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In considering North American security, the North Atlantic Ocean, the Arctic Ocean, and NATO, Greenland is often almost forgotten. In other areas where a sudden commercial development is foreseen a situation which has been stable for centuries has suddenly changed and created new uneasy political situations. This paper finds Greenland no exception.

GREENLAND AND ITS RELEVANCE TO NORTH AMERICAN SECURITY

by

Commander Finn B. Sørensen, Royal Danish Navy

Introduction

The Problem. As a result of technological advances and changes in the world economy, the Arctic in recent years has become increasingly significant for the United States, the Soviet Union and the lesser powers with northern possessions. The region is important not only for its vast mineral wealth but also for its location. A polar projection of the Northern Hemisphere brings this into perspective, showing that superpower rivalry is not just an "East-West" confrontation. Modern means of transportation enable the world's two strongest military powers to reach each other by the shortest route between their home continents, across the Arctic Ocean and its bounding seas. In the future this region could become the center of the West's military position with the Orient and Europe in the wings, geographically and perhaps even politically.

Greenland, the largest island in the world and located between the two superpowers as a huge mass of ice and land, has a population of only 40,000 to 50,000.¹ This huge island is a part of Denmark and consequently a part of NATO.

How important is Greenland to North American security? Is the importance changing? If it is changing, then why? Can we do anything about it?

All these and many similar questions are becoming more and more significant in considering the importance of the Arctic region. This paper will not propose packaged answers to all questions but will present some facts about Greenland and its surroundings and draw some lines between these facts and their relevance to North American security.

Treaties. In 1941 a treaty regarding the defense of Greenland was signed between Denmark and the United

States. After the war, Denmark joined the NATO alliance and soon began bilateral negotiations with the United States about Greenland.

The first agreement reached was the mutual defense assistance agreement, signed on 27 January 1950. The essential part of the agreement with respect to resources on Greenland states:

Article II

In conformity with the principle of mutual aid, the Government of Denmark agrees to facilitate the production and transfer to the Government of the United States, for such periods of time, in such quantities and upon such terms and conditions as may be agreed upon, of war and semi-processed materials required by the United States as a result of deficiencies or potential deficiencies in its own resources, and which may be available in Denmark or dependent territories under its administration. Arrangements for such transfers shall give due regard to reasonable requirements for domestic use and commercial export of Denmark.²

This agreement certainly requires a close relationship between Denmark and the United States and the importance of the agreement is self-evident as more and more resources are found in Greenland and as the technological development begins to make it cost-effective to extract those resources.

In addition to the agreement for mutual support of resources, Denmark and the United States negotiated a new agreement to replace that of 1941 for the defense of Greenland. Some changes were required after NATO was established, and the result of the bilateral negotiations was manifested in an agreement signed 27 April 1951 and which entered into force 8 June 1951. For Denmark, the agreement meant that this

huge island would have some kind of protection which would have been impossible for Denmark alone to give. It also meant that the United States guaranteed that Greenland should remain a part of Denmark. For the United States, it meant that it would now be possible to establish full coverage for Ballistic Missile Early Warning System (BMEWS).

A significant feature of all treaties between Denmark and the United States concerning Greenland is that they are implementations of the North Atlantic Treaty and, consequently, they only remain in effect for the duration of the North Atlantic Treaty.

Article II of the Agreement between the Government of the United States of America and the Government of the Kingdom of Denmark, pursuant to the North Atlantic Treaty, Concerning the Defense of Greenland states that the Government of the United States of America shall be entitled—within agreed defense areas:

(i) To improve and generally to fit the area for military use;

(ii) To construct, install, maintain, and operate facilities and equipment, including meteorological and communication facilities and equipment, and to store supplies;

(iii-iv-v) To provide housing of personnel, internal security and postal facilities and commissary stores;

(vi) To control landings, take-offs, anchorages, moorings, movements, and operations of ships, aircraft, and water-borne craft and vehicles, with due respect for responsibilities of the Government of the Kingdom of Denmark in regard to shipping and aviation;

(vii) To improve and deepen harbours, channels, entrances, and anchorages.³

This agreement was the basis on which the United States established

Thule Air Base with one of the three Ballistic Missile Early Warning Systems (BMEWS) stations. Other warning systems such as the Distant Early Warning-Line (DEW-Line) were also established in the 1960s across Greenland, and other American support facilities were established. The only limitation to this agreement is that no nuclear weapons are allowed in Greenland (or in other parts of Denmark).⁴

Although there are no treaties between Denmark and Canada (except NATO agreements) regarding the defense of Greenland, both countries are concerned about possible pollution of the areas of mutual interest in the Arctic. This concern has grown as the exploration for oil has commenced, and an agreement was signed in August 1977 on precautions and mutual assistance in order to avoid pollution, and if pollution occurs, endeavors to minimize the damage.⁵

The Threat. The following, from the *Annual Defense Department Report FY 1978*, gives, in summary, the American view of the threat on which the United States bases its strategic defense. Not all of these threats have direct relevance to the warning systems in Greenland or to Greenland at all but certainly Greenland and its warning system is a part of the overall American defense system.

