COASTAL DEFENSE REFERENCE STUDY GUIDE

The following information is provided in order to give you a clear understanding of the threat facing amphibious forces today. The information provided does not include all threat systems, just the major types we could expect to face if tasked to conduct a landing against an integrated coastal defense. The information is purposely sequenced in the following order: A series of articles on the Falkland Island's campaign (provides a good case study on the modem threat in the littorals), Mine Warfare (naval and land type), Coastal Artillery, Precision Guided Munitions (PGM) and Theater Ballistic Missile Defense.

Naval mines should be thought of as obstacles to Naval Expeditionary Forces (NEF's), not just as a lone threat. When these obstacles are covered by fire with coastal artillery, PGM's (air, land and sea launched) and Theater Ballistic Missiles (TBM), their effectiveness are greatly enhanced. There are many good examples which highlight the effectiveness of naval mines covered by fire, the Gallipoli naval campaign is one. Additionally, mines in the surf zone and on the beaches will normally be supported by some other type of obstacle like concertina, tanglefoot, hedgerow, etc. Amphibious planners need to be concerned with the mine threat in the deep water, shallow water, very shallow water and surf zone regions, because the US Navy has varying degrees of Mine Countermeasure (MCM) capability. Their capability, or lack of capability, will determine what landing forces will be able to do. A good review of the Iraqi beach defenses in Kuwait is included in this section.

The section on Coastal Artillery is an excellent piece put together by the Marine Corps Intelligence Activity (MCIA). It is important to know the difference between coastal and land based artillery. Coastal Artillery is only one of the elements that will face a landing force, but it is an integral part of a layered coastal defense system.

PGM's are perhaps the toughest threat that face amphibious forces today. Our amphibious doctrine, built decades ago, did not have to take into account this threat. PGM's are accurate, have a long range, are very fast and extremely lethal. Landing forces launching from over the horizon will not be safe in many cases because many of these systems can be put in a seeking mode and acquire a target (ship) after launch.

Theater Ballistic Missiles pose a similar threat to expeditionary forces except these weapons have a greater range, can carry a more lethal payload, but fortunately are not normally as accurate as PGM's. The article by MGen Jenkins "Theater Ballistic Missile Defense: The Enabler for Operational Maneuver From The Sea in the 21st Century" is an excellent writing which deals with the threat posed by PGM's and TBM's, and discusses a way to overcome the threat.

INDEX FOR ABBREVIATIONS

CPMIEC-China Precision Machinery Import and Export Company

0TH-Over the Horizon

ECCM-Electronic Counter Counter Measures

NATO-North Atlantic Treaty Organization

APHE-All Purpose High Explosive

HE-High Explosive

ERATO-Extended Range Automatic Targeting of Otomat

FAC-Fast Attack Crafts

Argentine Jointness And the Malvinas

By ROBERT L. SCHEINA

Identity is as basic to an institution as it is to those who comprise it, and once established identity can assume greater importance than survival itself. This is particularly true of the military. The Argentine experience in the Malvinas (Falklands) reveals that military institutions must evolve in order to succeed and that adherence to institutional identity can be fatal if maintained at all costs. Jointness existed at the operational and tactical levels within the Argentine armed forces during the Malvinas conflict, but it did not exist either strategically or doctrinally. In virtually every case it was the product of initiatives by mid-level officers aside service parochialism to confront a common enemy. There are a number of specific illustrations which stand out.

The Argentine operated the only tankers in the inventory. The 130s were essential to air strikes against the British Fleet whether carried out by air force or naval planes. For example, Skyhawks (f1own by both services) had at most a few minutes over their targets if not refueled in the air. The Malvinas were barely within range of the attack aircraft of either service. In addition, every mission flown by the navy's Exocet-armed Super Etendards required at least one air-to-air refueling.

either service. In a every mission flow navy's Exocet-arm Etendards required at least one air fueling. These planes carried out five attacks, the second of which sank the HMS *Sheffield* and the fourth *Atlantic Conveyor.* The last Super Etendard attack on May 30, 1982, need a triple refueling to strike over 500 miles from base and to circle and approach from the east.

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181G-1987.

Without the air force, Argentine naval aviation could not have sunk HMS *Sheffield, Atlantic Conveyor,* and *HMS Ardent* nor have damaged other ships.

The defense of the airfield at Puerto Argentina (Port Stanley) was also joint. The air force contributed search radar; the navy communication, plotters and direction personnel; and the army twin barrel, radar-controlled Oerlikon Contraves 35mm guns, Following an initial attack on May 1 by British Vulcans and Harriers, the latter had to change tactics from close-in bombing to less accurate lob bombing. This was due largely to the effective Argentine anti-aircraft defenses which were credited with shooting down five Harriers, plus a few Argentine aircraft which strayed too close. Importantly, the defenders kept the airfield partially operational throughout the entire conflict. The fact that in spite of British activity an Electra carrying supplies was able to land on June 14 (the day Port Stanley fell) testifies to the success of this joint effort.[2]

Another success that can be attributed to jointness was the Exocet missile which hit the destroyer *HMS Glamorgan.* In April, while tensions were building over the Argentine occupation of the Malvinas, the Argentine navy removed two Exocet missiles and launchers from the destroyer *Santisima Trinidad.* It married these to a jury-rigged fire control system and then mounted them on old trailers and christened them *Instalación de Tiro Berreta* (a do-it-yourself firing system). It took an air force C—130 three attempts to get the system to the Malvinas. Once on the island, the system was mated to an arm Rasit radar operated by a marine officer. The first attempt to fire a missile failed, perhap due to damage sustained in transit. A second missile veered sharply to the right because of a bad connection. On June 12, two days before the fall of Port Stanley, a third missile slammed into *HMS Glamorgan.*

Other cases of Argentine jointness arose when air force attack aircraft trained against navy type 42 destroyers (the same class c ship found in the British fleet); the air force and navy shared meager reconnaissance assets; and the air force carried navy Exocet between Rio Grande and Espora for maintenance. Unfortunately for the Argentine cause such ad hoc efforts on the operation and tactical levels were too few and too late and could not make up for a lack of join strategic planning and doctrine that was necessary to overcome the inertia fostered by each service’s institutional identity.

Today, the Argentines are fully aware of the price that they paid for this lack of jointness. In 1982 the last military junta tasked retired army general, Benjamin Rattenbact, to conduct an investigation of the war effort. Rattenbach, renowned for his professionalism, headed a joint team which produced a secret report. Eventually, many of the report findings were leaked to the press and, in 1988, a group of

veterans published the full report under the title of *Informe Rattenbach: el drama de Malvinas.* The report concluded that there was a lack of joint training and planning, and what did exist was purely theoretical and unable to be (translated) into action.[4]

Chronology

April 2 – Task Force 40 puts Argentine forces ashore near Port Stanley; Moody Brooks Barracks and Government House seized

April 5 – British carrier group sails from Portsmouth

April 12 – maritime exclusion zone comes into effect around Falklands

April 14 – Argentine fleet leaves Puerto Belgrado

April 21 – South Georgia operations begins

April 25 – South Georgia recaptured by British forces

April 29 – British tsk force arrives at exclusion zone

April 30 – total exclusion zone comes into force

May 1 – initial SAS and SBSD landings; first raid on Port Stanley by Sea hunters and naval bombardment

May 2 – General Belgrano sunk on orders of War Cabinet with loss of 321 Argentine sailors

May 4 – HMS Sheffield sunk; first Sea Harrier shot down

May 7 – total exclusion zone extends to 12 miles off Argentine coast

May 9 – trawler Narwhal attacked

May 12 – QE2 leaves Southhampton with 5th Brigade onboard

May 14 – SAS attack on Pebble Island

May 21 – San Carlos landing begins. HMS Ardent sunk; 16 Argentine aircraft lost

May 23 – Antelope sunk; 7 Argentine aircraft lost

May 25 – HMS Coventry and Atlantic Conveyor sunk

May 28 – Battle of Goose Green; 5th Brigade trans-ships from OE2 at South Georgia

May 29 – 42nd Commando lands on Mount Kent

June 1 – Brigade disembarks at San Carlos

June 2 – 2nd Para leapfrogs to Bluff Cove

June 6 – Scots Guards land at Fitzroy; Welsh Guards embark for same

June 8 – Disaster at Fitzroy; HMS Galahad and HMS Tristam bombed with loss of 51 crewmen

June 11 – Battle of Port Stanley; Mount Longdon, Harriet, and Two Sisters

June 12 – Battle of Tumbledown and Wireless Ridge

June 14 – Argentine forces surrender at Port Stanley

Source: Max Hastings and Simon Jenkins, *The Battle for the Falklands* (London: Michael Joseph, 1963), pp.341-43.

Juan Carlos Murguizur, a lecturer at the Argentine army staff college, laid bare the failure of jointness on the strategic level:

The armed forces were divided into watertight compartments, each service jealously guarding its rights and priviledges, and their compulsory participation in the to and fro of national politics merely aggravated the situation.

The so-called Estado Mayor de Coordination, *or coordination staff, was responsible in theory for drawing up plans for joint-service operations, but in practice did very little. In military circles, this organization was referred to as "the pantheon" since it served as an elegant burial-place for senior officers to old for command posting but not yet old enough to be retired. Plans for joint service operations needed the approval of all three services; and the troops and equipment necessary had to be requested from the respective commanders, making it desperately hard to get around the time-consuming bureaucracy and inter-service jealousy.*[5]

These findings should not surprise those who have studied the Central and South America, for the history of that region shaped the identity of its military institutions, one that can be surrendered only with great difficulty. As elsewhere, the principal role of the soldier in Latin America is to defend the nation. But that role was pursued in ways which differed significantly from those of the military in the United States. The armed forces of Latin America found an identity in defining nationality as well as in defending it.

As Latin American nations gained their independence (most by 1824), many lacked a sense of identity. The monarch's of Spain Spain, Portugal, France, Britain, and Holland had owned the region, and two of them, the kings of Spain and Portugal, ruled over the largest parts. Latin America was a huge area with isolated pockets of inhabitants. A1most impassable natural barriers—mountains, deserts, jungles, and rivers — reinforced this isolation and contributed to a lack of national identity. For example, Argentina was not united as a nation until 1853 even though it was among the first Spanish colonies to win independence in the 1800's. Also, colonial powers frequently fought each other and had little incentive in defining the boundaries of their empires. The King Spain, who owned perhaps three-fifths Latin America, was unconcerned over boundaries which subdivided his many possessions. As a consequence, the military of the region emerged not only as guarantors of sovereignty but also as creators and guardians of national identity.

In preserving national identity, many Latin American military establishments evolved into closely knit institutions whose cohesion served to bond a larger but weaker national

identity. But that cohesion within the military was achieved in part by creating loyalty to a service and its unique territorially-defined mission, and participating in an extensive and isolationist social infrastructure. The distinctive duties of the services traditionally found in Latin America—army, navy, air force, and federal police—reinforce this separateness and territoriality. These duties, traditionally implicit or at times explicit in Latin American constitutions, give the services separate, inviolable identities. While defending the nation, a service must act to define nationality. Consequently, one finds many examples in Latin America's past of a service acting to define the nation's political course.

Given this tradition it should not be surprising that the Argentine army, navy and air force fought three wars against the British in the Malvinas. But one must understand that the Argentine view of service identity, as established and reinforced by tradition, is the greatest obstacle to joint a activity, no matter how desperately circumstances press for such an innovation. F truly effective jointness, new institution perspectives must evolve. That *unnatural* process takes time, vision, and commitmer for it must work against the forces of history and tradition. ***JFQ***

NOTES

[1]Interview with Capitan Fragata Jorge Colombo, who commanded the Super Etendard squadron (September 15, 19863

[2]Interview with the Argentine navy's Malvinas analy group on September 30, 1983 interview with Contra Almirante Eduardo Otero, who commanded Naval Forces Malvinas (September 8, 1982).

[3]Interview with Capitan Fragata Julio Perez, who was charge of the special detachment responsible for the installation of the Exocet in the Malvvinas (September 9,1982).

[4]Centro Ex-Combatienl Malvinas—La Plata, *Informe Rattenbach: El drama de MaIvinas* (Buenos Aires: Ediciones Espãraco, 1988), pp. 204, 2

[5]Juan Carlos Murguizur, "The South Atlantic Conflict: An Argentine Point of View," *International L)efence Review,* vol. 16, no. 2 (February 1983), pp. 135—36.

OF CHIEFS AND CHAIRMAN

General Alexander A. Vandegrift, USMC

(1887—1973)

Commandant of the Marine Corps

VITA

Born in Charlottesville, Virginia. Graduated from University of Virginia; commissioned (1909). Attended Marine Officers' School, Port Royal, South Carolina. Assigned to Marine barracks, Portsmouth, New Hampshire. Participated in capture

of Coyotepe, Nicaragua, and occupation of Vera Cruz, Mexico. Assigned to 1st Brigade and participated in action against Cacos bandits at LeTrou and Fort Capois, Haiti (1914). Member of Haitian Constabulary at Port-au-Prince; served with *Gendarmerie d'Haiti* as inspector of constabulary (1916—19). Assistant chief of staff, Marine Corps base, San Diego (1926); operations and training officer, 3d Brigade, Tientsin, China (1927). Assistant chief coordinator, Bureau of Budget (1928). Assistant chief of staff, G—1 section, Fleet Marine Force, Quantico. Commanding officer, Marine detachment, American Embassy, Peiping, China (1935). Assistant to Major General Commandant, Headquarters Marine Corps (1940). Detached to 1st Marine Division prior to outbreak of World War 11(1941). First commanding general to leave U.S. shores to lead 1st Marine Division; reinforced in Solomon Islands (1942). Received Medal of Honor during defense of Solomons (1942). Assumed command of 1st Marine Amphibious Corps; commanded landing at Empress Augusta Bay, Bougainville (1943). Returned to Washington as Commandant-designate; sworn in as 18th Commandant (1944—46). First Marine Corps officer on active duty to attain four-star rank (1945). Died at Bethesda, Maryland.

HEADQUARTERS, FIRST MARINE AMPHIBIOUS CORPS
IN THE FIELD 15 October, 1943

MEMORANDUM TO: All Hands

1. The forward movement of our enemy in the Pacific has been stopped. More recently he has been forced to give up, at great cost in men and material, positions of great value to his campaign. His ships no longer appear in great force in these waters, his aircraft is becoming more cautious, and many of his soldiers and sailors admit they are no match for us. Nevertheless, he will fight desperately for his last hold in the Solomons.

2. The First Marine Amphibious Corps, composed of fighting men of the United States and of New Zealand, has been chosen to drive him completely out of the Solomons. It will not be an easy task but, as in the past, our squads can give and take punishment better and longer than his squads. This we are prepared to do. Our supporting air and naval forces are prepared to strike him with vastly greater blows than ever before. The first of these blows has already been delivered

3. It has been my privilege to assume command at this time. The day is set and we are ready. Be alert, and when the enemy appears shoot calmly, shoot fast, and shoot straight.

A.A. VANDEGRIFT,
Lieutenant General, U.S. Marine Corps,
Commanding.

Military affairs abroad

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CONFLICT WITH THE SOUTH ATLANTIC

As the second anniversary of the Argentine invasion of the Falklands/Malvinas approaches, generals on both sides of the Atlantic are still trying to sort out the lessons learned from the conflict. Disappointed Argentines no doubt search for answers to explain why their numerically superior Air Force failed to stop the British. High on the British assessment list is a reevaluation of the role and effectiveness of Harrier jets and the integration of air assets as part of an overall balanced force structure. No matter how these issues are settled finally, one point stands out: air power will continue to have a decisive impact on the outcome of limited wars of the future.

When conflict broke out in April 1982, most military experts expressed a high degree of confidence in the British army and navy. Once the British task force arrived in the South Atlantic, the navy quickly demonstrated its combat effectiveness. On 2 May, its nuclear-powered submarine HMS *Conqueror* launched two Mk8 torpedoes, sending the Argentine cruiser *General Belgrano* to the bottom. A total of 360 men died. From this point on, the on, the Argentine Navy remained close to the Argentine mainland and for all practical purposes did not participate in the conflict)

Few will dispute that the combined British ground forces, the army’s crack parachute troops and the navy’s Royal Marines, were more than a match for the Argentine units made up primarily of 18- and 19-year-old conscripts. The well-trained and highly disciplined British foot soldiers simply were better fighters. In every major ground operation, in spite of being outnumbered

by as much as three to one, the British defeated their adversary

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When the battle line's were drawn, the British mustered 28 Sea Harriers and 14 Royal Air Force GR3 ground-attack variants of the Harrier to face more than 150 Argentine combat aircraft. Neither side gained air superiority over the battle area, but the British held their numerically superior opposition.

and inflicted heavy casualties while suffering relatively few casualties of their own.

Although the British maintained the edge in terms of naval and ground resources, the lines cannot be drawn as clearly for the air war over the islands. From the onset of hostilities, both British political and military leaders were worried about the ability of Royal Air Force and Navy air power to support the task force adequately in the face of Argentine numerical superiority which, at times, was as high as five to one. The British had good reason to worry, as the Argentine Air Force turned out to be a formidable opponent. Neither side established complete air superiority. Right up until the final push on Port Stanley, Argentine fighters penetrated British airspace consistently, causing substantial damage to the fleet; five ships were sunk and at least twenty others hit. British losses numbered 255 for the entire war, but almost 80 percent of these came at the hands of Argentine air strikes on the naval task force. The majority of the 746 Argentine casualties resulted from ground actions supported by artillery and naval gun fire.[2]

The Argentines held a distinct advantage in the number of combat aircraft available for immediate use in the conflict. These included approximately 44 French-built supersonic Mirage III and Mirage V fighters, 68 American-built Skvhawk A4P fighter-bombers, 8-10 British-built Canberra bombers, and 5 French-built Super Etendard naval attack aircraft and about 60 pesky Argentine Pucará light ground-attack aircraft. Flying against this numerically superior force were 14 Royal Air Force (RAF) Harrier GR3s and 28 Navy Sea Harriers operating off two light aircraft carriers, HMS *Hermes* (25,00(3 tons) and HMS *Invincible* (20,000 tons). A third vessel, the container ship *Atlantic Contnveyor,* provided an alternate landing site for Harriers: but for the most part, its primary mission was to store aircraft, equipment, and supplies.[3]

What the British lacked in sheer numbers, they made up for with quality aircraft. Both RAF and Sea Harriers carried the improved version of the American-made air-to-air Sidewinder missile, the AIM-9L. The advantage of the 190-pound AIM-9L was that the attacking Harrier aircraft did not need to approach its target from behind to allow the missile to home in on the hot exhaust of the enemy plane. Instead, the AIM-9L could be launched "straight on" toward the oncoming aircraft. The missile proved to be a deadly weapon, destroying, according to British claims, five Skvhawks and nineteen Mirages.[4] It is not known how many, if any, of those were downed with head-on shots.

Harrier jump-jets performed well beyond the performance expectations of most military experts. The remarkable record of the aircraft is attributed not only to relatively sophisticated

gadgetry, such as warning receivers and electronic countermeasures to confuse Argentine antiaircraft weapons, but also to the skilled British pilots, the geographic limitations imposed by the location of the conflict area, and the older Argentine planes.[5]

Harriers were designed for vertical/short takeoff and landing (V/STOL), which allowed them to land and take off like helicopters. By rotating the jet engine nozzles downward, enough thrust was generated to lift the aircraft straight up. This built-in "jump" feature offered certain tactical advantages, mainly that the Harriers did not require long runways. During combat missions, when air traffic conditions became too congested on the *Hermes* and *Invincible,* Harriers low on fuel landed at helipads on destroyers.[6]

There was one glaring exception to the impression that the Argentine Air Force lacked a lethal punch for air operations. A few Super Etendards, carrying French-built Exocet AM39 missiles (range, 45 miles), caused devastating damage to two British ships. On 4 May an Exocet, skimming a few feet over the water at 600 mph, found its mark and, although its warhead did not explode, caused fires that sank the destroyer *Sheffield,* which had been serving as an early warning station[7]

Three weeks later, a second Exocet slammed into the side of the *Atlantic Conveyor,* sinking the vessel, along with its extremely valuable cargo of repair parts, Chinook helicopters, tentage, and more. The Super Etendard's inertial navigation system and the curvature of the earth permitted the plane to remain undetected by British radar. Once the plane entered British radar coverage, the pilot identified the target quickly with his radar, programmed the flight of the Exocet, launched, and departed the area immediately, not waiting to observe whether the missile struck its target. Hence, the Exocet was advertised as the "fire and forget" missile.[8]

However, according to most reported accounts, the Argentines had only five of the air-launched Exocets available. Because of the embargo imposed on Argentina by the European Common Market, the French had refused to fill orders for additional missiles.'

