces Journal International*, December 1984, p. 112.
56. David J. Meyers, "Brazil: Reluctant Pursuit of the Nuclear Option," *Orbis*, Winter 1984, p. 896.
57. Eduardo Italo Pesce, "Brazil's Navy Must Wait," U.S. Naval Institute *Proceedings*, March 1987, pp. 137-138.
58. Murguizur, p. 454.
59. Hewish, p. 9.
60. Thyssen Nordseewerke Special Submarine, supplement, p. 9.
61. Hewish, pp. 19-20.
62. Pesce, p. 134.
63. Ronaldo S. Olive, "100 Percent Fleet Increase for Brazilian Navy," *Jane's Defense Weekly*, 29 June 1985, p. 1277.