Chapter VI, Para. B.

The Soviet Union is and will remain for the foreseeable future the major threat to the United States and the international system on which we depend.

1. Across the spectrum of capabilities from strategic nuclear to general purpose, the Soviets give evidence of moving towards a fundamental shift in the "Correlation of Forces" that would give them peacetime and crisis leverage

over the United States and its allies.

2. The emphasis in Soviet nuclear programs on quantitative superiority indicates concern for major warfighting potential, in contrast to the U.S. emphasis on deterrence and stability.

The scope and vigor of the Soviet programs occurring at a time when the U.S.S.R. has achieved a powerful deterrent as well as rough equivalence with the United States in strategic forces, raises the question of whether these programs can or will carry to some form of strategic superiority over the United States. The trends lead to one judgment about the Soviet Union, and that is, in the main, their large and growing military capabilities with a growing offensive and warfighting orientation offer options to them which clearly are adverse to those who believe in freedom and self-determination, and particularly the United States.

As to the future, the U.S.S.R. can be expected to continue certain patterns, including:

- Strengthening its already formidable nuclear and conventional military forces;

- Seeking to expand its influence by manipulating local tensions and conflicts, particularly in the Third World;

- Offering political support and various forms of military assistance to exploit opportunities to divide the Western alliance system; (NOTE: A movement which could begin in Greenland.)

- Pursuing arms control initiatives that will enhance their security, support their military and political objectives, and stabilize the military balance at levels favorable to the U.S.S.R.⁶

As noted, Soviet intentions and objectives are not fully known outside the Kremlin. How the Soviets regard the Arctic area and its importance is even more speculative but a brief idea of how the Soviets regard the American activity in the Arctic can be derived from the following from an article on the International Legal Regime of the Arctic published in *Morskoy Sbornik* in 1973:

The Americans are setting themselves the task of gaining the leading position in the Arctic. Disregarding the historically established and existing regime, the authors assert that the "Arctic" region, in the main, comprises international areas which fall under the regime of the high seas, which provides for free passage.

And from the same article:

The Americans attach great importance to Arctic exploration. Eleven federal departments and agencies are participating in its study and development. We must note that a significant part of these explorations have a military nature.⁷

From these quotations the reader could get the impression that the U.S.S.R. does not carry out explorations of a military nature. Whether they do or not is not the purpose of this paper to determine, but they certainly do a significant amount of exploration—and all exploration in this area is of potential military importance. Furthermore, the U.S.S.R. possesses such immense reserves of minerals and energy in the northernmost part of Siberia that Soviet strategy is bound to be increasingly influenced by this fact. It is also necessary to note that the greater part of the Soviet coastline is placed in the Arctic region—an area which, by considerable effort, has been made navigable and which contributes toward linking up the river transport system in the Soviet Union.

Unique Aspects of Greenland and Their Relevance to North American Security

The Physical Environment. Geography and climate constitute relatively fixed factors for any military action and may either prohibit or permit the undertaking of the objectives of the military action in the area.

By far the most important passage-way between the Arctic Ocean and the North Atlantic runs between Greenland and the United Kingdom. It is known as the Greenland-Iceland-United Kingdom Gap (GIUK Gap) and is the normal approach to and exit from the Kola Peninsula with its bases for the Soviet Northern Fleet.

The waters between the Archipelago of Spitsbergen and northeast Greenland with a threshold depth upwards of 2,500 meters constitute an easy approach for submarines from the North Atlantic to the Arctic Ocean. The Norwegian Sea adjacent to the Arctic Ocean is normally ice-free throughout the year and with the Barents Sea furnishes the natural passage area to the Kola Peninsula. The Denmark Strait between Iceland and Greenland is also normally ice-free, although large areas along the east coast of Greenland may be tightly packed with ice during the spring months, especially after hard, icy winters.