In spite of its spectacular successes against British ships, Argentina lost the air-to-air war decisively. Argentine fighter aircraft failed to shoot down a single Harrier. British Harrier losses totaled nine— four to accidents and five by surface-based air defenses—surface-to-air missiles (SAMs) and antiaircraft artillery (AAA). The 400 miles from Argentina to the islands partially explained why the score was so lopsided. To make the 800-mile round trip from the Rio Gallegos Air Base on the coast severely strained the maximum operating range of the Argentine aircraft. Consequently, Argentine pilots had all they could do to reach the conflict area undetected and deliver their ordnance, "getting in and getting out" as quickly as possible. They could not afford to stay around to recon targets or offer much opposition to the Harriers sent up to intercept them, for in doing so, they realized, they would run dangerously low on fuel and might have to ditch in the Atlantic on the return

home.[10]

Because Argentine aerial-refueling capabilities were limited (two KC-130s, plus “buddy refueling” for Skyhawk and Super Etendard aircraft), the potential effect of the Argentine Air Force was reduced significantly. In contrast, the British Harriers operating off carriers did not face the fuel shortage problem and had the luxury of time on their side—factors that allowed them to perform recon and escort missions in addition to air-to-air combat.[11]

The importance of aerial refueling is perhaps one of the salient teaching points of the war. If Argentine fighters had been supported by a sizable air-refueling capability, they could have rendezvoused with air tankers near the islands. A massive, tanker-supported effort might have been able to tip the scales of the tactical air war more in their favor. On the other hand, the British were very dependent on the vital support role that aerial tankers played in logistical operations, reconnaissance /early-warning flights, and strategic bombing runs.

To sustain their task force, the British refueled tactical aircraft and transport planes (ferrying men and supplies) while in flight from England to the logistical base at Ascension Island, midway between the war zone and the home front. A few RAF Harriers flew directly from Ascension to the flight deck of the *Hermes,* refueled along the way by Victor K-2 tankers. Tankers also refueled Nimrod maritime reconnaissance aircraft on more than a hundred occasions. These latter flights lasted approximately fifteen hours each; however, they did not pick up enough intelligence to have any substantial impact on combat operations.[12]

Air tankers contributed also to three long-range bombing runs made on the Port Stanley airfield to destroy the runway, any planes parked there, and associated storage facilities. Two other raids were directed at a radar site that was providing information on British air activity to the Argentine defenders. Although these attacks set a record for the longest combat missions in the history of air warfare (8000 miles—round trip from Ascension to the disputed islands), they failed to disable any of the Argentine facilities. The first flight on 1 May, for example, dropped twenty-one 1000-pound bombs, but only one of the bombs landed on the runway. This lone crater did not prevent the Pucará fighter and Hercules cargo planes from using the runway. Yet even though the Vulcans caused only minor material damage, dropping 1000-pound bombs in the early morning hours under the cover of darkness probably did have the psychological effect of lowering the morale of Argentine soldiers on the ground.[13]

Selection of the 4100-foot paved airstrip at Port Stanley as a target demonstrated the British concern for this prime piece of real estate.. Once they arrived in the war zone, Harrier jets from time to time had attacked the airfield by dropping 1000-pound bombs but were unsuccessful. Antiaircraft (35-mm and 20-mm guns), plus Tigercat and Roland surface-to-air missiles positioned near the airport, posed too great a risk for the Harriers

to mount an intensive campaign.

Argentine turboprop Pucirrd.c were based on the Falklands/Malvinas. Many fell to British Blowpipe and Rapier surface-to-air missiles. Other, were destroyed by Special Air Service teams in hit-and-run attacks.
Helicopters hauled men and supplies, landed special learns, and conducted electronic countermeasure missions. One sank the Argentine submarine Sante Fe in Grvt ken harbor on South Georgia island. Bad weather and ground fire took its toll of both British and Argentine choppers.

Besides, as the war progressed, it became clear that British fighters could drive off most Argentine transport planes trying to land at Port Stanley, at least those attempting to fly in during daylight hours. In essence, the British had established a partially effective aerial blockade of Port Stanley, which was the logistical lifeline for ground troops on the islands.[34] More important, they almost completely halted aerial resupply from Port Stanley to troops in other isolated garrisons throughout the island, depriving them of even limited stocks that would have been available.

The Argentines had at least four weeks to build up supply stock levels before the British task force reached the islands. From May through the first week of June, some transports (landing at night) reached Port Stanley to bring in more supplies. If the war had lasted more than a few months, with the interruption of aerial resupply, it is doubtful that the Argentines could have held out for any length of time.

The Argentines made a serious misjudgment by not using the month of April to work on extending the Port Stanley runway. If they had accomplished this vital task, a more effective defense of Port Stanley could have been achieved. A longer runway could have accepted the much-needed Skyhawks and Mirages, allowing them to perform both counter-air and close air support missions. Operating from a land base on the islands, Skyhawks and Mirages would not have been so severely restricted by the limitations of fuel and distance. By significantly increasing the time that they could spend in the air and with at least a three-to-one advantage in fighter aircraft, the Argentine pilots might have been able to overwhelm the small British air force by numbers alone. Also, with the critical element of staying power working in their favor, they could have engaged in more recon missions to collect more accurate intelligence on the kind and location of targets. Even more important, Argentine fighters flying out of Port Stanley would have had a better opportunity to locate and successfully attack the British fleet. This achievement might have altered the outcome of the conflict.

The “what if” questions of warfare abound in almost any conflict, but in this particular case the importance of maintaining a secure tactical air and logistical base is illustrated clearly. The British supply lines extended across a distance twenty times greater than that of the Argentines. Yet the British were able to support and protect their air resources much better than the nearby Argentines. British air power,

including surface-based air defense, in the end proved superior.

The South Atlantic War yielded few new lessons in war-fighting but confirmed many concepts learned during combat in the Middle East and elsewhere. Foremost among the lessons revealed is that high-tech weaponry, like the Rapier SAM system gives an edge to the defense that can be overcome only through innovative and imaginative employment of reasonably sophisticated offensive weaponry.

This is not to say that the British did not pay a price. Argentine air power posed a substantial threat, as demonstrated by the major combat engagements of the war.

After their initial surrender of Port Stanley on 2 April, the British came back to win their first military victory at South Georgia. a small island in the Atlantic, 800 miles east of the Falklands/Malvinas. The advanced elements of the British task force reached the Falklands Malvinas in mid-April and were directed to recapture South Georgia held by a small contingent of Argentines. Driving the enemy off this island would serve three purposes. First, a British success early in the war would show the politicians at home that Margaret Thatcher's government was indeed pursuing the right course in dealing with outside aggression. Second, the fall of South Georgia would be a major step forward for the British military. Not only would it boost morale, but it would allow the field commanders to gauge the fighting ability of the Argentine soldiers. Finally, the fight would offer a unique "rehearsal" for the main assault on the Falklands/Malvinas.

Retaking South Georgia was risky business. The main task force was still en route, so the landing force had to go in without the benefit of close air support. However, air power did prevail to some degree with Wessex 3 helicopters from the destroyer *Antrim,* Lynx helicopters from the frigate *Brilliant,* and Wasp helicopters from the *Endurance.* On 25 April, a Wessex 3 spotted the Argentine submarine *Santa Fe* and damaged it by dropping depth charges. The Lynx and Wasp helicopters followed up by firing their SS-12 anti-ship missiles, causing the submarine to limp into King Edward Harbor, where its crew members eventually were taken prisoner. Although the 4.5-inch naval guns of the *Antrim* and *Plymouth* contributed additional firepower to turn the tide of battle, the British developed an appreciation for the air power contribution made by the navy helicopters.[15]

Air power was to have a much greater impact on the British landing at San Carlos, which began on 21 May. British soldiers

secured the beaches unopposed on the ground, but the escort ships in Falkland Sound that supported the operation faced wave after wave of Argentine planes from two directions. The small Pucarás took off from Port Stanley and flew low to the ground, approaching the Royal Navy from the east. The first Pucarás bombed and badly damaged the frigate *Argonaut,* one of five ships that formed a forward defense line to detect aircraft coming from the Argentine mainland.[16]

The courageous Argentine pilots demonstrated their aerial skills by flying a low-altitude, terrain-hugging profile over West Falkland Island to use the rolling hills as a shield against British radar detection.
Just before reaching San Carlos, they "popped up" and then executed dive-bomb maneuvers on the British ships. The first group of Mirages dropped 1000-pound bombs and succeeded in hitting the *Ardent,* ripping holes in her deck and setting off a number of uncontrollable fires. Twenty-three of the crew died and more than thirty were injured before the *Ardent* sank.[17]

On the second day at San Carlos, two 500-pound bombs landed on the *Antelope* but failed to explode. One bomb blew up as a British bomb expert tried to disarm it. The explosion tore a huge hole in the ship's side, sending a spectacular tower of smoke, fire, and debris skyward. The *Antelope* sank the next day.[18]

The problem of bombs that hit their targets but failed to detonate plagued the Argentines throughout the war. Some accounts estimate that nearly 80 percent of the bombs dropped on target malfunctioned because of poor wiring and delivery techniques. Releasing the bombs at very low altitudes (less than 40 feet) did not give the bombs sufficient time to arm themselves prior to impact.

On 24 May, bombs hit and damaged the landing ships HMS *Sir Galahad* and *Sir Lancelot,* which were bringing supplies to San Carlos. On 25 May, the same day an Exocet sank the *Atlantic Conveyor,* Argentine pilots made repeated passes and finally sank the destroyer *Coventry.* From 21 May to 25 May, the British paid an even higher price for establishing a beachhead at San Carlos: four of their ships sank, while at least ten others were hit and damaged by bombs.[19]

Although they suffered severe naval losses during the San Carlos encounter, the British inflicted a more damaging blow to the Argentine Air Force. Mirage and Skyhawk pilots flew against incredible odds in terms of distance, radar detection, surface-to-air missiles, and Harrier jets.[20] Approximately 109 Argentine aircraft were lost during the entire war. SAMs accounted for shooting down about 38 percent of them; the Harriers' kill ratio was 28 percent. The remaining third of the planes that the Argentines lost were shot down by small-arms fire or were captured/destroyed on the ground. Rapier proved to be the most effective land-based SAM, even though it had to be fired optically because the fleet's radar/electronics interfered with its radar. Foot soldiers carried the shoulder-fired Blowpipe, designed to hit both high-speed fighter aircraft flying low-

level air strikes and helicopters operating in a standoff mode. The supersonic Blowpipe missile achieved its greatest success against Pucarás. More than half the SAM kills were attributed to Rapier and Blowpipe. The balance of SAM kills came from the shipmounted Seawolf, Sea Dart, and Sea Cat missiles.[20]

Britain suffered its worst casualties from Argentine air power on 8 June, when British troops were caught in a poorly planned and badly executed operation to land soldiers at Fitzroy. Two landing ships, *Sir Tristram* and *Sir Galahad,* anchored in Fitzroy inlet (four miles from Bluff Cove) without protection from naval escort ships, offered an inviting target to the Argentine Air Force.

Mirages and Skyhawks capitalized on the opportunity by dropping bombs on both ships, which were loaded with troops ready to disembark at Fitzroy. Without naval-or land-based SAMs available to provide protective firepower, the *Tristram* and *Galahad* were extremely vulnerable. As a result, more than fifty lives were lost— the highest single-day casualty figure of the war for the Btitish.[22]

Once the British absorbed their losses at Fitzroy, their move to retake Port Stanley progressed by using air strikes to soften up the Argentine strongholds for the final assault. These strikes, in combination with almost three days' continual artillery bombardment of Port Stanley and the surrounding area, led ultimately to the Argentine surrender to British ground troops on 14 June.

Air power played a very significant role for both sides in the conflict over the Falklands/Malvinas. But one lesson which should not be ignored is that air power alone could not win the war. This assessment is not a departure from past doctrine but simply a reaffirmation of a time-honored principle of war: the combined actions of mutual] supportive air, ground, and naval forces decide the difference between victory and defeat.

The absence of an adequate Argentine naval force and the inferior training of the bulk of Argentine ground troops resulted in Argentina's placing a disproportionate share of combat responsibility and expectations on the Argentine Air Force. This circumstance, coupled with the Argentines' failure to extend the vitally important Port Stanley airstrip and their very limited aerial-refueling capability, directly contributed to Argentina's defeat.

British combat operations in the conflict were successful not only because of the Argentines' fundamental military weaknesses but also because of the superb leadership and highly coordinated planning efforts carried out by the Royal Navy Arms', and Air Force at all levels of command The navy provided a safe operating base for aircraft and furnished the needed fire support for ground actions. Royal Navy and Royal Air Force Harriers, operating side by side and flying off the same carrier decks, worked closely with one another to deliver maximum firepower on the enemy. A derivative of the Royal Air Force

Harrier, the Royal Navy Sea Harrier was originally designed for fleet air defense. It demonstrated its flexibility, however, by performing air defense, ship attack, and- until the Royal Air Force contingent arrived— reconnaissance and ground attack. The air force made other important contributions by executing long-range bombing runs, conducting Nimrod reconnaissance missions, and performing aerial-refueling operations to sustain the 8000-mile logistical lifeline.

Notes

1. Drew Middleton. ‘Electronics Tips *the* Scales of Cnmbat7 *New York Times.* 11 May 1982. p. A6.

British Air Power made its greatest contribution as part of an integrated combat effort. Assessing the degree to which each service contributed to the final outcome of the war is not yet possible, in part because official military assessments on both sides have not been completed. However, one point is clear: The generals and admirals who one day may face the prospect of fighting a limited war in a remote region of the world must recognize and stress the importance of a balanced force concept. Implementation of this policy requires a potent air arm. As demonstrated in the South Atlantic conflict, air power, one essential element of an effective combined force, played a key role in determining both victory and defeat.

Kirtland Air Force Base.

New Mexico

2. Charles W. Corddry. “Britains Near-Thing Victory,” Air *Force.* December 1982. pp. 50-53: Alistair Horne. “A British Historian’s Meditations” *National Review.* 23 JuI’ 1982. pp. 886-89.

Logistics Of the Falklands War

By Bruce P. Schoch **May-June 1986**

Annex C To Advance Sheet To Section 9

Logistics problems of Argentina and Great Britain during the Falk lands War provide lessons to U.S. logisticians in supporting remote operations

It was, as the Duke of Wellington said of Waterloo, “a damned close-run thing.” The 1982 conflict in the South Atlantic between Great Britain and Argentina—the Falklands War—posed logistics challenges and called for improvised solutions on both sides that made the line between tactical success and failure a fine one.

It is indeed fortunate for hundreds of British and Argentine infantrymen that the war ended as quickly as it did. The British were desperately short of artillery ammunition, combat rations, and helicopter transport. Spare parts problems had degraded land-based air defenses, and troops were suffering more and more from the cold, wet environment. Had the Argentines still been deployed and inclined to further resist, there probably would have been large-scale, savage infantry battles; the British would have been forced, for both tactical and domestic political reasons, to press for victory before their logistics problems forced them to settle for a stalemate.

The most significant logistics problems were lack of mobility, ammunition, and rations. These shortcomings not only affected tactical operations; they also impeded the conduct of

other support activities. In contrast to the “high-tech” war in the skies, with its Exocet and Sea Skua missiles, a more primitive war was waged ashore, where the logistics shortages had their greatest impact. For example, Argentine soldiers in the Falklands capital, Port Stanley (or Puerto Argentino, as they called it), had to unload supply aircraft by passing cargo along a human chain. And lack of transport forced many British infantrymen to walk the 85 miles from their landing site at San Carlos to Port Stanley.

The Falklands War began during the predawn hours of 2 April 1982, when 475 Marines of the 2d Battalion, Bujo Tacito, Armada Republican Argentina, landed at and around Port Stanley on East Falkland Island. They were ferried ashore from the landing ship, dock, *Candido de Lasala* and the landing ship, tank, *Cabo San Antonio,* by 4 (mechanized landing craft) LCM-6’s, 14 (tracked personnel landing vehicles) LVTP—7’s, and 15 (amphibious resupply cargo lighters) LARC-V’s. Under strict orders to keep all civilian casualties and property damage to a minimum, the Argentines secured their objectives within hours and suffered only minor casualties. Whatever else the armed forces of Argentina did or failed to do during the Falklands War, the 2d Marine Battalion’s actions during Operation ROSARIO were quite successful, as was the performance of their American-made logistics watercraft.

Following their seizure of the Falklands, the Argentines relied primarily on airlift to increase the size and strength of their occupying garrison. The 4,100-foot, hardsurfaced runway at Port Stanley was lengthened another 200 feet with steel plating and illuminated by the army’s 9th Engineer Company. During April, military and civilian aircraft transported 9,000 personnel and 5,000 tons of equipment and supplies to the Falklands. The runway was quickly repaired after the 1 May British airstrike, and the Argentine airlift continued to the end of the war. Averaging two flights in and out daily (often at night, in bad weather, and flying low to avoid intercept by the British Harrier jets), Argentine aircraft brought in an additional 470 tons of equipment, including four 155-millimeter howitzers and two Exocet missiles and launch equipment, and ferried out 604 wounded personnel.

The British land campaign to recapture the Falklands was essentially a light infantry action, with an ad hoc, multibranch, and multiservice composition that in effect formed a “light infantry division.” The British force consisted of the 3d Royal Marine Commando Brigade; two parachute battalions (used as heliborne and foot infantry); two dismounted mechanized

infantry battalions; one Gurkha battalion of soldiers from Nepal; five batteries of towed 105-millimeter howitzers; one section of light armor; two brigade headquarters and service detachments; and elements of three squadrons (each equivalent to a U.S. battalion) of the army's port regiment. This composition reflected the availability of both units and transport. Logistics played a leading role in force structuring for the campaign.

The primary British logistics unit in the Falklands War was the 17th Port Regiment, Royal Corps of Transport. The only unit of its kind in the British Army, the 17th Port Regiment is based at Matchwood Military Port, near Southhampton, England.

The regiment is composed of three active squadrons and one reserve squadron, each with its own mission—

- The 51st Squadron consists of the British Army's sailors, who wear blue uniforms. They man and operate vessels and lighters, for logistics-over-the-shore operations. Forty percent of this unit is detached to oversea postings in Belize, Hong Kong, Cyprus, and, more recently, the Falkland Islands. The 51st Squadron supplements the civilian crews on the 7 Royal Fleet Auxiliary Service logistics landing ships, each of which has a capacity of 1,400 tons and is armed with two 40-millimeter automatic cannons.
- The 52d Squadron consists of stevedores who use European-designed materials-handling equipment to support the 51st Squadron's mission.
- The 53d Squadron provides administrative supply and subsistence support to the regiment.
- The 265th Squadron, a reserve unit, augments the regiment in all three functional squadron areas and participated in the British buildup in the Falklands after the Argentine surrender.

British Army engineer, supply, postal, and medical companies and detachments formed the service core for both the 3d Commando Brigade (Marines) and the 5th Infantry Brigade (Army). An engineer company installed a metal-plate landing pad for Harrier jets at Goose Green in less than a week, allowing up to four Harriers to refuel there at one time. Both Royal Marines and Scots Guard bandsmen were pressed into service as stretcher-bearers. The Royal Marines used army service, transport, and catering (food service) units. At the time of the Falklands War, the Marines were a "barebones" service lacking an organic logistics "tail"; this is now being changed.

Because the Falklands are located in the South Atlantic, much closer to Argentina than to Great Britain, mobility presented a serious challenge to the British. The Royal Navy chartered or requisitioned 59 merchant ships for the Falklands War, including 6 from Swedish, Norwegian, and Canadian firms. Ten of those were not needed and were returned to their owners before hostilities were over. Of the number actually used, 12 arrived after the Argentine surrender. They included the only pure containership used in the campaign, if *MV Astronomer,* which

served as a helicopter ferry and repair platform, and the SS *Rangatira,* which brought the bulk of the engineers, equipment, and materiel. The *Rangatira* carried materiel for lengthening the Port Stanley runway an was eventually used to provide temporary housing for the occupation forces.