To the north of the Davis Strait there are two passages into the Arctic Ocean. The most well-known is the Northwest Passage through the Canadian Archipelago on into the Arctic Ocean. Because of the short duration of the navigable season and the difficult ice conditions, this route has not yet been of any great significance to trade or to transit of surface naval units from the Atlantic to the Pacific. The passage of U.S.S. *Seadragon* through the Canadian Archipelago in 1960 proved the Northwest Passage to be a practical passage-way for submarines.⁸

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The other possible passage to the Arctic Ocean, which may become interesting, is the ice-filled waters to the northwest of Greenland—Smith Sound, the Nares Strait and the Kennedy-Robinson Channel between Greenland and Ellesmere Island. For submarines, this is a possible, but very narrow passage.

So far, the most frequented route in the Arctic Ocean is the Northeast Passage, to the north of Siberia from the Atlantic to the Pacific; and the possibility cannot be discounted that use of nuclear icebreakers may render these waters navigable throughout the year thus enabling the Soviet Union to redistribute their Atlantic and Pacific Fleets quickly and without publicity. The recent well-publicized success of reaching the North Pole by surface icebreaker has proved that the Soviet Union possesses the capacity to break ice in this region.

The Arctic Ocean is distinguished from other oceans by the fact that it is covered by sea ice practically all year with the most sparse distribution in September when the sea is ice-free along the coasts of the Arctic basin. The ice does not form a solid mass. Ridges and openings are always present in varying quantities.

The bulk of the ice in the Arctic Ocean passes between Greenland and Spitsbergen. This is because of the currents prevalent in the Arctic Ocean and the North Atlantic, and in the relatively narrow straits such as the Bering Strait and the straits of the Canadian Archipelago. The North Atlantic itself, including the Norwegian Sea and parts of the Barents Sea, is normally ice-free because of the warm North Atlantic Westerly Drift (the Gulf Stream) which pushes the boundary of the ice back to the north coast of Spitsbergen and into the inner part of the Barents Sea.⁹

The Historical Background. The modern history of Greenland began

with a growing activity in Greenland waters during the 17th and 18th centuries by European whalers, and with the search for a shorter sea route to the East Indies to the north of the American Continent.

In 1721 Christianity was introduced to the country by a Danish clergyman, Hans Egede. That year marked the beginning of what may be termed a colonial period which lasted until 1953 when a Provincial Council Meeting in Greenland and the Danish Folketing in Copenhagen decided that Greenland should cease to be a colony and from 1953 on be considered a county of Denmark of equal status with the rest, a decision which was recognized by the U.N. the following year. This change in the constitution made Greenland a fully integrated part of the Danish Realm.

The technological development during World War II changed the strategic significance of the Atlantic islands, including Greenland and Iceland. The distance between the islands and the other European countries no longer provided an adequate guarantee of security.

During the war Denmark was occupied by Germany, and to protect the Faroe Islands and Iceland from being invaded and used for naval operations by the Germans the British put soldiers ashore but Greenland remained under free Danish administration, directed from the independent Danish legation in Washington, D.C.

In 1944 Iceland acquired full independence from Denmark.

The Danish Government decided to join NATO in 1949 because of a number of events in Scandinavia, among them the fruitless negotiations concerning a Scandinavian defense alliance. An insistence on the part of the Western Powers that a solution of the problem of defense of Greenland be somehow conceived in terms of a North Atlantic defense system was also a contributing factor in this decision being made.

The Political Situation and Development. Developments in Greenland since World War II have revealed the enormous difficulties of establishing a Europeanized community under extreme Arctic conditions. The question may well be asked whether such a goal is attainable even today. Greenland is not only a country of 40,000 people. It is also a world with great physical distances among the people who require help and whose needs differ as much as do the local conditions. The common experience of both Danes and Greenlanders has been that a few short decades will not suffice for the task of reconstruction.

Since World War II the political situation in Greenland has changed from complete passivity to a growing consciousness beginning in the early seventies. This political evolution is important for Greenland's future development and relevance to North American security.

On 27 December 1973 an international conference of indigenous Arctic peoples took place in Copenhagen, with participation by Canadian Indians, Eskimos from Greenland and Canada, and Lapps from Norway, Sweden and Finland. Delegates from every group protested against forced integration into modern society and the Greenland delegates announced they were dissatisfied with Denmark's policy of concentrating the population in urbanized settlements and bringing them into life patterns of the welfare state. They also stressed the likelihood that Greenland would press for home rule. These announcements were a result of the growing consciousness of the profits of an expected future mining industry in Greenland, but they obviously were contradictory to the wish of abstaining from the welfare state.

On 8 April 1975 the Danish Government granted the first leases for oil exploration off Greenland's west coast continental shelf covering a 15,000

square mile area. U.S. concessioners are: Chevron, Mobil, Gulf, Amoco, Cities Service, Murphy, Atlantic Richfield and Ultramar; the National Iranian Oil Company also is a participant. Leasing conditions specify an initial exploration period of up to 16 years, with production rights of up to 30 years. The Danish Government holds an option to participate up to 50 percent in any commercial production. Additionally, the government will receive royalties of 12.5 percent of production and taxes of 55 percent on production profits. These lease conditions were some of the best conditions obtained in the world and when the leases came through, a new political consciousness towards home rule and even a break with the motherland began.

In Denmark the government agreed to look for a solution for home rule as is in force in the Faroe Islands, and on 2 October 1975 the Minister for Greenland—Jorgen Peter Hansen—in Godthaab in Greenland appointed a commission to work out the laws for Greenland home rule. The commission included seven Greenlanders and seven Danish politicians.

On 28 October 1975 the Greenland Provincial Council unanimously declared that Greenland's subsurface resources belonged to the resident population of Greenland. (The declaration implies that it does not belong to the Danish State.) In the Danish Government it is seen as a victory for Greenland's left-wing politicians. The declaration had no legal validity but certainly started a large-scale discussion which was not completed until November 1976. On 8 November 1976 the Greenland Home Rule Special Commission agreed (with one abstention) that Greenlanders have no juridical rights to the mineral resources of their territory or its continental shelf.

Denmark is prepared to delegate to an autonomous local administration the responsibility over whether, when and

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how underground or seabed resources should be developed. The Greenland Home Rule Commission's indignant stand reversed the resolution passed by the (mainly consultative) Greenland Provincial Council.

With the framework for future development having been set, the emphasis (except for housing, where the need remains acute) is shifting more toward broad human concerns. A growing political consciousness is about to replace the cheerless search for self-identity (so typical of our age) that was on the point of becoming, for a while, the chief preoccupation of the new Greenland. There is a certain uneasiness about continuing in a passive role and an apparent readiness to play a more active part, even though this may entail a reduction in the role of development. The Greenlanders have become more critical and more self-critical. Criticism is directed at the policy of urban concentrations as representing too radical a break with much that is viable in the inherited social pattern. Humanly speaking, the price of progress may be too high.

In the years ahead, the Provincial Council and the local councils of Greenland will be pursuing a policy of accommodation to the new era, stressing native requirements. The Danish-Greenlandic Commission appointed in the fall of 1975 marked the first step toward home rule for Greenland. A great deal of attention will be given to education, in the hope of eventually mustering a generation capable of taking over many of the positions so far unavoidably occupied by Danes—often on a basis of economic favoritism that has been conducive neither to native self-respect nor to mutual cooperation.

Since 1975, the Danish-Greenlandic Commission has been working on the formulation of a new constitutional status for Greenland, giving the native Greenlanders an opportunity to govern

their own affairs as a separate unit of administration within the Danish kingdom.

The so-called "Home Rule" gives Greenland roughly the same status within the Danish kingdom as the Faroe Islands have had since the Second World War. As for the Faroe Islands, unless the status changes drastically, the foreign and defense policies will likely remain in the hands of the Parliament and the Government in Copenhagen.

Military Factors Affecting the Relevance of Greenland to North American Security.

The Importance of Early Warning. An article in *U.S. News & World Report*, 5 September 1977 gives a short but clear view of the importance of early warning systems. This article also gives some examples of what should be done in the very short period between when a nuclear strike is recognized as imminent in the United States until the first explosion.

The chances of a nuclear war are held to be slim by most Pentagon officials. Still these military planners are being driven to consider the "unthinkable" by a combination of developments in the Soviet Union—the massive buildup of strategic nuclear strength, expansions of the civil defense system and evidence that the Kremlin has embraced a doctrine aimed not only at deterring nuclear war but fighting one.¹⁰

The planners in Washington are focusing on two issues:

a. What would happen if U.S.-Soviet relations deteriorate to the point of an actual military attack? Could Russian missiles hit this country without any warning?

b. Could a surprise attack leave the Soviet Union free from retaliation by

knocking out America's elaborate chain of command over its nuclear forces on land, in the air and at sea?

Answers to these two questions suggest at the same time the importance of a reliable and extensive warning system.