The 37 merchantmen actually used during the war included 9 tankers, with a total capacity of 700,000 tons of fuel; 4 troopships, including a hospital ship; 11 fleet support ships, including 5 mine sweepers and 6 “despatch” and repair vessels; an 13 logistics ships (including 1 water tanker), with total capacity of 100,000 tons.

Two, of the logistics merchantmen deserve special mention. The *MVE1k,* with two 40-millimete guns, was the only armed merchantman in th Falklands during hostilities. Although it brough 2,000 tons of ammunition to the Falklands, hast~ loading plans caused it to leave 300 pallets of Roy al Marine-ammunition behind in England. The SS *Atlantic Conveyor* was a combination roll-on-roll off and containership that was sunk by Argentine Exocet missiles, it carried 14 Sea Harrier jets; CH—47C Chinook helicopters, 34f which were lost in the sinking; 1 Lynx-II antisubmarine warfare helicopter, which was lost; 6 Wessex Mark V utility helicopters, all lost; 4,000 tents, all lost; th4 bulk of the invading force’s helicopter cargo slings, all lost; and the bulk of aluminum plating for the Harrier landing strip, most of which was lost.

The sinking of the *Atlantic Conveyor* was critical in several respects. The loss of heavy-lift and utility helicopters severely limited troop mobility and crippled the amphibious landing of the lst Battalion, Welsh Guards, at Bluff Cove on 8 June The sole surviving CH-47C was forced to perform herculean service for the remainder of the campaign. The loss of cargo nets hampered resupply of forces ashore by aerial slingloads, forcing greater reliance on smaller, slower-to-handle loads aboard helicopters. Finally, the loss of tents probably prompted the very rapid return of Argentine prisoners of war at the conclusion of hostilities, since there were not enough shelters for 9,000 British and 11,000 Argentine soldiers with Winter beginning.

The loss of the *Elk,* with its ammunition cargo, would have been disastrous. As it was, ammunition was barely adequate for the five 105-millimeter howitzer batteries; some units were down to six ready rounds per tube on 14 June, the day of the Argentine surrender. By the end of the campaign, 30 guns had fired 16,000 shells from positions around Port Stanley. However, this concentration of fire was only possible once Port Stanley was hemmed in after nearly 2 weeks of British buildup. The required supply rate for the field artillery was 400 rounds per tube per day, but this was not met until near the end of the war.

An Argentine airstrike on the San Carlos beachhead as the 5th

Infantry Brigade was completing its landing destroyed its entire stock of Milan antitank missiles, a weapon the 3d Marine Commando Brigade had already found useful in busting sangers (built-up entrenchments) and bunkers. The Gurkha battalion landed with only the small arms ammunition in each trooper's pouch.

The British improvised a gargantuan air line of communication (ALOC) operation to deliver men and materiel to the Falklands. This ALOC ran from Great Britain to Ascension Island in the South Atlantic (4,300 nautical miles), and from Ascension to the task force around the Falklands (4,000 nautical miles). British Overseas Airline Company VC-10 airliners and Royal Air Force

C130 transports (modified for in-flight refueling) flew 600 sorties to Ascension, delivering 5,000 troops and 6,000 tons of supplies. Up to 400 fixed-wing and helicopter flights were recorded daily to and from Ascension. As the British Fleet sailed to Ascension, most of the personnel and supplies were transferred to the warships and auxiliary ships for transport to the Falklands. An additional 44 C-130 sorties were flown to the Fleet in the Falklands area, their loads parachuted for sea recovery. The ALOC resupply effort was necessary, although supplies for a 3-month campaign were being shipped, because merchantmen from Great Britain needed 3 to 4 weeks to reach the Falklands.

Fortunately for the British, there were no tanks opposing their landing at San Carlos (the 12 Argentine Panhard AFV tanks being 85 miles away at Port Stanley). Indeed, the British were opposed by nothing more than a corporal's guard of infantry that quickly withdrew. However, there were real problems with establishing and sustaining a base and moving inland to close with the Argentines.

The 3d Marine Commando Brigade landed on 21 May at San Carlos and needed 5 days to build up the base area. During that time, 12,000 tons of equipment and supplies and 5 battalions of men were landed by helicopter, by 5 (later 6) logistics landing ships, by Mexeflote barges, and by a handful of landing craft from the landing ships, dock *(HMS Fearless* and *HMS Intrepid).* These landing craft, eight (utility landing craft) LCU-9's, and eight smaller personnel and vehicle landing craft were designed for unit landings rather than for sustained logistics-over-the-shore operations. Since Port Stanley, the only port in the Falklands, remained in Argentine hands throughout the war, the entire British supply effort was over-the-shore. Ultimately, 30,000 tons of supplies and equipment were unloaded, mainly at San Carlos.

Discharge of supplies was effectively limited to 6 hours daily because of Argentine airstrikes, rough seas, and Antarctic Winter darkness. Many British helicopters, and most Argentine ones, could not operate over the barren, mountainous islands at night. The crew of the sole British CH-47C helicopter on two

occasions suffered “white-out” disorientation during snow showers, as did the crews of Wessex helicopters used during the British recapture of nearby South Georgia Island. Helicopters and crews equipped with and trained in the use of passive night-vision goggles were used in tactical maneuvers at night, by the British in their raid on Peeble Island and the capture of Mount Kent and Fitzroy and by the Argentines in their reinforcement and subsequent evacuation of Goose Green.

The loss of critical helicopters, especially three of the four available CH-47C’s when the *Atlantic Conveyor* was sunk, led to a ripple effect on British tactics and logistics. Helicopter shortages and operational shortfalls led the British to land the Welsh Guards at Bluff Cove as the only way to outflank the Argentines and move troops forward rapidly. This effort turned into a disaster because of lack of air cover and basic violations of the principles of amphibious landings.

Inland transport was a serious problem for both sides. There were only 12 miles of paved roads in the Falklands, all in the Port Stanley area; the rest of the “routes” were literally trails across the moors and through mountains. The British sent only 300 vehicles to the Falklands, very few of which were all-terrain-capable. The Royal Marines had 24 Volvo BV-202 tracked vehicles, and the single British armored unit (B Troop, Blues and Royal) had only 9 armored vehicles, including 4 Scorpions, 4 Scimitars, and 1 Sampson recovery vehicle. While the BV-202’s proved quite useful for towing artillery and ferrying small loads forward, their speed did not exceed that of infantry soldiers on foot. Land-Rovers, long a British workhorse utility vehicle, did not have sufficient ground clearance for the often rocky terrain of the Falklands. Nor were the 5th Brigade’s Sno-Cats particularly effective.

The lack of suitable off-road vehicles, coupled with the overstressed helicopter fleet, meant long marches on foot for most of the British troops. Facing cold weather, sustained only by combat rations, and burdened with heavy loads, troops could make only slow, methodical progress. While preserving the force, the slow advance also strained the supply reserves. Problems for the Argentine forces were similar, and they had even fewer helicopters than the British.

Despite press reports to the contrary, Argentine troops in the Falklands were not starving (though some isolated malnutrition cases were later evacuated from outposts). The Argentine forces had been in possession of the Falklands for 6 weeks be fore serious British opposition began, and they were able to fly supplies in and fly wounded soldiers out up to the day of their surrender.

The Argentine diet must have been monotonous, because the Argentine command sent purchasing agents and droving parties into the interior of East Falkland Island to purchase some of the 700,000 sheep raised by the locals. The Argentine command tried to maintain a correct relationship with the 2,000 British

inhabitants of the Falklands and, while there were lapses, property generally was not seized. Most of the inhabitants did not cooperate with the Argentines, but on at least one occasion an Argentine purchasing officer did buy 300 sheep at Fitzroy. Most of the sheep, however, were lost by inexperienced drovers during the 15 mile drive back to Port Stanley.

At the end of the campaign, Argentine rations from the supply dumps around Port Stanley were sufficient to feed both British troops and Argentine prisoners of war. Distribution of rations to its forces outside the Port Stanley and Darwin base areas appears to have been the biggest Argentine subsistence problem.

The British, however, had problems with the quantity and quality of food from the beginning. While troops ate well aboard the troopships, it was another matter ashore. The British had shipped to the South Atlantic several months' worth of refrigerated and institutional rations (12 million meals in all), but only 38 days' worth (1 million meals) of operational, or combat, rations. Ammunition resupply, troop movements, displacement of field artillery, and evacuation of the sick and wounded took priority for precious helicopter lift. Field kitchens would have to wait until surrender; meanwhile, troops ashore subsisted on combat rations. From the landings at San Carlos on 21 May to the surrender at Port Stanley on 14 June, 5 battalions consumed 24 days' worth of rations and 3 others consumed 14 days' worth; there were barely 2 weeks of combat rations left on 14 June. While much has been said of the high degree of physical conditioning of the British troops, the ration issue had at least one deleterious effect: company physical training cadres, no longer able to maintain their customary high-protein diets, began to fall out, while slightly overweight troops "drew upon their reserves" and kept going.

The speed of the British deployment caused problems in addition to the lack of mobility, ammunition, and food. While the 3d Marine Commando Brigade was on "spearhead" status when the war began and had its initial 30-day load of supplies and equipment already placed on pallets for rapid deployment, the 5th Infantry Brigade did not. One unit, the 2d Battalion, Scots Guards, had just come off duty at Buckingham Palace and did not have cold-weather clothing (the Royal Marines had such clothing from their annual training in Scandinavia). Several officers who were members of the peerage literally had to "pull rank" with family members in the House of Lords to receive Winter clothing before deployment.

Despite much evidence that the British forces had better physical conditioning and unit training and cohesion than the Argentine forces, the British still experienced up to 20 cases of trenchfoot per day after they landed. Argentine troops, in their largely static and prepared positions, were not badly

clothed for the climate. British Broadcasting Corporation newsreels of Argentine prisoners awaiting evacuation or undergoing strip searches revealed adequate Winter uniforms.

Logisticians can learn several lessons from the Falklands War. For example, units that are going to be resupplied by air must be fully trained in both external slingloading and internal loading of cargo and utility helicopters. Specially trained support personnel may not be available to do the job.

Physical conditioning is critical, though it can be misapplied. The intent is not to develop professional athletes, weightlifters, or human porters. The goals of unit and individual physical training should be to develop stamina for long marches, to learn personal health and hygiene (including looking out for fellow soldiers), and to learn to tend for oneself in the wild.

Units should critically evaluate their equipment needs. Are field kitchens necessary? British troops brewed their tea on folding stoves. How much is needed in weaponry? At least two Argentine aircraft were destroyed, in flight, by handheld anti-tank rockets, which were also useful for reducing sangers and bunkers. Must troops have shelters, or can they sleep in the open? There are no easy answers-all requirements must be carefully evaluated.

Air defense of logistics facilities, even with small arms, is obligatory. Twenty-five percent of the British vessels attacked in the Falklands were logistics or support vessels; all but two of the Argentine ships sunk were logistics vessels, and the Argentine submarine *Santa Fe* was on a logistics mission when it was sunk. Argentine air attacks on the San Carlos beachhead destroyed an ammunition point, damaged two helicopters, and in general disrupted the orderly flow of the British deployment. Defense against small but elite ground raiders also deserves training attention.

Any means that is not criminal should be considered to move men, equipment, and supplies. Horses, mules, carts, dogs, civilian vehicles, and civilian porters all can be possibilities at some time. The options were fewer in the Falklands, but not absent: the Argentines briefly impressed the Governor’s plane into service (it was destroyed by a cluster bomb), and the British availed themselves of a small, abandoned Argentine coaster, the *Monsunen.*

The Falklands War was a laboratory war in the mold of the Spanish Civil War of 1936 to 1939. It was also a nearly perfect “barebones” theater into which both sides had to import almost everything required to prosecute the war. Most news reports focused on the new technology used in the war, such as the Exocet missile; but the Falklands War also offers a valuable

case study in logistics, particularly for supporting operations in a small, remote theater.

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NAVAL MINE WARFARE

One of the main coastal threats in the littorals is mine warfare. Today's state of the art mine countermeasures is 20 years or more behind mining technology. The first recorded use of an underwater explosive device is in the "Baffle of Kegs" in the Delaware River near Philadelphia in 1777. Mine warfare has proven itself as an effective defense of coastal waters ever since. The Naval campaign at Gallipoli in 1915 and the US landing at Wonson, Korea are two examples where the worlds most powerful Navy was prevented from accomplishing it's mission due to the mine threat in the area.

Effects of Mine Warfare:

- Mine warfare has two effects on warfare. Physical and Psychological effects.

Types of Sea Mines:

-Contact Mines

-Magnetic Mines

-Acoustic Mines

-Influence Mines

-Combination Mines

-Improvised Explosive Devices

Fuse and Trigger Combinations:

-Fuse and Trigger combinations are the different ways that mines can be detonated. Mines can employ more than one Fuse and Trigger Combination.

Mining and Minefield Employment:

-There are six different ways to employ mines. They are Harbor Defense, Riverine and Land mining, Mobile Mine, Deep-Water Mines, Under-Ice Mines, and Miscellaneous Mining. Mines in the surf zone or on the landing beaches would be considered in the miscellaneous category. Mine fields can range in distances from 100 yards to 15 miles and the density will vary. The mine field can also be a mixture of mines tied in with other obstacles which would hamper MCM operations. The following exerpts provided by MCIA provides a glimpse at how Iraqi beach defenders prepared for a US landing in 1991.

GENERAL INFORMATION

CHARACTERISTICS

Today's mines are designed for deployment against many different classes or types of ships to achieve a variety of results. However, to meet the challenges of the missions that they may be called upon to perform, mines are becoming increasingly "complex." Moreover, the number of these missions is so large that no one mine can serve all purposes. And this is why the Navy's stockpile contains many different kinds of mines with the necessary built-in versatilities that provide the options needed for a wide variety of missions.

It should be noted that all mines discussed herein refer to sea mines, i.e., those mines which are emplaced in deep or shallow waters, coastal areas, harbor entrances, rivers, canals, and estuaries. It should also be noted that the term "sea mines" also includes destructors which are general-purpose bombs containing influence firing mechanisms. Destructors, however, can be used as land mines as well as sea mines.

In general, some mines, with small explosive charges, are designed only for use against river boats and wooden vessels of small displacement. Other mines with large charges can destroy

or damage most capital ships. Some mines are intended primarily for use against submarines.

Although it has been said that mines are becoming increasingly complex, it is largely because of the “intelligence” that is built into their firing systems. Conversely, the same technology that made mines more complex in some ways has made them simpler in others: The newer mines, for example, have features which make assembly, testing, and stowing much easier and safer than was possible with our older “not-so-complex” mines.

When deployed, mines may be used as offensive or defensive weapons. As offensive weapons, they may be planted in the enemy’s waterways, harbors, anchorages, and channels or they may be planted in sea lanes removed from the, enemy’s harbor areas to menace his military and commercial shipping. It should be noted that the actual threat of such mines is frequently of equal importance with the actual sinking of ships, since the presence or threat of mines requires the necessary countermeasures to sweep or neutralize them. Consequently, this causes delays in shipping schedules which may require that ships use alternate routes and port areas. As defensive weapons, mines may be planted in our own ports, friendly ports, harbors, channels, anchorages (perimeter defenses), bays, estuaries, or open waters to protect against enemy offensive seaborne attacks into these areas.

TYPES OF MINES

When classified according to the position they assume in the water, mines fall into three categories: bottom mines, moored mines, and drifting mines. (Note: Drifting mines were limited by the Hague Convention of 1907 and are no longer represented in the U.S. Navy’s mine stockpile.)

Bottom mines are most effective in comparatively shallow waters. A large negative buoyancy (tendency to sink) brings the bottom mine to rest on the ocean floor and keeps it there. In very deep waters, surface vessels may pass over the mine without actuating its firing mechanisms or, in the event of an actuation, without suffering much damage. Of course a bottom mine planted in deep water is still effective against submarines.

Moored mines are used for deep-water plants and are effective against submarines and surface ships. The explosive charge and firing mechanism in a moored mine are housed in a positive-buoyancy case, i.e., one that tends to float. A cable, attached to an anchor on the sea bottom, holds the case at a

predetermined depth below the surface.

Drifting mines float freely at or near the surface. They have no anchoring devices, and their buoyancy is approximately neutral. As already explained, the US. Navy stockpile contains no drifting-type mines.

When classified according to the method by which they are delivered, mines again fall into three categories: aircraft-laid mines, submarine-laid mines, and surface-laid mines. It should be noted that by using appropriate modifications, aircraft-laid mines (less flight gear) and submarine-laid mines may be planted by surface craft.

Aircraft-laid mines are normally employed in offensive operations and are dropped from aircraft in the manner of a bomb. These mines must be specially configured for air delivery. Aircraft provide the capability for replenishing minefields over an extended period *of* time without danger from previously laid mines. Aircraft are also capable of mining enemy-held inland waterways.

III. IRAQI COASTAL DEFENSES (U)

A. ANTIPERSONNEL BARRIERS (U)

(U) Wire obstacles of standard type, a limited number of fire trenches, field expedient obstacles coined “sea urchin” and “hedgerow”, and antipersonnel mines were the primary antipersonnel barriers found.

1. WIRE OBSTACLES (U)

(U) Standard types of antipersonnel wire obstacles were found (figures 2 and 3). Construction consisted of concertina and tanglefoot made with barbed wire, concertina wire, and engineer stakes. These wire emplacements contained numerous antipersonnel mines. In areas affected by ocean tides, the antipersonnel mines were tied to the wire obstacle to prevent their being washed away. Wire emplacements would cause delays to personnel movement and limit vehicular mobility on the beach (effects on AAV mobility will be discussed under “Antitank/AAV Barriers”). A deliberate breach of these obstacles would be within the capability of existing equipment, munitions, and doctrine.

4. ANTIPERSONNEL MINES (U)

(U) Extensive use of antipersonnel mines (Italian VS-50) of the pressure activated type were used as part of the wire obstacles discussed earlier. Mines were buried within the wire emplacements (Figure 6). Due to the sand cover and wind action many mines within the wire were found uncovered. Antipersonnel mines (Italian VALMARA-69), activated by trip wires, were found to have been improperly installed. The trip wire, designed to be stretched across the expected enemy path up to 15 meters and anchored with a stake, was emplaced with the stake only a meter or so away with 15 meters of loose wire coiled around the mine and stake. Wire obstacles in the water had VS-SO antipersonnel mines tied to the wire or the wire support stakes to keep them from being washed away (Figure 7). The VS-SO mine is nonmetallic and designed to defeat overpressure countermeasures enhancing the effectiveness of the wire obstacles. Marines mounted inside AAVs would be protected from these antipersonnel mines during a hasty breach of wire obstacles. Limitations for AAVs breaching wire obstacles are discussed under “Antitank/AAV Barriers”. Due to the number of mines used deliberate clearing of the beachhead area would require a significant engineer manpower intensive effort.

B. ANT1TANK/AAV BARRIERS (U)

(U) With apparent scarcity of materials (heavy I-beams, concrete etc.) to construct antitankIAAV obstacles, the Iraqis improvised. Common precast concrete road dividers, the above mentioned fire trenches, wire obstacles, and high density sea urchin and hedgerow obstacles augmented preexisting beach riprap and a seawall. Antitank/AAV minefields and a plan to create a fire barrier by discharging oil into the water and then setting it afire was seen only in the Bubiyan Island Bridge area.

(U) Dividers of the type, often seen on American roadways, were used to create a vehicular barrier (Figure 8). Between 36 and 42 inches high. this barrier could have created a problem had the obstacle been deployed with dirt backfill to create a more substantial obstacle or (36 inches vertical is the effective barrier height for *AA* Vs). As the dividers were employed, tanks and AAVs would have overturned, driven over, or crushed them. The only effect would have been to momentarily expose the belly of the vehicle and degrade the ability to use the vehicle’s armament during breaching. Deliberate breaching would not present a problem for existing equipment, munitions, and

doctrine.