It is impossible for the Russians to launch a massive nuclear attack on the United States without some warning period as only a few of the long-range Soviet missiles are capable of being launched quickly. Their guidance gyroscopes cannot be operated continuously as can those in American missiles and they must be "cranked up" before being launched—a process that can be detected by the United States.¹¹

Similarly, Russian bombers are not on the kind of alert that the Americans are; and Soviet nuclear submarines are kept on a very low alert status compared to the Americans. U.S. intelligence will be able to warn of a buildup of the alert status of aircraft and deployment of nuclear submarines easily. Hence, a surprise attack with any chance of success would have to come after a period of growing tension and intense preparation.

After this period of intense preparation, an attack may occur—but at that time the Western World would have been alerted and the warning time given by modern warning systems would allow sufficient time for a wide range of precautions to be taken.

A few of the most important reactions to a nuclear attack warning are listed below. The possibility of successful implementation of the actions depends on the warning screen around the United States.

The President's command post (a converted Boeing 747 jet airliner) will be launched with the President and his staff of 15 military specialists, plus a small group of high-ranking advisors. From this command post Minutemen missiles can be launched by remote control. The post is equipped with communication equipment that will en-

able the President to conduct a war from this plane. It is estimated that the President would have, at most, half an hour to take off.

As the President takes to the air, other key government officials—especially those in line of succession to the President—would leave Washington by helicopter according to a carefully rehearsed plan designed to keep vital government services functioning.

The strategic B-52 bombers will have sufficient time to get airborne and survive a first Russian strike.

The above-mentioned items may be the three most important measures which will be taken immediately upon a warning of a nuclear attack on the United States. At the same time, the two questions asked in the beginning of this chapter are answered:

The Soviet Union could not hit their main targets in the United States without warning.

A surprise attack would not knock out America's chain of command over its nuclear forces and hence, leave the U.S.S.R. free of retaliation.¹²

It is important to recognize that the survival of America's fighting capability may depend on the warning of the first nuclear strike against her.

The Present Weapon and Warning Technology. Warning alone does not prevent an attack on the United States and neither can warning alone win a war, but an extensive warning screen is an important factor among the measures necessary in a defense system in order to increase the survivability of the country.

To determine the importance of Greenland in the North American warning system, it is important to have a look at the weapons which are likely to be employed in this area and against which the warning systems are or should be designed.

Weapons launched from the U.S.S.R. or adjacent waters which must over-fly

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Greenland can all be classified as strategic weapon systems. The development within land-based intercontinental missiles (ICBM) and similar submarine-based systems (SLBM) is now mainly focused on improved accuracy. Multiple Independently Targetable Re-entry Vehicles (MIRVs), Maneuverable Re-entry Vehicles (MARVs), and Cruise Missiles.

While the SALT I agreements between the United States and the U.S.S.R. limited the number of weapons and vehicles, they did not limit improvements in the quality of the weapons. This is why the development of MIRV, MARV and Short-Range Attack Missiles (SRAM) continued.¹³

Another limitation agreed upon in SALT I covered the Anti-Ballistic Missile (ABM) before these systems were operational in great numbers. The limitation on ABM sites was also important for Greenland as the limitation meant that these systems would not be employed to Greenland. Since the threat from ICBM, SLBM, MIRV and MARV will probably continue to exist in the future, new warning systems will also be developed in support of existing systems.

It is not difficult to imagine that satellite-based warning systems for use against ICBMs and other targets could render superfluous existing warning systems, but as satellite-based warning systems would be rather easy targets for new weapons (i.e., laser weapons). The result has presently been a combination of satellite-based warning and land-based warning systems.

In the land-based warning system, Greenland plays an important role, as the DEW-Line has four stations across Greenland, and as one of three stations in the BMEWS is placed in northeast Greenland at the Thule Base.

The American geosynchronous (also called geostationary) warning satellites, coordinated with the three BMEWS stations, DEW-Line and other systems

of warning stations around the United States, provide the current strategic warning screen for the United States. It is assumed that as long as one of the satellite-based warning systems is unable to provide the required strategic warning alone, at least the existing BMEWS stations will be maintained and remain operational.

Today there is no evidence (with respect to stopping the production of the B-1 strategic long-range bomber) that long-range strategic bombers or similar missile systems would not be used in the future. Therefore, it is assumed that the technological development probably will not render superfluous the existing DEW-Line stations and the other warning stations on Iceland and the Faroe Islands. The strategic importance of these areas—Greenland, Iceland and the Faroe Islands—for surveillance and warning and for the control of the airspace over the polar region and the North Atlantic is likely to remain unchanged, at least in the immediate future.