5. TERRAIN FEATURES AND SEAWALL (U)

(U) The majority of the Kuwaiti coast has no significant natural terrain features. Egress from the sea would be impeded only by the hearing strength of the sand for tracked and wheeled vehicles. In the vicinity of Kuwait City a seawall had been constructed and riprap in selected places had been placed to prevent erosion of the beach in some areas.

a. SEAWALL (U)

(U) A seawall about .5 meters thick, varying in height from zero to two or three meters located at the high water mark or high enough inland on the beach to protect against storm surge, had been constructed prior to the invasion of Kuwait (Figure 10). The seawall protected buildings in a buildup area or seaside homes. The seawall presents no significant restrictions to movement on the beach and, if needed, can be breached with engineer equipment or explosives for egress off of the beach.

b. RIPRAP (U)

(U) In other locations, particularly in the harbor, pier, and breakwater areas, riprap of most any kind (concrete blocks, large rocks etc.) was used to prevent erosion (Figure 11). The nature of the riprap, and the steep grade of the beach at the waterline where riprap was needed, would have significantly restricted mobility across these sections of the beach. Any breach of these areas would entail a concerted deliberate engineering effort.

C. COASTAL FIGHTING POSITIONS (U)

(U) Tank revetments, crew served weapon: positions, bunkers, and trenches were evident in and around the built up areas along the coast and largely were integrated into the preexisting obstacles of the seawall and the riprap (Figure 13). The Iraqi coastal fortifications, particularly the bunkers and trench-works, were poorly constructed and maintained. Where overhead cover existed it was no more than a sun shade with only enough soil to prevent the wind from blowing away the tin roof; if a burster layer was found it was of minimum use. The noncohesive sandy soil also required extensive shoring for any below-grade

construction or trench work.

I. TANK REVETMENTS (U

(U) These fortifications were designed to have a tank drive into a hull defilade position, with an apron forward to reduce dust kicked up from a muzzle blast (Figure 14). The number of revetments was consistent with the number of tanks that would be assigned to an infantry unit. No attempt was made to provide overhead cover. These positions would be untenable during pre-invasion beach preparation fires. Iraqi tanks would have had to move into these positions after the beach prep-fires. Once the position was abandoned, there would be no restriction to mobility and minimum engineer effort would be required to clear these positions.

2. CREW SERVED WEAPONS POSITIONS (U)

(U) Fighting and crew served weapons positions meet minimum standards and lacked any overhead protection (Figure 15). When overhead protection was used (a tin sheet of metal and only enough dirt to keep the metal sheet from blowing away) it would have been insufficient to protect against shell fragment penetration from overhead burst. Trenches connecting quartering areas, ammunition supply areas, and firing positions were uncovered and seldom deeper than one to 1.5 meters or wider than one meter. Parapets, if used, consisted of one or a few layers of sandbags. Due to the sandy soil all below ground walls required to be shored; in most cases with masonry taken from surrounding buildings. Because of the shallow and narrow trench systems and firing positions, once neutralized, these obstacles pose no significant problem for combat wheeled or tracked vehicles. Minimum engineer effort would be required for clearing or breaching of these positions.

3. BUNKERS(U)

(U) Like most of the fortifications, bunkers were built to minimum standards (Figure 17). Aside from being only half buried and made of concrete, the only other precaution was a handgrenade fence around the hunkers at a reasonable standoff distance. Overhead cover consisted of a foot of concrete and a layer of sandbags. All above grade bunkers were used for observation and did not shelter weapons systems. Entry ways to

above-grade bunkers often were made of local masonry and with no burst protection baffle. Below-grade bunkers for quarters or storage had no more than a tin roof for protection from the sun (Figure 18).

4. TRENCHES (U)

(U) As mentioned earlier trenches were only 1 to 1.5 meters deep and 1 meter wide (Figure 19). The loose sandy soil required the sides to be shored with locally obtained masonry. In addition the trenches were built in a straight line. The entire length of the trench was exposed to flanking fires. Trenches would not present any significant mobility restrictions to troops or combat vehicles and would present no challenge to combat engineers to clear.

III. IRAQI COASTAL DEFENSES (U)

A. ANTIPERSONNEL BARRIERS (U)

(U) Wire obstacles of standard type, a limited number of fire trenches, field expedient obstacles coined “sea urchin” and “hedgerow”, and antipersonnel mines were the primary antipersonnel barriers found.

1. WIRE OBSTACLES (U)

(U) Standard types of antipersonnel wire obstacles were found (figures 2 and 3). Construction consisted of concertina and tanglefoot made with barbed wire, concertina wire, and engineer stakes. These wire emplacements contained numerous antipersonnel mines. In areas affected by ocean tides, the antipersonnel mines were tied to the wire obstacle to prevent their being washed away. Wire emplacements would cause delays to personnel movement and limit vehicular mobility on the beach (effects on AAV mobility will be discussed under “Antitank/AAV Barriers”). A deliberate breach of these obstacles would be within the capability of existing equipment, munitions, and doctrine.

4. ANTIPERSONNEL MINES (U)

(U) Extensive use of antipersonnel mines (Italian VS-SO) of the pressure activated type were used as part of the wire obstacles discussed earlier. Mines were buried within the wire emplacements (Figure 6). Due to the sand cover and wind action many mines within the wire were found uncovered. Antipersonnel mines (Italian VALMARA-69), activated by trip wires, were found to have been improperly installed. The trip wire, designed to be stretched across the expected enemy path up to 15 meters and anchored with a stake, was emplaced with the stake only a meter or so away with 15 meters of loose wire coiled around the mine and stake. Wire obstacles in the water had VS-SO antipersonnel mines tied to the wire or the wire support stakes to keep them from being washed away (Figure 7). The VS-SO mine is nonmetallic and designed to defeat overpressure countermeasures enhancing the effectiveness of the wire obstacles. Marines mounted inside AAVs would be protected from these antipersonnel mines during a hasty breach of wire obstacles. Limitations for AAVs breaching wire obstacles are discussed under “AntitanklAAV Barriers”. Due to the number of mines used deliberate clearing of the beachhead area would require a significant engineer manpower intensive effort.

B.ANTITANK/AAV BARRIERS (U)

(U) With apparent scarcity of materials (heavy I-beams, concrete etc.) to construct antitank/AAV obstacles, the Iraqis improvised. Common precast concrete road dividers, the above mentioned fire trenches, wire obstacles, and high density sea urchin and hedgerow obstacles augmented preexisting beach riprap and a seawall. Antitank/AAV minefields and a plan to create a fire barrier by discharging oil into the water and then setting it afire was seen only in the Bubiyan Island Bridge area.

QUESTIONS

1.What are the two different effects that mines have on warfare?

2.Name the 6 types of Sea Mines?

3. Briefly discuss the different methods of minefield employment that were utilized by Iraqi beach defenders in Kuwait in 1991.

MARINE CORPS INTELLIGENCE ACTIVITY

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Revolutionary Development in Coastal Artillery

Introduction

A great deal has been written lately regarding the "revolution in military affairs" which began in the former Soviet Union over ten years ago. Essentially, the revolution in military affairs has as its thesis that the impact of technology will cause a "sea change" in military strategy, operational art and tactics, and in the structure of the forces themselves. This

change is already underway as new military equipment, incorporating dramatic increases in accuracy and effectiveness, makes an impact on the military forces of the world. Nowhere has this change been more notable than in the field of artillery. Breakthroughs have occurred in fire control which allow a single control station to direct the fires of an entire battery (four to six guns, or more). Ammunition has become more lethal through the use of precision guided munitions and submunitions. Lasers and improved radars have also played a part in enhancing artillery accuracy and lethality. Finally, global positioning satellites permit quick, accurate artillery survey, allowing units to get into and out of action so quickly that counterbattery fires can only be called in with difficulty, if at all. These technologies, which have combined to provide unprecedented capabilities for artillery in the past few years, have now found their way into coastal defense artillery systems. This MCIA note will examine the technologies now being incorporated into coastal artillery, briefly examine their impact on coastal defense, and describe a few of the revolutionary new systems now being offered for sale on the international arms market.

Background

Artillery of any type is more than simply the guns which comprise the firing battery - it is a system of interrelated elements and the processes that control them.
These elements generally consist of a location or navigation system and site-survey system, a target acquisition system, a fire direction system, gunnery and fire control procedures, ammunition or projectiles and propellants, logistical support and supply, meteorology, command-control-communications (C^3) systems, and the gun itself. The ability to accurately and successfully employ artillery in a particular situation depends on the integration and synchronization of all elements of the system.

Coastal artillery’s mission is to defend strategic and tactical coastal areas, marine ports and terminals, military installations, transportation along coastal areas, and indigenous military forces from attack by naval and airborne forces. Coastal artillery weapons may be any caliber of gun or howitzer, but are generally in the medium to large caliber (100 to 155-mm or 203-mm and up) range. Additionally, these systems usually incorporate hydraulically enhanced emplacement, loading, munitions handling, and mobility subsystems. They can be static or fixed position, towed, towed with auxiliary mobility sources,

or self-propelled systems. The factors which influence or determine the particular systems employed include, but are not limited to, the geographic characteristics or topography of the region, the economic and industrial status of the respective nation, the structure of the indigenous military forces, current or former alliances with other nations, and the opposition force structure.

Coastal Defense System Improvements

Whereas traditional coastal artillery used large caliber, long-range guns emplaced in heavily revetted concrete fortifications, technology has enabled modern coastal artillery to become highly mobile. This provides the commander responsible for defending his country's coastline with much more flexibility and responsiveness while complicating the plans of any would be invader. Technology has also allowed the development of coastal artillery which employs high-precision ammunition and sophisticated fire control components, including radar, laser thermal imaging, laser range finders, and the means to integrate them into a highly effective defensive artillery system. Electronics and computer technologies are essentially responsible for this breakthrough, which enables a coastal defense battery to not only engage fast-moving targets with unprecedented accuracy, but provides it with fire control capabilities which allow integration of several weapons within a firing battery. Most significant is that for any country with the money to purchase it, coastal artillery is now available which integrates fire control, automation, lethality and mobility in manners which may pose serious threats to Marine Corps expeditionary forces.

The current level of sophistication with respect to artillery subsystems is broad and diverse. In the case of surveying equipment, target acquisition, fire control, and land navigation or positional systems, the level of sophistication ranges from hand held, manually operated devices to fully automatic computer driven systems.

Two technologies assessed to provide the greatest improvements to currently fielded artillery systems are the improvements in automation and computer driven command and control (C^2), and the introduction and fielding of precision guided munitions (PGM). Related areas which are presently being improved are rates of fire, range, targeting and identification, automation and robotics in the firing sequence, mobility, and

propellant technology. For example, the new Russian “Bereg” 130-mm coastal artillery system exemplifies the new integration of automation, increased rates of fire, and mobility.

Automation and computerization of fire control systems constitutes one of the easiest and quickest means to improve or enhance the capabilities of an artillery system. Fire control computers manage reception of target designator, target tracking and motion parameters, provide solutions for ballistic problems, and calculate the deflection and elevation for the gun. The most sophisticated systems also determine fuse settings, calculate volumes of fire, and provide firing information to the unit. The automation of the fire control process, especially with respect to the transmission and display of firing data, provides an increase in responsiveness by the firing unit and an increase in accuracy for those systems which automatically position the gun to the correct elevation and deflection.

Recently fielded fire-control computers are based on personal computer (PC) processors with a corresponding computational capability. As computer chip and software technology improves, the capabilities of these systems will become more sophisticated. Improvements in processing speed and memory will reduce the time required to compute fire commands and solutions and to disseminate the information; increase the rates of fire; improve accuracy; and enable the total integration of all phases of the fire process. Several integrated coastal defense C^3I systems have recently been marketed with advanced artillery computers supporting multiple gun sections. Individual guns can receive continuous information updates at 0.5 to 1.0 second intervals of prediction which integrates firing data using complete ballistic trajectory computations, including azimuth, elevation, type of ammunition (including shell, charge, fuse, and fuse setting), type of fire, number of rounds to fire, and fire commands.

Advancements In Precision Guided Munition

Advancements in the field of precision guided munitions will become a critical element in improving the accuracy of future systems. The introduction of seeker or sensor devices integrated with a projectile will dramatically increase the first round hit probability, which is the key to successfully engaging and defeating an adversary. There are various sensor or seeker types which detect energy from, or provide guidance input to a target. Guidance inputs to the projectile may be semi-active laser guidance, homing, course correcting, or terminal

homing. Types of sensors include active, semi-active, and passive (Figure 1). Another technique to improve the accuracy and effectiveness of

FIGURE 1
SENSOR ENERGY BANDS

Near infrared - reflected energy in the 1-3 micron range
Mid-infrared - emitted energy in the 3-5 micron range
Far infrared - emitted energy in the 8-14 micron range
Active millimeter wave (MMW) - 35 or 94 GHz range
Passive MMW - reflected background radiation Acoustic emitted 10-250 Hz frequencies
Acoustic – emitted 10-250 Hz frequiencies
Multi-sensor - combinations of the above munitions is the capability to automatically program the fuse settings of projectiles based on inputs from the target acquisition system directly to the fire control system.

Potential Improvements in Coastal Artillery Accuracy

Related to the improvement in PGMs is the potential improvement in the accuracy of the system itself. Accuracy is a function of the gun and target position estimation (survey), the process of laying in the gun (fire control), propellant charge, fire adjustment, and projectile velocity. Improvements to overall system accuracy will evolve from increased accuracy of laying in the gun, automation of the fire control process, improved target acquisition and tracking, a more accurate site survey, and improved meteorological methods.

One of the key elements for the successful employment, of an artillery system is the location or site survey system. The capability to accurately establish and relate all components of an artillery system to a specific location and coordinate system is critical for accurate delivery of fires. The site (or artillery) survey provides the geographic coordinates and altitudes of the weapons, targeting (or target acquisition) devices, observation posts, command posts, fire direction control elements, reconnaissance elements, and the potential targets or target areas. This survey provides the data to align all the components of the artillery system on a common baseline or reference coordinate in order to compute the necessary directional corrections to apply prior to employing the weapons.

Notable Coastal Defense System Upgrades

A number of countries have developed coastal artillery systems embodying many of the new technologies we have discussed. Most notable are the Russians, the Swedes, and the Chinese. Other countries, such as South Africa, have systems under development.

Coastal artillery employment and current doctrine (use) in Russia is largely based on the work of the late Russian Marshal Nikolai Ogarkov, which was proposed in his “New Revolution in Military Affairs,” in the early 1980’s. Technology, the foundation of the “Ogarkov Revolution,” has enabled the Russians to produce coastal artillery systems which now provide any nation wishing to defend itself from seaborne assault with state of the art weaponry. Two Russian systems, the “Bereg” 130-mm coastal defense gun and the “Hermes” coastal defense guided missile system, pose serious potential threats to U.S. Expeditionary operations. The “Bereg” is currently available on the international arms market. It offers the customer unprecedented mobility, flexibility, and potential full integration of a “layered” coastal defense system. The “Hermes” is in final stages of research and development. Both systems also allow the defender to prepare and presurvey any number of potential firing positions, while holding artillery firing assets in concealed locations until they are needed against landing forces.

“Bereg” 130-mm Coastal Artillery System

The “Bereg” coastal artillery system consists of a six-gun central battery control vehicle and a battery service vehicle. The “Bereg” can be deployed into presurveyed positions in less than two minutes, fire, and reposition in under two minutes, before an air strike or counterbattery fire can be directed against the system. The “Bereg’s” 130-mm guns are naval weapons which in the land role have a sustained rate of fire of up to 10 rounds per minute. The central control vehicle uses multichannel radar and opto-electronics (TV or Laser) for target tracking to a range of 35 km and engagement out to 20 km (Table 1).
The “Bereg” can track four moving targets at speeds up to 200 knots and engage two of these simultaneously. Each gun is

capable of independent operation, although target tracking and engagement would be severely degraded without the central fire direction vehicle. Each gun has a laser rangefinder and a ballistic computer. The guns can be dispersed up to 1,000 meters from the battery control vehicle, thus enhancing survivability. If expeditionary forces manage to get ashore, the “Bereg” can fall back and be used as precision artillery.

Table 1
“BEREG” 130-mm COASTAL GUN CHRACTERISTICS

Effective Range	20 km
Target Acquisition Range, Max	35 km
Target Destruction, 80% probability	1-2 min
Max Road Speed	60 km/hr
Caliber	130-mm
Fire Control	2-channel Radar, TV, Laser
Rates of Fire	10 rds/min
On Board Ammo Supply	40 rds
Deflection	$\pm 120^0$
Elevation	-5 to $+50^0$
Weight	43.7 tons
Length	12.9 meters
Height	3.9 meters
Crew	8
Food, Fuel, & Water Reserves	7 days

“Hermes” High-Mobility 155-mm Coastal Defense Missile System

The Russian “Hermes” system is primarily intended for destruction of enemy amphibious assault forces. According to Russian sales literature, it can also be used to repel massed armored attacks, as well as the destruction of individual ground defensive positions. The “Hermes” is mounted on a BMID-3 airborne amphibious assault vehicle chassis. There is no indication of a central control vehicle like that of the “Bereg”, but it is probable that each vehicle has an independent fire control system consisting of radar, a four-channel TV/thermal imager and a two-channel laser designator. Russian sales literature also indicates that each vehicle is equipped

with an autonomous survey and firing data computation capability. Each firing battery consists of three vehicles, which according to the Russians, is the equivalent of two 155-mm artillery batteries.

Interestingly enough, the “Hermes” fires a 155-mm projectile, a departure from the usual Russian 152-mm caliber. The range of the “Hermes” missile is 12 km, which supports the notion that the system was designed as part of a layered, integrated and highly flexible coastal defense system consisting not only of “Hermes” and “Bereg”, but of longer range anti-ship systems, as well. Little else is presently known of this system. Probably in its final stages of development, the system is currently available for sale by the Russians, who are seeking orders prior to beginning full production. The “Hermes” and the “Bereg”, are likely to be shown at the Abu Dhabi arms show next spring (1995). (Table 2)

TABLE 2
“HERMES” HIGH MOBILITY MULTIPURPOSE SYSTEM CHARACTERISTICS

Effective Range	12 km
Hit Probability	0.8-0.9
Firing Methods	Burst/Salvo
Projectile/Salvo	2-4
Operational Conditional (degree celsius)	Day/Night
Reaction Tine, Sec.	10
Target Engagement Rate/Min	12-18
Crew	3
Ammunition Load	14-16
Fire Control	Radar, 4-channel TV/Thermal Imager 2-channel Laser Designator
Guidance	Semiactive
Homing Caliber	155-mm
Projectile Weight	60 kg
Warhead Type	Shaped Charge, HE

Sweden's 120-mm Coastal Defense System

Another nation which manufactures "state-of-the-art" coastal artillery for potential sale on the international market is Sweden. Indigenously, coastal artillery is the responsibility of the navy. If sold to an overseas customer, Swedish doctrine and tactics could reasonably be expected to be employed by coastal artillery users. Swedish doctrine employs coastal artillery in cooperation with naval units, the army, and the air force to: defend important coastal areas against sea and air-borne landings; defend important ports, inlets and shipping lanes; defend naval bases; defend shipping along the coast and within the archipelagoes; and support army units. Mechanized heavy artillery is an integral part of Sweden's mobile coast artillery. New units, principally armed with 120-mm mobile coastal defense guns and modern fire control, have been established. These have been organized into batteries and formed into coastal defense battalions. These units with their greater firepower can engage attackers at ranges up to 30 km.

The guns are highly mobile and can be quickly redeployed after an engagement. The units can also be moved rapidly within the country and have their own maintenance and repair facilities. Additionally, they possess an efficient self-defense system against air and ground attack. It is also possible to redeploy more than 15 times in a day.

The primary weapon of the Swedish Coastal Defense Battalion is the mobile 120-mm coastal defense gun made by Bofors (Table 3). These guns form part of the Field Howitzer 77, FH77, product range. The guns have good strategic and cross-country mobility,

even in difficult terrain. During cross-country travel the vehicle and gun can be driven in tandem, which greatly increases mobility. The gun can also be driven shorter distances under its own power. Deployment is fast and easy as everything is hydraulically operated and has built-in backup systems. The guns are controlled remotely from the battery fire control. The gun's computer receives its target data via radio or wire from the fire direction center. Ballistic data including wind-speed and muzzle velocity are processed in the computer. The guns also have a high rate of fire with very high precision. The 120-mm coastal defense CD8O gun has a rate of fire in excess of 15 rounds per minute (10 rounds per minute for the 155-mm caliber CD77). This means a sustained rate of fire of up to 200 rounds every 20 minutes (150 rounds/20 minutes). The principal ammunition consists of naval target shells which have high penetrating capability and delayed burst. The delayed burst gives a much higher effect inside the target compared with older types of ammunition. The units will also be equipped with terminally guided ammunition which will considerably increase precision at longer ranges. For combating ground targets and open landing craft, an improved HE-shell with a Zelar multi-function proximity fuze is used.

The coastal artillery battery has two advanced types of fire control systems. The PEAB 9 KA 500, Kardinal, is an all-weather station that can direct fire at a number of targets simultaneously. The PEAB 9 KA 100, Kobra, is used in daylight and twilight. The gun computer calculates how the gun should be layed. The laying system is automatic and remotely controlled, with the inclination of the gun compensated for automatically.

The 9 KA 500 consists of two units: a sensor unit and an operating unit. Information is transferred between the units via an optical fiber link. The sensor unit consists of a radar unit for surveillance and tracking of surface naval targets, a turntable with a TV-camera, and a laser range finder. A laser beam is transmitted towards the target and the reflected beam gives the distance. Operating range is 10-20 km. The distance to an aircraft or a ship can be measured with laser equipment with an error of less than 10 meters. An optronic range finder can be used, but is restricted to one target at a time. Bearing and distance are fed to a computer which evaluates the position, course and speed of the target. Target data is then transmitted to one of the guns via a data link. Firing is controlled and

corrected from the operator's panel.

The information is processed in the operator unit's computer which locates the target and calculates speed and provides ballistics information for aiming the guns.

The system relies on cross-country vehicles used by the Swedish Coastal Artillery, developed by Scania in cooperation with the Defense Material Administration of Sweden. There are two basic designs: the two-axle cross-country vehicle type SBAT 4x4 and the three-axle type SBAT 6x6. Both types use all-wheel drive and a differential lock on each axle. Cross-country mobility is incredibly good. The driving characteristics are influenced by several interacting factors: all-wheel drive, automatic gearbox, high engine power output, single tires, and same wheel track front and rear.

TABLE 3

BOFORS 120-mm COASTAL GUN
'KARIN/CD 80" CHARACTERISTICS

Effective Range	30km
Max Road Speed	70 km/hr
Caliber	120-mm
Fire Control	Radar, TV, Laser
Rate of FIre	15 rds/min
Deflection	3600
Elevation	-3.to 50^0
Weight	12500 kg
Length	13.1 meters
Height	3.0. meters

The Chinese "NORINCO" 155-mm Coastal Defense System

The Chinese have the NORINCO coastal defense system. This system consists of a battery of six NORINCO 155-mm gun-howitzers Type WA 021. According to NORINCO, the coastal defense system is capable of searching, intercepting, engaging and tracking surface targets under all weather conditions. The system has two key parts, the six (Type WA 021) 155-mm gun-howitzers, each with

a Gun Display Unit (GDU), and the fire-control system. The fire-control system utilizes an advanced military 16-bit microcomputer in the Fire Direction Center and an advanced communications system.

Each fire-control computer can support six guns of its own battery and can also take over the control of an additional 12 guns if their fire-control computers malfunction. Information is fed into the central fire-control computer from the observer's station (radar and laser range-finder) and the meteorological station. The WA 021 gun-howitzer has a maximum range of 30,000 m using extended-range-full-bore (ERFB) projectiles and 39,000 m using extended-range-full-bore-base bleed (ERFB-BB) projectiles. The gun can traverse through a total of 70 degrees (30 degrees left and 40 degrees right), and has a rate of fire of *5* rounds per minute (Table 4). The NORINCO system is available for sale on the international arms market.

TABLE 4

NORINCO 155-mm GUN-HOWITZER (TYPE WA 021) CHARACTERISTICS

Effective Range	39 km (ERFB/BB) 30(ERFB)
Max Road Speed (Towed)	90 km/hr
Caliber	155-mm
Fire Control	Radar, Laser
Rate of Fire. (sustained)	2 rds/min
On Board Ammo Supply	122 rounds
Deflection	30^0 (left) 40^0 (right)
Elevation	-5 to +72'~
Weight	9700
Length	11.4 meters
Height	2.2 meters

South African 155-mm G5 Gun-Howitzer

The South African G-5 155-mm Gun-Howitzer (Table 5*)* is the most battle-proven of the modern 155-mm gun systems in the world. The G5 155-mm is a multipurpose towed howitzer that can be used in a traditional field artillery role as well as for coastal defense.

The G5 uses a 45-caliber barrel designed to accommodate the extended-range-full-bore ERFB round. Rate of fire is 3 rds/min for 15 minutes maximum. The maximum range is 30,000 meters at sea level, and 39,000 meters with extended-range-full bore-base bleed ERFB-BB rounds. The system comes equipped with a 59-kw air-cooled 79-hp diesel auxiliary power unit (APU) which permits hydraulic deployment of the gun at speeds of up to 2 km/hr when avoiding counter-battery fire. Fuel capacity is 102 liters giving the weapon a self-propelled range of more than 100 km. The G5 can be placed into and taken out of action in two minutes. In the event of APU failure, slave sockets and pipes are provided to use the hydraulic system from another gun or tractor. The gun is serviced by a five-man crew, although it can be handled by a minimum of two men.

A number of improvements have been made to the system since its initial production. These include a temperature warning device that allows higher rates of fire, a new tow bar which allows towing by virtually any prime mover, as well as improved RAM-D characteristics.

Late in 1992, the South Africans built a prototype of a 155-mm ordnance of 52-caliber barrel length. In addition, improvements in ammunition were underway as a Modular Charge System of identical units of 2.2 kg, each which could be used in 39-, 45-, and 52-caliber systems. A new 155-mm high explosive extended range full-bore-base-bleed projectile (ERFB-BB) was also under development. This round contained 8.4 kg of HE which, using the existing M53 charge, would give a maximum range of 40.2 km when fired from a 155-mm 52-caliber weapon.

DENEL 155-mm G5 Gun-Howitzer

Maximum Range (Sea Level)	30 km, 30 km EFRB-BB)
Road Speed (Self-Propelled)	16 km/hr
(Towed)	90 km/hr
Caliber	155-mm
Fire Control	Radar, FDG, via use of Real-time RPV-GPS Targeting data
Rate of Fire	3 rds/min for 15 min
Max Deflection	82^0 (>15^0 elev.)

The South Africans manufacture seven different types of 155-mm ammunition for the G5. The weapon is also compatible with all types of 155-mm ammunition including standard NATO 155-mm. The specialized ammunition for the G5 is available in conventional and base-bleed in each type. The base-bleed ammunition gives a 30 percent increase in range over conventional projectiles (30 km conventional/39 km base-bleed).

A G5 battery of 3 to 6 guns can be an effective coastal defense weapon system. Using ammunition at ranges out to 39 km, has yielded results which support hit probabilities of one salvo of compensated fire on a medium sized target (range 30 km) of 80 percent. Smaller target hit probabilities show 60 percent hits at 10 km and 15 percent at 35 km. Fire control can be achieved through the use of airborne, shipborne or coastal radars. The ideal platform is KENTRON’s SEEKER remotely-piloted vehicle (RPV) which has a 9 hour endurance limit and can operate 200 km from its control unit. It is an ideal system for surveillance, target location, target identification and fall-of-Utilizing a color-stablilized zoom video camera and infrared, shot observation during day or night. The RPV is small, fast and difficult to shoot down. Using GPS, it provides accurate real-time target information which enables the fire direction center (FDC) to perform accurate future position predictions and to provide information for compensated firing.
Using RPV information, the FDC can support calculations to ensure all battery rounds can land simultaneously on target for maximum effect. The G5 can be ready for action in 2 minutes, and with its long range of 39 kin, can be successfully employed against high speed boats once they have been detected. In a coastal defense role, the G5 system is effective at controlling

sea straits, passages between islands, or against landing forces. The system's mobility adds to its flexibility. This increases its value in a coastal defense or in a conventional field artillery role, further enhancing its value to end-users around the world.

Summary

Nations, particularly those in the third world with the money to do so, are actively seeking to obtain new, improved, weaponry. Current technologies provide capabilities for integrated coastal defense systems. These technologies can provide coastal defense enhancements, incorporating fully automatic multi-spectral sensors (e.g. radar, IR, E/O, acoustic), which provide search, detection, tracking, classification, targeting and engagement of multiple targets (large and small) at ranges out to more than 50 km. This includes: short range (guns and missiles) <15 km; medium range (guns and missiles) 15-50 km; and long range (missiles) >50 km. Current coastal defense technology also incorporates automated command and control, and increased accuracy and lethality with improved munitions. All this at lower cost and with greatly increased mobility (pre-surveyed positions - "shoot and scoot") capabilities. International interest in coastal defense coupled with continued technological advances will lead to increased proliferation of advanced weapons systems (including coastal defense), worldwide. The significance of new, revolutionary, coastal artillery systems currently under development by the Russians and others is not so much their possession by those countries, but their availability on the international arms market. The willingness of the Russians and others to market these "sophisticated" systems, particularly to third world countries where U.S. Marine Corps employment is possible, poses a potentially serious threat to future expeditionary operations, worldwide.

NOTE: This article was prepared by Mr. K A. Bako of the MCIA. It is based on corporate brochures and other unclassified open source documents. Questions or comments should be directed to the author on commercial (703) 640-2268 or DSN 278-2268.

ADDITIONAL COASTAL ARTILLERY SYSTEMS

Excalibur Coast Defense Missile System

-A trailer-mounted system for the Royal Navy comprises a

control cabin which contains the missile fire control system, communications equipment, power supply converters and associated radar, gyro and system interface displays.
-MM38 itself is 5.21 m long, has a body diameter of .348 m and a maximum wingspan of 1.04. It has a HE shape charge warhead and delay action contact fuse.

Specifics:
-Max. speed is 300 m/s which reduces to Mach .6 at the extreme effective range of around 40,000 m. Max. range is 42-45,000 m. Minimum range is 5000 m.

Employed by:
-England

130mm Coastal Gun SM-4-1

-A 130mm gun with a mobile carriage, which was developed during WWII. Wheels can be removed to be replaced with stabilizers
-Ammunition used is not interchangeable with the Soviet 130 mm Field Gun M-46 or the 130 mm anti-aircraft gun KS-30. This gun fires the APHE projectile weighing 33.6 kg and an HE projectile weighing 33.4 kg.
-This gun has a radar fire control system which gives it a capability to engage targets in all weather conditions.

Specifics:
Caliber: 130mm
Barrel Length: 7.6 m
Rate of Fire: 5 rds/min
Range: 29500m

Employed by:
-Bulgaria
-Egypt
-North Korea
-Poland
-Romania
-Syria
-USSR
-Yemen
-Yugoslavia

Russian 305 mm and 152 mm Coastal Defense Guns

-These guns are both from the second world war and are currently still employed with Russia.
Specifics: 305 mm

Caliber:	305 mmL/56	305 mmL/52
Max Range:	APC 43,900 m	APC 24,620 in
	HE 46,000 m plus	HE n/av

Specifics: 152mm
Caliber: 152 mmL/57
MaxRange: HE29,000 m

Penguin Coastal Defense System

-The Penguin surface-to-surface anti-ship missile is in the process of being reconfigured to serve in a number of coastal defense roles, in either fixed or mobile versions. The Penguin was originally developed as a ship-to-ship weapon system for the Royal Norwegian navy by the Norwegian Defense Research Establishment and A/A Kongsberg Vapenfabrikk.

-Studies of various configuration of coastal defense systems based on the Penguin missile have been conducted for several years by the Norwegian authorities, but no order has been placed.

-The land based Penguin missile weapon system consists of a fire control system, the missile and missile control system. It also consists of a radar or optical sensor.

-The Penguin can also be adapted as a self-contained, autonomous, mobile coastal defense unit. Vehicle-mounted surveillance radar is used to provide target detection and designation for batteries of Penguin anti-ship missiles deployed on the ‘Flat-beds’ of similar six-wheeled trucks to those carrying the radar.

Specifics:
Speed: High Subsonic
Range: 27km

QUESTIONS

1. Explain the difference between field artillery and coastal artillery.

2. Briefly describe the capabilities of Russia’s Bergen and Hermes Coastal Defense systems.

3. What makes Sweden’s 120mm Bofors gun so dangerous?

4. What is the principle Chinese coastal artillery weapon and briefly describe it’s characteristics?

5. What is the range of the South African Denel and briefly describe the capabilities of the Kentron Seeker RPV.

6. What countries currently employ the old Soviet SM-4-1 130mm coastal gun?

PRECISION GUIDED MUNITIONS

(PGM' S)

Russia and the Commonwealth of Independent States (former USSR)

SS-N-2 'STYX' (P-15 TERMIT/P-20, 21, 22,27 RUBEZH)

TYPE:
Medium-range anti-ship missile. Ship launched.

DEVELOPMENT:
During the mid-1970s efficient infra-red seekers were developed and used in the P-22 missiles (SS-N-2d) supplementing the P-21 as the prime anti-ship weapon of the Project 1241 and Project 206 Missile Cutters ('Tarantul' class corvettes and 'Matka' class FACs which entered service in 1978. They were also used for coast defense purposes and received the NATO designation SSC-3 'Styx'. The P-15 is manufactured in China, North Korea and India.

It is the only ship-launched missile to have sunk large warships in action. On 21 October 1967 the Israeli destroyer *Eilat* was hit and sunk off Port Said by three missiles. Subsequently in the Holy Day War of 1973 the missile proved less effective with some 52 being fired without effect by Egyptian and Syrian naval units. One missile was destroyed in the air by a 76 mm gun. The versions of the 'Styx' missile are as follows:

TITLE: P-15M Termit

DESCRIPTION:
Improved P-15 with folding wings and modified guidance system.

TIThE: P-20 Rubezh

DESCRIPTION:
Redesigned P-15 with improved range, due to the use of new fuels. There is also some improvement to the radar range and to its lock-on capability, while the autopilots are further modified. It is possible that the guidance system in this version received an Indian-developed jamming system as an ECCM measure.

TIThE: P-20M Rubezh

DESCRIPTION:
A P-20 with the MS-2A seeker. This has a solid-state radar with improved range, bearing accuracy, low-level detection

capability and clutter suppression. The radar has six preset frequencies and several can be selected for use during the flight with the receiver opening for selected pulses. The radar has improved ECCM capabilities including the ability to home-on-jam.

TITLE: P-21 Rubezh
DESCRIPTION:
P-15 with infra-red seeker.

TITLE: P-22 Rubezh

DESCRIPTION:
P-20M with infra-red seeker. The infra-red seeker, whose sensor head projects from just below the nose, is used as a backup to the radar seeker if the latter is jammed. The sensor is reported to be extremely sensitive but no further details are available.

TIThE: P-27 Rubezh

DESCRIPTION:
P-20M with L-band seeker. In larger ships such as the 'Tarantul' class corvettes the 'Square Tie' radar is replaced by one with the NATO designation 'Plank Shave'. This is another I-band system which is reported to have the Russian name Garpun.

The 'Styx' missiles have been subject to extensive in-service modification, indeed Indian sources would suggest that each of the former Soviet Navy fleets may have adapted their missiles to meet anticipated local tactical conditions. It is reported that MS-2A and IR. sensors have been retrofitted into earlier missiles together with ECCM hardware. Indian sources suggest that improvements in seeker technology developed by the Defense Research and Development Laboratories in Hyderabad and the Naval Chemical and Metallurgical Laboratories in Vishakhapatnam were adopted into the missiles of the Soviet Navy.

STATUS:
It would appear that production of' Styx' has ceased in Russia but it may continue in India, North Korea and possibly Egypt.

COUNTRIES:
Algeria, Angola, Bulgaria, Croatia, Cuba, Egypt, Ethiopia, Finland, India, Iraq, North Korea, Libya, Poland, Romania,

Russia, Syria, Vietnam, Yemen, Yugoslavia.

SPECIFICATIONS:

	SS-N-2a	SS-N-2b	SS-N-2c	SS-N-2d (P-22)
Speed	Mach 0.9	Mach 0.9	Mach 0.9	Mach 0.9
Weight (Without Booster)	2300 kg	2300 kg	2500 kg	2600 kg
Range	3-24nm	3-43nm	3-46nm	3-54nm
	5.5-45 kin)	(5.5-80 kin)	*5.5-85* kin)	(5.5-100 kin)

Guidance: Autopilot with active radar (supplemented in some with IR)

COMPANY NAME : Raduga

QUESTIONS

1. What type of missile is the STYX and what type of platform is it fired from?

2. Where are the STYX missiles manufactured?

3. What are the different versions of the STYX missile?

4. What is the status of the STYX missile?

5. What type of guidance' systems are employed by the STYX missiles?

SS-N-3a/c ‘SHADDOCK’ (P-/17 PROYGRESS); SS-N-3b ‘SEPAL’ (P-35 PROYGRESS)

TYPE:
Long-range anti-ship missile. Ship, submarine, and land launched.

DEVELOPMENT:
The ‘Whisky Twin Cylinder’ class was deployed only to the Northern and Pacific Fleets but circa 1960 there was a major change in Soviet naval policy away from the emphasis upon land attack, which could be better handled by the land-based missiles of the Strategic Rocket Forces, and more towards anti-ship, specifically the new generation of US ‘super carriers’ which could threaten the Soviet homeland. This led to a change in role for the ‘Echo I’ class while work already under way to improve the P-5 was exploited to produce a long-range anti-ship missile designated P-6 Proygress (NATO designation SS-N-3a ‘Shaddock’) which was assigned to the submarine force from circa 1963. The limitation of the Proygress missile system was that it could not be launched by a submerged submarine.

DESCRIPTION:
The Proygress missile is a long slim cylinder with pointed nose and a large air scoop under the fuselage. It has short swept-back wings which fold, and a clipped delta tailplane under the rear of the fuselage. Also at the rear are two moving tail surfaces low down on the fuselage and two slim, rectangular stabilizers in ‘V’ shaped configuration high up. In ‘Shaddock’ (P-617) the air intake is unimpeded but in ‘Sepal’ (P-25) it is split. Both versions use twin-booster packs weighing some 800 kg and attached to the rear sides to get into the air but the packs are slightly different in design.

Reports indicate air support was especially important for submarine-launched missiles. The submarine has to remain on the surface for 20 minutes after launch to track the missile and provide course corrections and during this time its speed would be reduced to as little as eight knots. To protect it against aerial retaliation a ‘Snoop Slab’ or ‘Snoop Tray’ I-band radar in the fin is used to track friendly aircraft and to provide target update data.

STATUS:

Limited production of the P-6 (SS-N-3a) was reported to be continuing in the mid-1980s but production of the P-7 (SS-N-3c) is completed. Small numbers ofP-35 (SS-N-3b) were still being produced in 1986 possibly to replace wastage or possibly as Remotely Piloted Vehicles (RPV). It is unclear if any of the missiles remain in production for the anti-shipping role, but it seems unlikely.

The SS-N-3 is in service only with the Russian Navy.

SPECIFICATIONS:

Range: (min)l2nm(22km) (max) 190 rim (350 km)
Speed: Mach 1.2

Guidance: Command and active radar and/or ER

COMPANY NAME : NPO Mashinostroenia

SS-N-7 'STARBRIGI{T'(AMETIST)/SS-N-9 'SIREN' (MALACHIT)

TYPE:

Medium range submarine-/surface-launched anti-ship missiles.

DEVELOPMENT:

From circa 1960 the Soviet Navy was tasked to engage US carrier groups which might launch nuclear attacks upon the Soviet homeland. Initially submarines assigned this anti-ship task were armed with a mixture of torpedoes and Proygress (see SS-N-3 'Shaddock'I' Sepal' entry) but the latter could be launched only on the surface which posed serious operational problems. This led to a requirement for an anti-ship missile which could be launched from under water.