The GIUK Gap has, until now, been the only route used by Russian naval forces when they deployed between their base on the Kola Peninsula and the Atlantic Ocean. However, on 2 September 1977 an article in the Danish newspaper *The Weekend Avisen* indicated that Russian nuclear submarines now were using the "back door" for their deployment. The "back door" is known as the route beneath the polar ice through the Kennedy Channel between the northwest part of Greenland and the Canadian island of Ellesmere; further south through the Baffin Bay and Davis Strait into the Atlantic Ocean.¹⁴

The Canadian station "Alert" placed near the northernmost point of Ellesmere Island has reported that several Russian nuclear submarines are believed to have passed through the Kennedy Channel, but this information is not officially confirmed. Whether it is true or not is not important, but the fact

that it is possible for a nuclear submarine to pass this way is very important. Traditionally, NATO ASW forces are concentrated in the GIUK Gap, but if Russian nuclear submarines can avoid this gap during their deployment, a completely new situation exists in the northern North Atlantic.

The sea between Greenland and the northern Canadian islands is traditionally regarded as a Canadian defense area. That Canadians regard the submarine threat as their primary threat can easily be concluded by having a look at the composition of their navy—mainly consisting of ASW frigates and other ASW equipment. Other facts:

Canada has ordered 18 "Aurora" ASW A/C from the United States.

Is developing and building new ASW destroyers.

These indicate that the Canadians believe the submarine threat will become even more serious in the future.

Danish participation in the surveillance of the sea west of Greenland is limited to fishery inspection.¹⁵ However, the exploration for oil and minerals is expanding rapidly in these areas and is the reason why some kind of permanent Danish (and Canadian) surveillance may be demanded in the near future.

Along with an expanding exploration and possible exploitation, these areas west of Greenland will be of more and more concern for Canada and Denmark. As the activity probably will continue to grow, it will be even more difficult for a nuclear submarine to pass undetected through these waters.

On the east coast of Greenland the situation is still unchanged. The merchant ship activity is very limited and the unfriendly weather conditions continue to provide an undisturbed hiding and operation area for nuclear submarines.

It is important to realize, however, that the Soviet capabilities show an appreciation of the importance of

conventional strength, and reflect a determined, sustained, and increasing effort to develop two powerful conventional sea forces—one in the Atlantic and one in the Pacific Ocean. These modern offensive forces, combined with their increasing capability to project power thousands of miles from Soviet shores, could be used to project superior Soviet power between the east coast of Greenland and northern Norway. Keeping this possibility in mind, Greenland provides an excellent frame or limitation of the northern North Atlantic and hence also limits this area to the advantage of the Soviet Union as well as for the United States.

Commercial Factors Affecting the Relevance of Greenland to North American Security.

Known Resources in Greenland.

As a result of intensive geological testing and activity in the ice-free coastal areas of Greenland, an important number of minerals has been found. There are still huge areas to be investigated before a complete statement of the amount of the resources in Greenland can be estimated, but considering the resources already found, it is reasonable to estimate that still more will be found.

The areas on Greenland where mineral resources have been located are much more easily reached than similar areas in Canada and most other polar regions. The areas are located along deep fjords which are navigable during summer on the west coast and also to some extent on the east coast. The most important minerals which have been located are:

Lead. Today, lead is the fifth most important metal in world trade. Known world reserves are about 130 million tons which is enough to last almost to the year 2000. Known resources on Greenland are estimated to be 8-10 million tons.

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Zinc. Zinc is the fourth most important metal in world trade. There are huge known resources of this metal in the world and extraction is only a matter of cost-effectiveness of production.

Coal. Today there are known coal resources to last several hundred years. In Greenland there are several locations of coal of approximately 50 million tons.

Iron. Lack of iron resources is not foreseen in the future. This metal is located many places in Greenland. Richest resources amount to about two billion tons.

Chromium. Probably the most important metal in Greenland is chromium. Although chromium is not expected to be lacking the next 100 years, most of the known resources are located in Rhodesia and South Africa (90 percent). The last 10 percent in sequence of quantity is located in the U.S.S.R., Greenland, India, Brazil, Turkey and the Philippines. Although the resources in Greenland are small compared with global resources, they are probably the biggest in NATO.

The importance of these resources is further stressed by the fact that more than 95 percent of the rest of the chromium resources in the Western Hemisphere are located in South Africa and Rhodesia. These countries cannot be regarded as safe delivery sources.

Uranium. Greenland's known resources are approximately 16,000 tons. These resources are the largest in Europe and are expected to reinforce the Danish economy in the future.

Molybdenum. The resources of molybdenum can be described as huge. This metal is one of the few which, compared with global consumption, has been located in more than sufficient amounts.