The missile, apparently given the Russian name Ametist (possibly P-120), was selected for the new Project 670 Atomic-Powered Cruise Missile Submarines ('Charlie I' class) which were laid down from 1967, although the missile itself is rocket-powered. It entered service circa 1968 and was given the NATO code-name of SS-N-7 'Starbright'.

DESCRIPTION:

Externally SS-N-7 'Starbright' is of cylindrical shape with a sharply pointed nose and a prominent reinforcing member or wiring duct along the underside of the body. There are short,

folding, swept-back (1200) wings midway up the body in the rear half and three rear-facing cooling ducts around the wing leading edge; one on top of the body and the others on the sides underneath the wings. The rear of the missile has a prominent clipped delta tail on the underside and two smaller, trapezoid-shaped stabilizers in V configuration at the top. Twin booster packs are fitted to the rear sides of the missile.
It is possible this missile uses the same hollow-charge warhead as the Proygress (SS-N-2 'Styx') missile.

The SS-N-9 'Siren' or 4K85 missile is believed to be similar in configuration but longer. The prime difference appears to be that the rear-facing ducts in 'Starbright' are replaced by an air intake under the fuselage. There appears to be an aerial installation near the nose on the right-hand side. It is possible that the active radar seeker is complemented by an IR seeker.

STATUS:

It is believed that about 200 'Starbright' and 500 'Siren' missiles were produced but that production has now ceased. The missiles are used only by the Russian Navy.

SPECIFICATIONS:

	Starbright	**Siren**
Range:	35nm(64km)	38nm(7Okm)
	Submarine	60 rim (110 kin) Corvette
Speed:	Mach 0.9	Mach 0.9

Guidance: Autopilot with active radar (possibly complemented by

ER in Siren) COMPANY NAME : Zvezda

SS-N-12 'SANDBOX' (BAZALT)

TYPE:
Long-range anti-ship missile. Submarine and Ship launched missile.

DEVELOPMENT:

Development work began in the mid-1960s probably as part of the Eighth Five Year Plan (1966-1970), was apparently completed in 1973 and the system entered service with the aircraft carrier Kiev in May 1975. Production was probably authorized as part of the ninth Five Year Plan (1971-1976). The missile was later retrofitted into the 'Echo II' and 'Juliet' class submarines

during the 1980s, replacing the SS-N-3. The ‘Juliet’ class is designated Cruise Missile Submarines in Soviet terminology.

DESCRIPTION:

While no photographs of the ‘Sandbox’ missile (4K80) have been released, drawings believed to originate with intelligence sources do permit a description of the missile. It has a cylindrical body whose front is slim with a sharply pointed nose. Two-thirds of the way along it bulges before tapering towards the rear. The missile is powered by a turbo-jet and there is a small air intake about halfway along the body. The missile is believed to use a solid propellant booster to clear the launcher and enter the cruising phase. There are two short, swept-back wings which are believed to be folded when the missile is in its launcher. A triangular vertical stabilizer is at the top of the missile behind the wings and there is another on the underside at the tail. Two short, swept-back fins are located at the rear of the missile forward of the rear stabilizer. The missile features command or inertial guidance with the option of mid-course updates. There is believed to be an active radar seeker for the terminal phase. The payload consisted of either a 1000 kg high explosive warhead or a 350 kT nuclear device, but the latter have now been removed.

For Over-The-Horizon (OTH) targeting aircraft may also be used. These include the Tu-95 ‘Bear D’, the Ka-25 ‘Hormone B’ and the Ka-27 ‘Helix B’ with Big Bulge I/J-band radar.

STATUS:

Some 500 missiles were produced but production has now ceased.

COUNTRIES:

Russia, Ukraine

SPECIFICATIONS:

Speed: Mach 1.7
Range: *550* km (296 rim) with OTH targeting

Guidance: Inertial (with command updates) and active radar

COMPANY NAME : NPO Mashinostroenia

SS-N-19 ‘SHIPWRECK’ (P700 GRANIT)

TYPE:

Long-range anti-ship missile. Submarine and ship launched.

DEVELOPMENT:

The improved US ASW defenses around carrier battlegroups during the 1970s increasingly restricted the effectiveness of Soviet submarines carrying the SS-N-7/9 ‘Starbright/’ Siren’ (Ametist/Malachit). At the same time the Soviet Navy wished to strengthen the defenses of its SSBN bastions and this led to a requirement for a new missile, P700

DESCRIPTION:

No photographs of’ Shipwreck’ have yet been published but the missile is believed to have a broad cylinder body with pointed nose. Halfway along the body is an air inlet for the turbofan or turbo-jet which is used in the cruising phase after the missile has been launched with the aid of two solid propellant boosters. There are two sharply swept-back wings and two swept-back tail fins with a similar stabilizer on the underside of the missile.

The missile is believed to have an inertial guidance system possibly with provision for mid-course guidance in over-the-horizon (OTH) engagements although this seems unlikely (see below). Following the usual Soviet practice the missile employs active radar terminal guidance. It uses a 750 kg high explosive warhead with impact and proximity fuses. Alternative payloads were reported to be nuclear or fuel-air explosive.

However, it seems more probable that the aircraft and the satellite feed target location data to the ships, and it is noteworthy that all the ‘Shipwreck’ launch platforms carry ‘Punch Bowl’ satellite communications systems.

STATUS:

Some 300 missiles are believed to have been produced but production is complete. The missile is used only by the Russian Navy.

SPECIFICATIONS:

Speed: Mach 1.6 (some sources state Mach 2 or Mach 2.5)
Range: 550 km (296 nm)
Guidance: Inertial with command update and active radar

COMPANY NAME : NPO Mashinostroenia

SS-N-22 ‘SUNBURN’ (P270 MOSKIT)

TYPE:
Medium-range anti-ship missiles. Ship launched.

DEVELOPMENT:

The NATO designation SS-N-22 ‘Sunburn’ is believed to be designated P270 Moskit and may have been designed originally to enhance the effectiveness of Missile Cutter Brigades (that is, units of missile-equipped FACs) and Destroyer Brigades hitherto dependent upon the Malachit or SS-N-9 ‘Siren’. A high supersonic speed was specified to reduce the target’s time to deploy self-defense weapons, indeed the weapon was designed specifically to strike ships with the Aegis (qv) command and weapon control system and the SM-2 (qv) surface-to-air missile.

DESCRIPTION:

The Moskit (3M80) is a ramjet-powered missile with a slim forward body and ovoid nose, and a fatter rear half with four divided air intakes. There are four clipped delta platform wings and four smaller tail surfaces of similar shape organized in cruciform configuration around the fuselage. All the wings and tail surfaces are folded when the missile is in the launcher.

Internally the radar seeker is in the nose with the guidance system, batteries and radio altimeter in the remainder of the front compartment, and the 300 kg semi-armor-piercing warhead immediately behind. A fuel tank, presumably with a kerosene-type fuel, occupies the area to the leading edges of the wing and the area almost to the rear edges is occupied by the ramjet. Much of the rear of the missile is occupied by a solid propellant booster through which runs the ramjet nozzle. Actuators are to be found below the tail surfaces.

The missile takes only 2 mm to cover its frill range and manufacturers state that 1-2 missiles could incapacitate a destroyer while 1-5 missiles could sink a 20000 ton merchantman. An extended range missile, 9M80E is now available.

STATUS:

Some 600 missiles have been produced or are on order and they are available for export.

COUNTRIES:

Russia, India.

SPECIFICATIONS:

Speed: Mach 2
Range: 48 rim (90 kin); 65 rim (120 kin) in 3M80E
Guidance: Inertial

COMPANY NAME : Raduga

SS-N-25 (Kh 35 URAN)

TYPE:
Medium-range anti-ship missile. Ship and air launched.

DEVELOPMENT:

The origins of this missile are obscure although its similarity to the Harpoon have led to the unofficial name 'Harpoonski'. The designation Kh 35 has been applied to it by Russian sources, although this probably refers to the air-launched version while the ship-launched version is reported to be named Uran.

The missile has been selected for the most modern of the Russian Navy's ASW vessels, namely the Project 1154 Large Anti-Submarine Ships ('Neustrashimy' class frigates), and is being retrofitted into Type 1135 Escort Ships ('Krivak I' frigates) replacing the RBU mountings. It is also being offered with the 'Gepard' class Small Anti-Submarine Ship (frigates) which appears to be a replacement for the 'Koni' class on the export market.

DESCRIPTION:

The SS-N-25 is an autonomous anti-ship missile system and consists of the missile, the launcher-handling system and probably a fire-control console. It is compatible with most surface search radars.

The missile is a thick cylinder with ovoid nose and a long air intake of square cross-section running along the lower half of the body. There are four clipped-delta platform wings midway along the body and four slim trapezoid control fins at the rear. The wings and control fins are in X configuration and all fold. A tandem 120 kg solid propellant rocket booster is fitted and has four long, slim, rectangular fins.

SS-N-25 probably operates in a similar fashion to Harpoon

with data from the ship’s sensors being fed into the missile through the fire-control console. Russian literature would suggest that the missile has a limited capability compared with Harpoon. Air-launched versions can conduct purely sea-skimming attacks or may conduct a high altitude search then enter a sea-skimming terminal phase. The sea-skimming altitude is 5-10 in.

STATUS:

Some 150 missiles appear to have been ordered and the missile is also available for export. It is currently used only by the Russian Navy.

SPECIFICATIONS:
Max speed: Mach 0.9
Range: 2.5-70 nm (5-130 kin)
(air-launched)
Guidance: Inertial and active radar

COMPANY NAME : Zvezda Design Bureau

QUESTIONS

1. Why was the SHADDOCK developed?

2. What type of missile is the STARBRIGHT and what platforms is it employed from?

3. Why was the STARBRIGHT developed?

4. Give a brief description of the STARBRIGHT?

5. What type of missile is the SHIPWRECK and what platforms is it employed from?

6. Why was the SHIPWRECK developed?

7. What is the status of the SHIPWRECK?

8. What is the range, speed, and guidance of the SHIPWRECK?

9. What type of missile is the SANDBOX and what platforms is it fired from?

10. Can SANDBOX acquire a target from OTH?

11. What is the range and speed of the SANDBOX?

12. Give a brief description of the SUNBURN?

13. What countries currently employ the SUNBURN?

14. What is the speed, range, and guidance of the SUNBURN?

15. What U.S. missile is the URAN similar to and what is the unofficial name of it?

16. What is the speed and range of the URAN?

17. How does the guidance of the URAN work? Both air and ship

launched?

Coastal Defence Weapons

CHINA (PEOPLE'S REPUBLIC)

3984.121
HY-2 (CSS-N-2) COASTAL DEFENCE MISSILE SYSTEM

Soon after it became known that the Soviet Union had supplied the People's Republic of China with SS-N-2 anti-ship missiles (1155.221), it was disclosed that China had embarked on a plan to deploy this missile for defence of its extensive coastline. This programme has been followed since perhaps the early 1 970s, and although it is still not known to what extent it has been fulfilled, or the numbers of missiles available for this purpose, the existence of a missile coastal defence force has now been officially confirmed by the release of a few photographs of units armed with the CSS-N-2.

More recently it was confirmed that China has its own indigenous production facilities for this weapon, which has the official designation HY-2. In 1984 the Chinese Government made this system available for export.

So far as can be gathered, the missile itself is virtually unchanged from its shipborne configuration, and the performance must also be similar. The overall system is configured in transportable, mobile form, with the missile on a wheeled trailer that carries a launching ramp which can be slewed in azimuth and adjusted in elevation. Maximum effective range is stated as 95 km. at high sub-sonic speed.

The basic HY-2 uses active radar homing, while HY-2G adds a radio altimeter to permit a lower penetration altitude, and the

third model, HY-2A. relies on an IR homing head to counter radar countermeasures. Estimated mid-course cruise altitudes for the three versions are 100, 50 and 30 metres. The truck-mounted radar associated with the HY-2 system provides surveillance and target detection facilities and is also stated to perform target tracking. The design apparently originates from a Soviet naval search radar and probably operates in the C-band of the spectrum.

STATUS
Operational and in production in the Peoples Republic of China. Available for export and thought to have been supplied to some African states.
CONTRACTOR
China Precision Machinery Import & Export Corporation. 17 Wenchang Hutong Xidan Beijing, People’s Republic of China.

TYPE:
Medium-range anti-ship missiles. Ship launched.

DEVELOPMENT:
During the early 1 970s the Nanchang Aircraft Manufacturing Company designed a Styx’ derivative as Feilung 1 (Flying Dragon 1) (see CCS-N-1 (HY-1)/CCS-N-2 (HY-2) entry) then began to exploit their expertise to produce their own designs which were marketed by CATJC as a rival to the CPMIEC HY-2. The design of the FL-1 is clearly derived from the HY-1 (qv) and the missile was first seen outside China in 1984.

DESCRIPTION:
The FL-2 has the same overall configuration as the CCS-N-2 being a miniature aircraft with clipped delta wings, a vertical tail surface and two fins on the underside of the missile but the fuselage is noticeably slimmer and the vertical tail surface is smaller. There is a small horizontal stabilizer under the rudder. The reduction in size has been achieved by replacing the liquid propellant sustainer with a solid propellant one. The warhead is also reduced in size to 365 kg and several options are reportedly available, including hollow charge. The FL-7 is an evolutionary development of the FL-2 but with a liquid propellant sustainer and an 1800 kg solid propellant booster. The small horizontal stabilizer has been removed but the guidance and warhead systems have been retained.

STATUS:
Some reports suggest the FL-1 entered service with the

Chinese Navy in 1980 and that it has been exported to Bangladesh, Pakistan, Thailand and Egypt (see SY-1/HY-1). The FL-2 (also SY-2) may have entered service in 1983 but may no longer be in production. The FL-7 is believed to be under development with a possible in-service date of 1992.

SPECIFICATIONS:

	FL-2	FL-7
Speed:	Mach	0.9 Mach 1.4
Range:	50nm	30nm
	(93 1cm)	(*55.5* 1cm)

Guidance: Unknown

COMPANY NAME: China National Aero-Technology Import and Export Corporation (CATIC)

CSSC-6 'SAW HORSE' (C-1O1)

TYPE:
Medium-range anti-ship missile. Ship, Land, and Aircraft launched.

DEVELOPMENT:
Models of a ramjet-powered missile, the C-101, were shown at the CPMIEC stand during the Paris Air Show in 1986. The same missile has been displayed at subsequent exhibitions for operations from a variety of platforms including ships, land and aircraft. It is believed this missile may be designed specifically for the export market. Testing of the new missile is reported to have begun in 1989.

DESCRIPTION:
The following description of C-101 is based upon Chinese sources. The missile is a sea-skimming, supersonic anti-ship weapon whose sea-launched version is designed for use in destroyers and frigates.

Externally it is of cylindrical shape with pointed nose, small canard wings and rectangular tail surfaces at the top and bottom. Behind them are four clipped-delta stabilizers arranged in 'X' formation. On each side of the missile, hanging from a

pair of short, slim wings is a liquid-fueled ram jet with a thrust of 18 kN. Ship-launched missiles use a pair of solid-propellant (polysulphur composite) boosters each with a tail fin.

Internally the missile has a radar compartment in the nose with a J-band (12-18 GHz) monopulse sensor then a 300 kg semi-armor-piercing warhead with delayed impact fuse. Behind it is a tank with 200 kg of a kerosene-type fuel with a small load-bearing compartment to which the forward wings and boosters are attached.

STATUS:
The C-l01 is believed to be still under development but is being marketed.

SPECIFICATIONS:
Speed: Mach 2.0
Range: 24 nm *(45* 1cm)

Guidance: Inertial and active radar

COMPANY NAME: China Precision Machinery Import and Export Company (CPMIEC)

CSSC-7 ‘SADSACK’ *(HY-41C-201)*

TYPE:
Long-range anti-ship missile. Ship and land launched.

DEVELOPMENT:
Little is known of the development of this missile which is a derivative of the HY-1 family, using a turbo-jet. Development is believed to have begun in the early 1970s and the missile is believed to have entered service about 1985. Ship and coastal defense versions are believed to exist and an air-launched version is also believed to have been developed but not to have entered service. At a defense exhibition in Beijing during November 1988 an export version, C-201, was displayed.

DESCRIPTION:
The configuration of this missile is similar to that of the ‘Styx’ (qv) and SY-1/HY-1 (qv) families with delta wings and triple tail surfaces. However, there is a large ventral scoop air inlet on the centerline of the fuselage for the turbo-jet engine. The missile is launched with the aid of a 300 kg solid-propellant booster attached to the rear underside of the fuselage. The missile uses an autopilot for mid-course guidance and a J-band (10-20 GHz) monopulse active radar seeker for the terminal phase. A radio altimeter allows the cruise height to be adjusted between 70 and 200 m and the terminal phase involves a high angle dive attack. It is equipped with a 500 kg warhead,

which is probably semi-armour-piercing.

STATUS:

Some sources indicate the HY-4 entered service about 1985 with the Chinese Navy's ship and coastal defense forces. However, there is no confirmation of this data and no Chinese ships are known to be equipped with the missile.

SPECIFICATIONS:

Speed: Mach 0.9
Range: 80 nm (150 1cm)
Guidance: Autopilot and active radar

COMPANY NAME: China Precision Machinery Import and Export Company (CPMIEC)

CSSC-4 'SARDINE'(YJ-1/C-801);CSSC-8 'SACCADE'*(YJ-21C-802);* CY-1

TYPE:

Medium-range anti-ship missile (CY-1 anti-submarine missile). Land, submarine and ship launched.

DEVELOPMENT:

The development of the Ying Ji (Strike Eagle) missile as a successor to the 'Styx'-based missiles such as HY-2 (qv) was extremely tortuous and marked what might be termed the beginning of a 'Western-influenced' period in China's missile design bureau. It is clear that there was a radical change in the design philosophy to a solid-propellant subsonic missile and the passing resemblance of the YJ-1 to the Exocet MIM4O led to the suggestion that the Chinese missile was the result of reverse engineering.

DESCRIPTION:

The YJ-1 (C-801) is in a slim cylinder with ovoid nose, fixed trapezoid wings and stubby fins near the end of the body. Along the top of the body is the launch-rail fitting. A winged booster is fitted to the tail. The nose section consists of a monopulse, high-frequency (probably J-band) terminal guidance radar seeker with a 165 kg semi-armor-piercing warhead behind it. The instrument compartment, possibly containing the guidance

command processor, vertical gyro, radio altimeter and its antenna, is located in front of the sustainer. It should be noted that the submarine-launched version can be used only when the boat has surfaced.

The CY- 1 anti-submarine missile consists of the rear half of the YJ- 1 with a lightweight torpedo, probably the Eurotorp/Whitehead A244 in the forward part. The missile appears to be fired from fixed launcher-containers and probably operates in the same way as Milas and Asroc.

The YJ-2 (C-802 is externally similar to the YJ-1 but it is powered by a turbojet with paraffin-based fuel. This caused the fuselage to be extended to accommodate the fuel.

STATUS:

Some 90 YJ-1/YJ-2 systems have been produced with about 1000 missiles. Production continues for domestic and export customers.

COUNTRIES:

China, Thailand

SPECIFICATIONS:

YJ-1

Speed: Mach 0.9

Range: *4.5-23* n miles (8-42 1cm)

Guidance: Inertial and active radar

YJ-2

Speed: Mach 0.9

Range: *8-65* n miles (15-1201cm)

Guidance: Inertial and active radar

COMPANY NAME: China Precision Machinery Import and Export Company (CPMIEC)

FRANCE

AIR-LAUNCH EXOCET (AM 39)

AM 39 is the air-to-surface version of the all-weather anti-ship Exocet missile. It is designed to be launched against naval surface targets from helicopters, maritime patrol and surveillance aircraft, and jet strike/attack aircraft.

The Exocet AM 39 weapon system comprises:

(1) a command panel for insertion of operational and tactical data, and orders

(2) a missile adaptor kit which allows missile selection, initiates the firing sequence, and translates for the missile the information coming from the command panel and aircraft sensors

(3) one or more missile launchers under the aircraft wings, or alongside the fuselage, depending on aircraft type.

The weapon system uses the target range and bearing given by the aircraft's air-to-surface radar, which can be of the current type and an inertial platform or a doppler radar navigator system.

More details of the missile itself will be found in the entries dealing with the ship and land-based applications of Exocet **(2118.121 and 1156.221).**

CHARACTERISTICS
Length: 4.69 m
Dlameter: 35 cm
Wing span: 1.004 m
Weight: 652 kg
Propulsion: 2-stage solid rocket motor
Range: 50 - 70 km. depending on the height and speed of launch aircraft
Flight speed: High subsonic

DEVELOPMENT
By late 1979 the AM 39 had reached operational status and tests with the Sea King and Super Frelon helicopters and Super Etendard naval attack aircraft followed. Details of earlier development history appeared under this entry in previous editions of *Jane's Weapon Systems*.

STATUS
The decision to arm aircraft of the French Navy with the AM 39 Exocet was taken by the French Government in May 1974. At present those aircraft are the Super Etendard and the Atlantic G2 maritime patrol aircraft. Eight foreign governments, Abu Dhabi, Argentina, Brazil, Iraq. Kuwait, Oman, Pakistan and Peru, have ordered the system for their own helicopters and for Super Etendard and Mirage strike aircraft. To date over 800 missiles have been ordered or delivered to the nine customers.

The AM 39 scored its first successes in the Gulf War during 1980 and since then well over 100 have been fired by the Iraqis from Aérospatiale Super Frelon helicopters. Super Entendards and Mirage FlEQ-5 jet fighter-bombers against Iranian warships, oil rig platforms and various merchant ships. In 1982 the Argentinian Navy used AM 39s from its Super Entendards against Royal Navy ships during the Falklands War to cause the loss of HMS *Sheffield,* a Type 42 air defence destroyer and the MV *Atlantic Conveyor,* a merchant ship taken up from trade.

CONTRACTOR
Aérospatiale, Division Engins Tactiques, 2 rue Beranger, 92322 Chatillon Cedex, France.

TYPE:
Medium-range anti-ship missile. Air, ship and submarine launched.

DEVELOPMENT:
The Exocet missile is not only the most famous anti-ship weapon in the world but it also has one of the longest pedigrees. The first firing of a full Exocet was made on 10 June 1971 and development was completed in July 1972. Development was

completed in September 1984 and the missile entered service with the French Navy in April *1985* with the commissioning of L'Inflexible. The only warship casualty was the 'Oliver Hazard Perry' class frigate USS *Stark* (FFG 31) which was struck by two missiles on 17 May 1987 of which the warhead of only one detonated.

DESCRIPTION:

The Exocet features a cylindrical body with sharply pointed nose. The swept, cropped long chord wings and small tail control surfaces are laid out in a cruciform configuration. The following description is of MM 38. The front of the missile contains the guidance compartment. Behind the guidance compartment is a Luchaire GP1A 165 kg fragmentation warhead with a SERAT delayed impact fuse and an autopilot-controlled proximity fuse. The warhead consists of cast hexolite and is designed to penetrate the hull before detonating.

STATUS:

By June 1993 Aerospatiale had produced or had orders for some 3000 ship- and land-launched Exocets. Production of MM 38 was completed with the 1260th unit but production of MM 40 continues with 575 delivered in Block 1 and Block 2 versions. The SM 39 also remains in production but no figures are officially available although unofficial sources suggest some 150 will be produced. They have been produced or ordered for the following navies listed over.

COUNTRIES:

Argentina, Bahrain, Belgium, Brazil, Brunei, Cameroon, Chile, Colombia, Ecuador, France, Germany, Greece, Indonesia, Iraq, South Korea, Kuwait, Malaysia, Morocco, Nigeria, Oman, Pakistan, Peru, Philippines, Saudi Arabia, Thailand, Tunisia, UAE, UK, Uruguay

SPECIFICATIONS:

	MM38	SM39	MM4OBlockl	MM4OBlock2
Speed:	Mach 0.9	Mach 0.9	Mach 0.9	Mach 0.9
Range:	2-22.5 n miles (4-42 kin)	2-27 n miles (4-50 kin)	2-38 n miles (4-70 kin)	2-40.5 n miles (4-75 kin)

Guidance: Inertial and active radar

COMPANY NAME : Aerospatiale Missiles

QUESTIONS

OTOMAT

TYPE:
Medium- to long-range anti-ship missile. Ship and land launched.

DEVELOPMENT:
The first production missile was accepted in January 1976 by the Italian Navy. This version has provision for mid-course guidance updating. The missile was ordered by the Italian Navy with the first export order coming from Venezuela. From this the French developed a lightweight version, Otomat Compact, with a new launcher-container.

Coast defense versions have also been produced and Otomat will be the basis for the Franco-Italian Milas (qv) ASW torpedo delivery system. In 1993 the manufacturers unveiled a combined weapon system with the Milas (qv) anti-submarine missile.

DESCRIPTION:
The Otomat missile is of broad cylindrical shape with rounded nose and slightly tapered tail. There are four air inlets approximately halfway along the body and on top of these

are short, swept wings each with an updating receiver antenna at the tip. In Otomat Mark 1 these wings are fixed but in Otomat Mark 2 they are folded. Cropped, delta-shaped fins are behind the wings and in line with them. The 210 kg semi-armor-piercing warhead, which can penetrate 8 cm of nickel-chromium armor, contains 65 kg of explosive and includes both impact and proximity fuses. Behind it are the altimeter, Thomson-TRT AHV8 radio and gyroscope, a junction box, autopilot and flight computer with converter. The ERATO system is able to launch four missiles in a salvo and to control up to six (later eight) in flight simultaneously.

STATUS:

Some 90 systems and 980 rounds have been produced and the system was selected by nine navies and acquired by eight. In addition to naval versions, Egypt and Saudi Arabia have coastal versions.

COUNTRIES:

Egypt, Iraq, Italy, Kenya, Libya, Morocco, Nigeria, Peru~ Saudi Arabia, Venezuela

NOTES:

-Only Saudi Arabia is believed to operate with the ERATO system. Other customers are believed to use TESEO.

SPECIFICATIONS:

Range: 86 nm (160 kin)
Guidance: Inertial and active radar homing

COMPANY NAME: OTO Melara

COMPANY NAME : Matra Defense

ISRAEL

4529.321

GABRIEL MK III AIR-LAUNCHED ANTI-SHIP MISSILE

An air-launched version of the successful Gabriel III anti-ship missile **(6019.221)** was revealed by the Israeli manufacturers in the last quarter of 1982 as the Gabriel Mk III A/S. together with photographs of test and development models on an Israeli Phantom aircraft. The weapon can also be carried by A-4 Skyhawk, Kfir 02, Sea Scan and other aircraft types, principally for use in anti-shipping roles.

The missile itself was derived directly from the ship-launched Gabriel mentioned above and the developers specified two configurations. That closest to the basic Mk III missile has different aerodynamic surfaces, more suitable for carriage and launching from high performance aircraft, but with an extended range propulsion rocket motor as the ship-launched Gabriel Mk III. This gives a range of approximately 40 km. The second derivative has the same aerodynamic modifications, but additionally uses air breathing jet propulsion for longer

ranges.

The system provides all-weather, day/night, anti-ship capability against targets ranging from small fast patrol boats to destroyers and larger ships. The Gabriel Mk Ill A/S is an active homing, sea-skimming missile with ‘fire-and-forget’ and ‘fire-and-update’ operating modes. The I-band frequency agile radar seeker performs data processing and control functions providing good all-weather and ECCM performance. Inertial components, a radar altimeter and a digital processor are employed for missile guidance, and four tail control surfaces steer the missile and control its flight path. A high explosive warhead weighing 150 kg ensures maximum target damage.

The solid-propulsion motor provides over-the-horizon ranges at low level and the terminal attack altitude is set before take-off in accordance with the prevailing sea state to one of three values. Other characteristics of the missile are given below and can be gathered from the adjacent illustrations.

The complete system comprises one or more missiles (depending on the aircraft type, but typically two) and the missile fire control system (MFCS) fitted in the aircraft. In the case of a Gabriel Mk III A/S installation in a fighter aircraft the main MFCS elements include: a pilot fire control panel (PFOP), missile processing unit (MPU), power supply unit (PSU), and armament interface hardware (AIH). Built-in test facilities are incorporated and operate automatically as part of the firing sequence. The AIH units are incorporated in missile loading hardpoints and the other MFCS items are fitted in various fuselage locations.

OPERATION

As mentioned briefly above, there are two operating modes. ‘Fire-and-forget missiles, to accomplish their objective with high probability of target acquisition have to accommodate wide search areas. The actual size of the search area depends on the missile-target range at launch. To minimize the uncertainty of target position at the time of missile seeker activation, a ‘fire-and-update’ facility is provided in the Gabriel Mk III A/S system in addition to the basic ‘fire-and-forget’ mode. ‘Fire-and-update’ is used on larger maritime patrol aircraft as an optional mode of deployment, and relative missile/target locations are monitored, calculated and transmitted by the MFCS to the missile in flight. For this mode, in addition to the track-while-scan facilities of the aircraft’s surveillance radar, a command link to the missile is added to the MFCS installation on the aircraft.

By this technique the seeker search zone in bearing and range is reduced considerably, so that the updating facility ensures

that each missile is directed toward its designated target and not against ‘potential targets’ (which may or may not be significant) which may be close to the actual target area. After launch, data transfer between missile and launch aircraft are entirely automatic. Thus, ‘fire-and-update’ is an enhanced version of ‘fire-and-forget’ with the advantage of a reduced search zone and improved target lock-on.

In the vertical plane, at high altitudes, the missile pitch angle is controlled by a preset angle program for command to maintain a midcourse cruise altitude of about 20 metres, before descending to 1.5, 2.5 or 4 metres for the terminal phase under pre-programmed control in the horizontal plane. Inertial guidance is used for the initial and midcourse phases for fire-and-forget’ operation, and inertial is also used in the ‘fire-and-update’ mode for the midcourse phase. For both modes, seeker switch-on is under the control of pre-programmed logic in the computer Target detection in the search area, lock-on and terminal homing are by active radar, operating in the horizontal plane only.

Target data (range/bearing) can be supplied from sensors aboard the launch aircraft, or from external sources. Altitude, speed and attitude data required for missile launch are provided from aircraft systems. The MFCS is operated by the pilot, using the PFCP, the other units (MPU, PSU and AIH) compute and supply the power and pre-launch data required by the missile. Missile release is activated by the pilot, by pressing a missile fire button on the control stick.

Missiles operated from fighter aircraft use the fire-and-forget mode for one of the following procedures:

(1) radar-range and bearing launch (RBL)
(2) manual RBL
(3) bearing only launch (BOL)

444.221

SKORPIEN ANTI-SHIP MISSLE

Skorpien is the name under which the South African Navy operates the Israeli Gabriel II anti-ship missiles **(6019.221**) which arms the ‘Minister” class fast attack craft. Target position relative to the aircraft is then automatically and fed into the missile up to the moment to launch. The pilot receives an indication that the predetermined launch criteria have been met, by the flashing of a fire indicator light on the PFCP.

Manual RBL This method allows target location information to be fed to the missile by manual means, by either reading this information from aircraft navigation displays etc. and entering it manually on the PFCP, or receiving target data from an

external source (eg a maritime patrol aircraft, ship, or other aircraft), entering this on the PFCP, while present aircraft position is updated by using an initiation point (entered via the PFCP before take-off). The MPU will continue to calculate the target location and transfer the required target range and bearing data to the missile. When the aircraft reaches the release range (as calculated by the MPU and indicated on the PFCP) the pilot can initiate missile firing.

Bearing Only Launch In this mode the pilot uses an estimated range together with a defined target bearing. Both estimated bearing and measured range are entered via the PFCP and transferred to the missile via the MPU. The estimated range is defined as automatically selected if no other choice is made as a fall-back mode, and in this case the aircraft us aligned to the target direction and for range the minimum weapon range is chosen.

CHARACTERISTICS

Length: 3.85 m
Diameter: 34 cm
Max span: 1.1 m
Launch weight: 600 kg
Warhead: HE 150 kg
Fuze: Impact, delayed action Propulsion: Solid
Range: Over 60 km
Cruise speed: Mach 0.73
Launch altitude: 90- 9000 m
Cruise altitude: 20 m
Terminal phase altitude: 1.5/2.5/4 m (pre-set)
Guidance: Inertial (plus optional command update) midcourse; active radar homing

STATUS

Entering production.

CONTRACTOR

Israel Aircraft Industries Ltd. Ben Gurion International Airport 70100, Israel.

SOUTH AFRICA

4444.221

SKORPIOEN ANTI-SHIP MISSILE

Skorpioen is the name under which the South African Navy operates the Israeli Gabriel 11 anti-ship missiles (6019.221) which arm the ‘Minister’ class fast attack craft serving with the SAN. These vessels are similar to the Israeli ‘Sa’ar class and three of them were constructed in Haifa, reaching South Africa in July 1978. Launchers are made in South Africa, and a number of components, but the extent to which the SAN is independent of Israeli sources is not known. For details of operation, performance etc. refer to the entry for Gabriel.

SWEDEN

3976.221

RBS 15 ANTI-SHIP MISSILE

RBS 15 is a new-generation anti-ship missile system suitable for use by both Swedish Air Force aircraft and Swedish naval vessels. The first installation has been completed aboard a Royal Swedish Navy 'Spica' class fast patrol boat. They are housed in launcher/ containers. The air-launch model (**3975.321**) programme is following, and the manufacturers' programme also includes a coastal defence version.

An air-breathing propulsion system provides long range, with a high subsonic cruise speed at sea-skimming height. Two solid-propellant booster motors aid launch, but these will not be required in the air-launch version. The mission profile can include a high-level cruise phase over a preset distance, a low-level cruise phase during which the seeker head is switched on and target acquisition takes place, followed by a sea-skimming final trajectory.

RBS 15 has a fire-and-forget capability and is provided with an ECM-resistant homing head made by Philips Elektronikindustrier (PEAB). Pre-launch operations are minimal and all calculations are performed automatically by an on-board computer. A radar altimeter ensures safe cruising at low level

CHARACTERISTICS

Length: 4.35 m

Diameter: 50 cm

Wing span: 1.4 m; 85 cm (folded)

Launch weight 770 kg

WeIght 600 kg (without boosters)

Guidance: Probably programmed autopilot cruise with height hold, followed by active radar homing

Range: 150 km (estimated)

Cruising speed: >Mach 0.8

STATUS

Series production. A contract worth SK 600 million for the development and production of the naval version was awarded to SAAB Bofors Missile Corporation (SBMC) by the Swedish Defence Material Administration in July 1979, and in June 1982 a contract was awarded for the air-launched version 56MG, a company formed by SAAB Missiles AB and Bofors, is serving as the main contractor. Saab Missiles is the prime contractor for RBS 15.

The first export order for RBS15 was placed in March 1983 when a contract for the system to be fitted in new 'Helsinki class fast patrol boats for the Finnish Naval Forces was signed

CONTRACTOR

SBMC, Stureplan 15, 11145 Stockholm, Sweden.
SAAB Missiles AB, 58188 Lrnkoping, Sweden.

RBS 15 COASTAL DEFENCE WEAPON

A coastal defence version of the ship-to-ship RBS 15 is under development. Canisters and missiles are identical to the ship-launched version (see entry **3975.321**).

STATUS

Under development, and will be incorporated into the Swedish coastal defence organisation in the future.

CONTRACTOR

SAAB Missiles AB, S-58188 Linkbping. Sweden.

4878.121

HELLFIRE SHORE DEFENCE SYSTEM

In late 1984 Rockwell International was awarded a $7.7 million contract by the Swedish government to adapt the Hellfire modular missile, already developed for helicopter operation **(1391.311)** and battlefield use **(4877.111),** for the shore defence role. Under this two-year adaptation phase, Rockwell will act as the prime contractor with responsibility for systems integration in collaboration with Swedish industry.

Although it has been stated by the manufacturer that this application of Hellfire will entail some modification to the production missile to make it more suitable for shore defence operations, it would appear that there will be a significant degree of commonality between the Swedish system configuration and the anti-armour battlefield system tested by the US Army apart from the use of vehicle mounting in the latter version.

It is believed that in the first instance the laser homing version of the Hellfire modular missile will be employed in the Swedish shore defence application, and in most respects the basic characteristics and performance will be very similar to those of the ground-launched anti-armour version of the system (4877.111).

STATUS

Development project under Swedish Government contract awarded in 1984. First foreign sale of Hellfire.

CONTRACTOR

Rockwell International, Missile Systems Division, Defence

Electronics Operations, 1800 Satellite

TAIWAN

4442.121
HSIUNG FENG COASTAL DEFENCE MISSILE
Hsiung Feng is the name given by the Taiwanese authorities to a missile designed to engage ship targets at estimated ranges of 30 to 40 km. The land-mobile configuration of this weapon was the first to be revealed in public, but shipborne versions of it also exist. It is a locally-made variant of the Israeli Gabriel. Three missiles are housed, each in its own container, on a triple rotatable launcher unit which is mounted on a semi-trailer which is towed by a heavy tractor unit. The triple launcher is likely to weigh about two tonnes.
STATUS
In service.
CONTRACTORS
State Arsenals.
Sun Vat Sen Institute (seeker).

UNITED KINGDOM

6186.121
EXCALIBUR COAST DEFENCE MISSILE SYSTEM
Excalibur is based on the MM-38 Exocet mobile missile battery designed and built for the Royal Navy, but can be readily adapted to any new or surplus SSM of the customers choice. The system comprises a control cabin, a stores and accommodation cabin, two radar/launcher trailers and two mobile diesel generators, making it fully self-contained. It can be transported on its own trailers by land, sea or air to a coastal site, where it can provide an invisible threat to shipping within its area of control.

The control cabin contains the missile fire control system, radar displays for target indication, gyro displays and system interfaces, secure radio facilities and power-supply conversion equipment. The stores and accommodation cabin contains ready-use spares to support the system and limited domestic facilities for the crew during the deployed period. The radar/launcher trailers carry two missiles each, with a hydraulically-operated ramp to permit accurate setting of the firing angle or to compensate for operation on a sloping site. The radar mast is hydraulically extended.

One system, using MM-38 missiles from the stock held for surface warships, was installed by the RN at Gibraltar in 1985, replacing obsolete gun batteries.

CHARACTERISTICS
Radar/launcher trailer
Length: 6.7 m
Width: 2.5m
Height: 2.4 m
Weight: 10300 kg (loaded)
Length of cabins: 9.2 m
Width: 3.3 m
Height: 2.4 m
Weight combined: 30500 kg (max)

STATUS
Operational with Royal Navy (1985).

CONTRACTOR
Vosper Thornycroft (UK) Ltd, Woolston Works, Woolston, Southampton S09 5GR, UK.

1530.321
SEA SKUA HELICOPTER AIR-TO-SURFACE MISSILE

Sea Skua is an all-weather, helicopter-launched, sea-skimming anti-ship guided weapon system which is in operational use with the RN and on order for three other navies. Initially designed for fitment to the naval variant of the Westland Lynx helicopter fitted with the Ferranti Seaspray radar, it is the RN’s principal air-to-surface light strike weapon for use against a variety of targets ranging from missile-firing fast patrol boats to coastal escorts, frigates and destroyers. Sea Skua is also suitable for fitting on other types of helicopter and fixed wing aircraft. Studies have also been carried out on a ship-launched version and this is described in entry **4553.221**.

The helicopter/Sea Skua combination provides a rapid-reaction, surface attack capability up to, and well beyond, the

radar horizon of the parent ship which retains the option of remaining passive and therefore undetected.

The missile is light enough to permit a four-Sea Skua fit on a small helicopter. Solid-propellant boost and sustainer motors are used to give the missile a range in excess of 15 kin, sufficient to provide a good ‘stand-off’ capability for the helicopter with consequent protection from counter attack. To commence an engagement the helicopter would close the target to enable its radar to lock on and automatically track. While in this automatic tracking mode, the radar will illuminate the target with radio frequency energy, which, when reflected, provides the source onto which the Sea Skua semi-active radar homing head locks. On release from the helicopter the missile drops for a short distance under autopilot control maintaining attitude angle stabilisation in roll, pitch and yaw before the rocket motors are ignited. The Sea Skua missile then descends in stages, under control of a radio altimeter, to one of four terminal sea-skimming heights selected by the pilot prior to missile release, depending on the sea state or size of target. The missile, guided by the homing head in azimuth will fly on a proportional navigational course to hit the target The warhead is designed to explode within the target to give high lethality. Sea Skua missiles can be fired in rapid succession if required and the helicopter is free to manueuvre after the last missile release within the limits required to maintain target illumination.