NATO, as well as the Warsaw Pact, is and will be self-sufficient; however, in Western Europe, Norway is the only state which has some resources of molybdenum.

Oil. In the period 1969-1972, about 30 different companies carried out geological investigations with special regard to the possibility of oil and natural gas being found underground. These investigations showed that geological conditions for oil existed in many parts of Greenland's continental shelf, but that production costs in most parts would be unacceptably high. Investigations have continued but to date no oil has been found. Be that as it may, the search has just begun, and only a small percent of the continental shelf has been explored.

Exploration and Extraction of Resources in Greenland.

Minerals.

Cryolite. These resources have been known for centuries in Greenland. So far, 3.5 million tons have been extracted. The reserves allow for another 10 years of export of approximately 50,000 tons a year.

Lead and Zinc. There is a daily production of 1,650 tons, of which 4.3 percent is lead and 18.6 percent zinc. It is estimated that present resources will allow for this production another 10-14 years if no further resources are found.

Coal. Production of coal has been discontinued in Greenland and the cost to resume production is too prohibitive compared with the price on the world market. However, the known resources will at least provide Greenland with an important energy reserve should an emergency occur.

Iron. To be cost-effective, calculations show that at least 22 million tons of ore must be extracted each year. This amount of ore will give a concentrate of 68 percent iron. The extraction of the ore will require quite an investment, but the resources are there and extraction is under consideration.

Chromium. As long as chromium can be delivered from already existing mining facilities at existing prices, the chances for an extraction from Greenland are small. The amount of chromium outside Greenland is sufficient for at least 250 years—but production is possible if problems with delivery from existing sources occur.

Uranium. Because of the favorable location of the resources, uranium production would be possible on the "Kvanefjeld" where the ore could be extracted in an open mine. As there are only 300 grams in each ton of ore, the price of uranium on the world market must be at least \$20 per pound U₃O₈ before production is cost-effective. These prices have been reached today upon several occasions (e.g., in 1976 Western Nuclear sold uranium to Union Electric Company at a price of \$40 per pound). However, extraction has been delayed until it is determined whether nuclear plants will be used in Denmark in the future or not.¹⁶

Molybdenum. Even with the huge amount of molybdenum, it is doubtful whether production will be started or not. The fineness is only 0.25 percent and the resources are not easy to extract. Unless other kinds of resources are found with molybdenum ore, or other activities in the area will make extraction cheaper, production is not foreseen in the immediate future.

Oil. The search for oil has continued to penetrate the seabed beneath

one of the best fishing areas of Greenland. So far, no oil has been found.

In the early part of August 1977, the Danish Minister of State, Anker Jørgensen, faced a new protest demonstration during his visit to Greenland. The demonstration was based on catch phrases such as "This is our country—no doubt about that" or "Why oil activities in our fishing grounds?", etc. The demonstration was obviously organized by the left wing and was an outbreak of the activities discussed earlier.

Nevertheless, the government in Copenhagen (supported by the Greenland Provincial Council) had already decided to commence the exploration for oil. But after an accident and the following pollution from the Norwegian BRAVO drill rig in 1977, 11 of 17 Greenland Provincial Council members voted for a total stoppage of oil exploration until a completely safe system for exploration and exploitation had been found. This would, of course, have meant a stoppage of any exploration for oil, as such a system does not exist and probably cannot be developed.

The government in Copenhagen again decided that exploration should continue, mainly because of the rather bad economy in Denmark and the depressing outlook of the world's future energy resources.

The first oil concessions were granted on 1 April 1975. The lease conditions described earlier were favorable for Denmark, and six international groups (consisting of 24 companies) requested and obtained concessions. When so many companies are ready to gamble in the business of oil exploration off Greenland in spite of the very hard conditions, at least a partial reason must be the threatening lack of oil for the future in the world. All over the globe, companies are exploring for oil. That they are now exploring off Greenland does not mean that they will find any oil, but rather that they cannot afford to miss the chance of finding it. All companies,

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as well as Denmark, officially claim that no profit from any oil can be expected before 1985-90, if there is oil in the area at all.

What the political situation between Denmark and Greenland will be at that time is difficult to estimate, but only very few doubt that Greenland will have some kind of a home rule by then. Consequently, a number of matters which are now shared will be Greenland's responsibility alone and eventually profit from oil and other minerals will be used for different development projects and improvements for Greenland. This is the goal the Greenland Provincial Council is striving for. Whether, at that time young Greenland will wish to continue further pursuit of independence is anybody's guess.