System control equipment associated with armed release of the missiles has been designed for rapid removal and replacement, thereby reducing to a minimum any weight penalty to the helicopter when *t* is not required to operate in the strike role The missile can be treated as a round of ammunition as no on-board testing is required. It is delivered in a wheeled ‘palletrolley’ fitted with a shock absorbing system suitable for shipborne magazine stowage.

CHARACTERISTICS

Length: 2.85 m
Diameter: 0.222 m
Span: 0.62 m (max)
Weight: 147 kg
Range: 20 km
Warhead: 30 kg SAP HF

STATUS

In June 1981, a multi-million pound contract for Sea Skua production for the RN was announced, and it was confirmed that initial deliveries were already being made. In May 1982 the weapon scored its first operational successes in the fighting to

regain the Falkland Islands, despite not having completed the *U* N's formal acceptance procedure.

In addition to the RN, Sea Skua has been selected to arm naval helicopters of the Federal Republic of Germany, Brazilian and Turkish navies.

CONTRACTORS

Prime contractor: British Aerospace, Air Weapons Division. Hatfield-Lostock Division, Manor Road, Hatfield Hertfordshire AL 1O 9LL, England. Homing head. Marconi Defence Systems Ltd. The Grove. Warren Lane, Stanmore, Middlesex HA7 4LY, England

SHIPS USED FOR LAUNCHING OF MISSILES

China: -Houjian, Houxin, Hainan, Huangfen, and Hola class Fast Attack Craft (FAC) carry the SARDINE, SADSACK SSM systems.

France: -La Fayette, Floreal, D'estienne D'Orves, and Commandant Riviere class Frigates carry the EXOCET SSM system.

Russia: -Tarantul, Nanuchka, and Dergach class Corvettes carry either the STYX, SUNBURN or SIREN SSM systems or their respective upgrades. Matka, and Osa class Fast Attack Craft (FAC) carry either the URAN or STYX SSM systems.

Iraq: -Yugoslav class Frigate carries the EXOCET and OTOMAT SSM systems. Assad class Corvettès carry the OTOMAT SSM system. OSA class Fast Attack Craft (FAC) carries the STYX SSM system.

SUMMARY:

It should be known that all these missiles can and are used on various other ships. Destroyers, cruisers, and other ships use these missiles as well. However, FAC's and other smaller ships are mainly used for Coastal Defense. These missiles are used on land as well. These are not the only countries or ships used, but they are the main ones.

HY-2(CSS-N-2) NAVAL SURFACE-TO-SURFACE MISSILE

As a former client of the Soviet Union, the People's Republic of China received a number of SS-N-2 Styx anti-ship missiles (**1155221**), and this weapon now forms a major element of the Chinese inventory. It is extensively employed in both the shipborne surface-to-surface role and for coastal defence (**3984.121**).

So far as can be ascertained, few if any changes have been made to the original Soviet design, although indigenous

production is now in hand and the possibility of internal detail changes can hardly be ruled out. Chinese-built missiles of this type are designated Hal Ying (Sea Eagle), HY-2, and they were offered for export in 1984. In the Luda class and Anshan’ class Chinese vessels on which the HY-2 is currently deployed, the launcher arrangements are obviously of local origin. The Luda’ class has two triple trainable launchers, while the Anshan’ has two twin trainable launchers.

The HY-2 is produced in three versions, differing in their guidance sub-systems. Cruise altitudes vary between the models: 100 in (HY-2), 50 in (HY-2G) or 30 in (HY-2A).

CHARACTERISTICS

Length: 5.8 in

Range: 95 kin (claimed, but almost certainly lower) Warhead: 1100 **lbs**

Guidance: Active radar (HY-2) + radio altimeter (HY-2G), passive IR homing (HY-2A)

STATUS

In operational use and production continues. Luda class destroyers have two triple launchers for HY-2 missiles and converted ‘Anshan’ class destroyers have two twin launchers although there have been reports of some of these ships having been fitted with triple launchers. Chinese Jianghu’ class frigates have two twin launchers and frigates of the Chengdu’ class have one twin launcher. Two main classes of fast missile boat are operated by the Chinese Navy, both derived from their Soviet ‘Osa’ and ‘Komar’ class

QUESTIONS:

1.What type of missile is the FL-217/SY-2?

2. What is the range of this missile and what platform is it fired from?

3. Is this missile employed in any other countries other than China?

4. What type of guidance is used by the SAWHORSE?

5. What is the speed and range of the SAWHORSE?

6. What platforms are used to employ the SARDINE?

7. What countries employ the SARDINE and what are the different ranges of it?

8. What type of missile is the SADSACK and what platform can it be launched from?

9. What missile is the SADSACK derived from?

10. What is the range and speed of the SADSACK?

11. What are the primary platforms that the EXOCET missile is launched from?

12. What U.S. warship was struck by an EXOCET missile? And what country fired it?

13. What country designed the **EXOCET missile?**

14. Name at least two other countries that have the EXOCET missile?

15. What type of missile is the OTOMAT and what platform can it be fired from?

16. What two countries also have the OTOMAT in coastal versions as well?

17. Name six countries that employ the OTOMAT?

18. What is the guidance system used on the OTOMAT?

19. What is the final approach altitude for the Gabriel Mark III?

20. What design is the South African Skorpian anti-ship missile based off of?

21. What is the estimated range of Sweden's RBS 15?

22. What system is the Excalibur Coast Defense Missile system similar too?

23. Name the UK's Helicopter Air to Surface Missile.

ANNEX K TO ADVANCE SHEET TO SECTION 1

FOCUS

Theater Ballistic Missile Defense:
The Enabler for Operational Maneuver
From the Sea for the 21st Century

MajGen Harry W. Jenkins, Jr., USMC(Ret)

The proliferation of theater ballistic missiles and cruise missiles battlespace domiance threatens the Navy-Marine team's ability to ensure battlespace dominance and carry out amphibious operations.

Crises in Somolia, Bosnia, Rwanda, and Haiti have seen the commitment of U.S forces for a variety of humanitarian and military response missions. We will see more missions of varying intensity that will require forward-deployed Navy and Marine units to react; however, future crises will also see our forces challenged by increasingly lethal weapons including cruise missiles and theatre ballistic missiles (TBMs). As we approach the 21st century and progress deeper into the missile age, it is clear that Navy and Marine forces must be prepared to deal with this threat along with a plethora of conventional, chemical, and even nuclear warheads. In such a threat environment, our ability to carry out amphibious power projection missions in a manner that Marines have been comfortable with for the past 50 years will change radically. Future maneuver operations from sea will not be successful in the face of a concentrated air threat from cruise missiles and TBMs unless a seabased missile defense capability to the achievement of battlespace dominance in the objective area.

Missile Proliferation

U.S. intelligence estimates project that more than 40,000 antiship cruise missiles will be in the inventories of some 100 countries by the year 2000. Many of these missiles, skimming in from over the horizon 15 to 20 feet above the sea at speeds in excess of Mach 1.5, pose a very serious threat to naval and amphibious shipping operating in the littorals. In addition, it is clear that ballistic missile proliferation has also accelerated with little international control. More than 15 countries possess these weapons now, and the number of countries expected to maintain such a capability by the beginning of the 21st century will exceed 20. The developmental trend for the TBMs has been steadily increased range. Figure 1 indicates that the number of countries with missiles with a range greater than 500 kilometers (kin) had grown to 13 by the end of 1994.

Three countries in particular— Iran, North Korea, and Iraq—continue to be of serious concern to the United States. Iran has pursued an indigenous Scud C program, with some assistance from North Korea, and successfully tested this missile in 1991. China has also been active in the Iranian ballistic missile programs selling a variety of missiles to Iran over the past few years. North Korea tested its 1,000-km No Dong missile early in 1994, although not to its full-range capability. No Dong is believed to be capable of carrying a 500-kilogram (kg) payload and is one of several long—range ballistic missiles currently in the North Korean inventory. While Iraqi missile programs were disrupted

during the Persian Gulf War and are currently restricted by international sanctions, it is believed that there still exists a large stock of the Al Hussein missiles that could be used in the future against military or political targets.

With cruise missiles and TBMs becoming weapons of choice for many countries, the Navy and the Marine Corps must focus on what is needed to ensure that battlespace dominance can be achieved so that amphibious power projection missions can be carried out if required.

Theater Ballistic Missile Defense (TBMD)

For the Navy operating in the littorals in support of future expeditionary operations, the TBMD system will be built around the Aegis combat systems in the *Ticonderoga* class cruisers and the *Arleigh Burke* class destroyers. This capability is based upon modifications to the phased-array radars and weapons systems on board the 22 Aegis VLS (Vertical Launch System) cruisers as well as the projected 57 Aegis destroyers, and the fusing of target data provided by airborne surveillance aircraft like the E2C Hawkeye, surface combatants, and amphibious ships through the real-time networking of sensors and fire control systems in what is called the cooperative engagement capability (CEC). The CEC will facilitate intercepts of tactical ballistic missiles as well as provide longer intercept ranges and quicker reaction times. This is absolutely vital for the survivability of battlegroups and amphibious forces operating within a TBM threat environment. In addition, the Navy’s improved Standard Missile (SM—2 Block IV) will provide both an area defense or layered defensive capability against TBMs that will extend well over a land mass in support of amphibious power projection missions or operations ashore. The Navy estimates that an Aegis system can defend a space 100 to 150 km forward over the beach as well as 30 km in altitude. It is within this bubble, once it is established and extended ashore, that amphibious maneuver from the sea must be executed, and in some circumstances, from extended distances offshore.

The Navy’s TBMD system should be able to deal with the ballistic missile threat by the end of the decade; however, in many respects the more lethal threat in littoral regions is the sea-skimming cruise missile. The exceptionally high speed of cruise missiles at very low levels (15 to 20 feet above the ocean), along with the difficulty that radars currently have in low-level target detection, make these missiles extremely difficult to track and destroy. With a variety of cruise missiles on the world market today, the Navy is working hard to improve ship self-defense systems (SSDS) on the non-Aegis ships in order to enhance their survivability. Antiair warfare (AAW) improvements are imperative; and it has been determined that ship survival is increased substantially by linking existing AAW weapons systems with detection and tracking sensors in a coordinated network oh board individual ships. Currently, all amphibious ships are non-Aegis, and much work remains to be done before the SSDS concept becomes a reality in the amphibious

force. What then is the impact of both a TBM and a cruise missile threat on our ability to conduct amphibious power projection missions from the sea?

Operational Maneuver From the Sea (OMFTS)

OMFTS is a concept that will allow Navy and Marine Corps units to capitalize on traditional strengths against more sophisticated threats with improved technology and platforms. OMFTS applies the tenets of maneuver warfare, so aptly described by *FMFM 1, Warfighting,* using the sea as the maneuver space from which we can strike the enemy where he is most vulnerable at a time and place of our choosing. It also means that:

- We will break the cohesion and integration of enemy defenses through the selective use of firepower and deception.
- We will use speed, maneuver, and tempo of operations to exploit enemy surfaces and gaps while avoiding attrition-style, head-on attacks
- We will execute myriad power projection missions from extended distances at sea depending on the situation.
- New thinking is required by Navy and Marine leadership on how such missions will be executed in the face of the type of threat that is the basis for this article

The one thing that QMFTS does not mean is the traditional amphibious assault. By the early 21st century the missile threat array, and especially cruise missiles, will prevent the close-in concentration of shipping that has been required for such operations in the past. In addition, the traditional amphibious assault is a classic case of the head-on, attrition style of attack that should be avoided. Future commanders must learn to fight in a much more intelligent manner using maneuver, deception, electronic warfare, and appropriate fire support to accomplish the mission.

While it is clear that a combined TBM and cruise missile threat to an amphibious force might be a worst case scenario, Navy and Marine commanders could be ordered to execute a variety of amphibious power projection missions in the face of such a threat and must be prepared. Appropriate missions could range from a noncombatant evacuation operation (NEO) to a raid, or larger operations such as an airfield or port takedown in order to prepare for the insertion of larger follow-on forces. In each situation the Navy must establish a reasonable level of battlespace dominance supported by a robust TBMD capability. This defensive capability is the enabler that provides Marine units executing OMFTS a high degree of survivability as they carry out their assignments.

What other capabilities are required for OMFTS to be successful ~[‘ in this threat scenario?

- *Intelligence.* It is imperative that early intelligence on enemy geography, dispositions, as well as strengths and weaknesses be made available to the designated joint task force (JTF) commander along with appropriate Navy and Marine commanders. This must be done when the force is at sea and days or weeks away from the objective area. While this

requirement very early in a mission is not new, the methodology used for collecting information in the face of such a threat is new.

The traditional use of satellites and national assets will continue although there are fewer systems available today as compared to 4 years ago in the Persian Gulf. Long range, high altitude unmanned aerial vehicles (UAVs) with a continuous coverage capability will be employed from several locations to the objective area to provide a continuous flow of information to the JTF and appropriate commanders. While UAVs are relatively new today, they will have replaced the reconnaissance platforms by early in the next decade. They are considerably cheaper than manned platforms, will provide 24-hour coverage over objective areas, and will put far fewer aviators at risk. Information gathered by onboard sensors will be directly downlinked to the command ships at sea for use as required.

• *Clandestine Mine Reconnaissance.* At sea, 688-Class submarines (SSNs) will play a critical role in intelligence gathering activities in enemy coastal waters well in advance of the arrival of the JTF in the theatre. They will carry out clandestine mine reconnaissance, electronic surveillance as well as employ SEAL teams on a variety of special missions. The SSNs will emloy onboard underwater unmanned vehicles (UUVs) to detect enemy mining operations and established minefields. Most important, they will employ the UUVs to find the gaps between minefields or open channels to the shoreline for further exploration. Surface combatants will also operate well over the horizon in enemy waters with their own onboard UUVs. These vehicles, capable of operating for extended periods of time away from the mother ship, will conduct their intelligence—gathering missions against mines and other enemy activity.

Gaps in enemy minefields or other defenses in coastal waters that are uncovered by UUVs will be marked with underwater sensors. SSNs will be in position in coastal areas to monitor any activity that may be detected by the sensors. If enemy units are emplacing mines in the water or a previously identified open area or gap, that information will be passed back to appropriate Navy and Marine commanders for processing. Landing plans will be continuously updated in order to exploit the gaps that are clear.

The Navy will have a significantly improved command, control, communications, computers, intelligence (C4I) architecture in its flagships, combatants, large-deck amphibious ships, and carriers by the end of the decade. This architecture, along with the required band width for UHF, SHF, or EHF communications, will provide commanders with a direct flow of information from all of the aforementioned intelligence gathering platforms and sensors. Navy and Marine commanders will be able to continuously modify developing battle plans far at sea, as well as make quick decisions on circumstances created by a threat change.

In order to conduct OMFTS in this threat environment, it is imperative that a robust communications system be in place.

• *Targeting and Missile Strikes.* As the Navy extends its TBMD coverage into coastal waters, and begins to attempt to establish battlespace dominance, a variety of enemy missile sites, facilities, command and control nodes and units will be targeted for precision strikes. Relying on updated intelligence information on the TBM/cruise missile threat, naval commanders will begin to engage designated targets from hundreds of miles at sea using the Tomahawk missile system. Launched from surface ships and 688-Class SSNs the Tomahawk will provide a precision strike capability designed to reduce the missile threat as well as disrupt communications well before the JTF approaches the objective area. Missile strikes, along with the TBMD are requirements in order to ensure that units conducting OMFTS will be able to do so against a much reduced enemy capability. At this stage of the operation, naval gunfire support as we have seen it for decades will not be a factor because of the vulnerability of the few fire support ships to cruise missiles and to the limited range of the gun systems.

When the established area defense umbrella is extended over the beach and inland, MAGTF (Marine air-ground task force) commanders can prepare to carry out assigned missions through OMFTS. Even though reasonable conditions for amphibious maneuver are established, Marine planners must realize that as long as the TBM or cruise missile threat exists the amphibious ships will remain at great distances off an enemy coastline. The *Arleigh Burke* destroyers will be maneuvering up to 25 miles off-shore ready to track and engage inbound missiles. The amphibious ships will be another 10—15 miles out to sea and constantly maneuvering as well so as not to present an easy target. The implications for carrying out ship-to-shore maneuver under these conditions must drive new thinking in the Corps. As we move toward the 21st century, it is very clear that Marine leadership will have to develop tactics and techniques for employing our units over extended distances, as well as for controlling and sustaining them. The missile threat will dictate this requirement, and we cannot ignore it.

For those who may not believe that the Corps will have to project power over those distances, one only’ has to be reminded of the NEO that was conducted at the American Embassy in Mogadishu in January 1991. Marine CH—53E helicopters, with SEALS and force reconnaissance teams on board, were ordered to launch at night from amphibious ships 450 miles at sea off Somalia. Refueling twice at night from Marine C—130s en route, the helicopterborne force arrived over the embassy at dawn in time to rescue American and other diplomatic personnel caught in a war between clans in that city. There was no known missile threat to this mission; however, the Navy-Marine team did what was ordered in spite of the distances involved. The same kind of scenario could occur in the future where the missile threat is real.

If MAGTF commanders in the future are required to conduct

OMFTS under these circumstances, several things will have to occur. Landing force units will have to move at night at high speed over extended distances with precise GPS navigation. Surface and airborne units may have to loiter over the horizon for periods of time as commanders, reacting to changing intelligence and threat conditions, shift units into different gaps across a wide area ashore. Airborne units will move in MV—22s and helicopters applying what has been described as infestation tactics *(MCG,* Apr95) to land in a variety of sites ashore. Surface units will move in MCACs (multipurpose craft air cushion), LCACs and possibly AAAVs to different sites along the coast. MCACs, with their mine-hunting and obstacle-breaching capability *(MCG,* Mar95), will lead the surface-borne units into the identified gaps as they make their high-speed runs to the beach. It is clear that units operating over extended distances will have to be logistically self-contained for a designated period of time until a sustainment capability can be moved ashore.

Once ashore small, highly mobile units will be maneuvering over a wide area to disrupt enemy lines of communication and command and control nodes in order to break up his ability to react and concentrate. These mobile units will be supported by a C41 system that will feature cellular communication and direct broadcast video down to the small-unit level that will substantially increase situational awareness.

Fire support for the maneuver units will be provided by tactical aviation, missile strikes, and possibly gunfire support if it is in range and available. AV—8B Harriers from LHDs and LHAs will provide close air support to the ground units ashore. F/A—18s from aircraft carriers will also provide close air support as required. Tomahawk missile strikes against key targets very deep in the battlespace will come from surface combatants and submarines operating well off the coastline. Other tactical missiles such as ATACMS or a modified SM—2 may be available in the next decade to provide direct fire support to the maneuver units on the ground. The Navy is looking at a variety of options in this area that will help compensate for the lack of naval shore fire support today. The employment of tactical aviation and tactical missiles from extended ranges in support of maneuver units spread out over a large area ashore will create fire support coordination issues that Marine commanders have not faced to date. Add to that UAVs that will also be operating in the battlespace. Just how MAGTF commanders in the future will coordinate this fire support needs to be carefully studied and procedures developed that are approved at the JTF level. The new weapon in our combined arms inventory is the tactical missile fired from ships and submarines, and it is clear that we need to learn how to employ it in support of our maneuver units ashore.

The Navy’s TBMD capability is the enabler in the battlespace that will provide the umbrella under which N4AGTFs will execute OMFTS for a variety of missions in the early 21st century.

The great challenge for Marines is to get rid of old paradigms regarding amphibious assaults and develop new doctrine and techniques to support amphibious power projection in the missile age.

US~MC

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THEATER BALLISTIC MISSILE

1. What are the primary threats to US Expeditionary forces in the littoral region?

2. What impact do these threats have on our ability to project power ashore?

3. How will US forces overcome the PGM threat?

4. Discuss the impact the coastal threat has had on our amphibious doctrine and how OMFTS comes into existence.