One thing should be taken into consideration; those in Greenland who currently demand that all oil exploration be stopped will probably reverse their opinion the day oil starts to give them profit. Any realistic evaluation of the future of Greenland shows that only exploration for oil and minerals can give some kind of balance in the society. Hunting, fishing and present trade will never be able to do that.

One consolation for Denmark the day oil starts to pay off in Greenland will be that Danish taxpayers at least can retain the amount of money which is now granted to Greenland (for 1976 just over one billion Danish kroner).

However, oblivious of future problems between Denmark and Greenland and out of sight from the coast are the working drilling rigs. Several hundred holes might have to be drilled before oil is found. If a few dry holes appears discouraging for the reader, it is not so for the companies working on oil exploration.

The guidance for the future economic activity level and, hence, indirectly, for the importance of Greenland for Denmark's strategy and policy will be how the nations (Denmark and

Greenland) choose to balance the wanted extraction of Greenland's potential resources of energy and minerals with the necessary social and environmental consideration to the Greenland community and its future development.

One of the big questions in the coming years is what will be the long term consequences of the initial economic and commercial exploration of the resources of the Arctic region? The problem is to determine whether this exploration and economic activity has started a development which will drastically change the conditions for a continuous peaceful coexistence in the area and consequently change the balance of the existing powers.

Another question is whether the nations with interests in the polar area will be able to agree upon how to divide the area among themselves. The Soviet Union still claims that the area should be divided after the sector principle as the Antarctic is, while other nations work for the 200 nautical mile economic zones only. The latter idea is the most likely to be agreed upon, as this concept is accepted more and more throughout the world.

Will development in the area continue, or will there be even more antagonism and lack of cooperation between East and West over their interests in extraction of the potential resources of Greenland?

Conclusions

Based on the areas covered within political, strategic, economic and technological developments and tendencies, the following conclusions seem reasonable:

There is a risk of growing strategic, economic and political instability which could lead to a confrontation in the northern North Atlantic and in the polar regions between the superpowers as well as among NATO members. This

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risk can be minimized by awareness and sensible crisis management of this situation by responsible Danish and North American politicians as well as by NATO military planners.

The future development in and around Greenland is expected to increase the need for surveillance, control and assertion of sovereignty in peacetime as well as during periods of increased tension. This will, of course, increase the amount of necessary forces in the area and hence might increase the need for further negotiations and ratification of other bilateral agreements among the United States, Canada and Denmark.

The importance of the warning systems placed on Greenland cannot be neglected in the immediate future. The importance of these bases could be even more significant with the development of OTHBR (Over-The-Horizon-Backscatter-Radar) with a coverage which is unknown for the traditional radar.

Geographically, Greenland forms a part of the North American Continent. This, coupled with the fact that Greenland is of great importance to meteorological services and so to aviation and navigation in the North Atlantic, means that Greenland and the surrounding waters are of great strategic importance to the United States, Canada, and to the NATO alliance.

Military strategy in the North Atlantic stresses the importance of eastern Greenland (one of the two fronts in the area) with Greenland to the west and Europe to the east. As things are at present, ice may prevent conventional navigation along the eastern part of Greenland during many months of the year. In any case, control of this area will be of great significance in the event of a major conflict.

Because of its position at the center of industrial communities of the Northern Hemisphere, potential resources, and in view of future development of civilian and military technology, the

Arctic region is likely to play a major role in global economic and military strategy. As the northern part of Greenland forms one of the borders of the Arctic Ocean, the possession of this part of Greenland is likely to become a strategic advantage.

The growing economic exploitation of the resources of the Arctic areas of Canada is likely to create a growing Canadian interest in the future level of activities in the Arctic region, an interest which is likely to extend to developments in and around the neighboring Greenland, particularly as many of the initial Greenlandic offshore activities will be connected to waters in Davis Strait between Canada and Greenland.

It is obvious that the possibility of mining and extraction of the resources of oil, natural gas and other raw materials in Greenland is of strategic and security/political importance not only to Denmark, but to its allies as well.

The possibilities of exploiting the resources of Greenland and the special value of such materials as chromium, uranium, molybdenum and such energy resources as oil, natural gas and even hydraulic power can be expected to enhance the strategic, economic and commercial importance of the area to a greater extent than formerly visualized.

When evaluating the strategic importance of Greenland in the event of a global conflict involving the entire

BIOGRAPHIC SUMMARY



Commander Sørensen graduated from the Danish Naval Academy in 1967. He has served in the Royal Yacht, in HDMS *Peder Skram*, and as ASW Staff Officer of STANAVFORLANT. He is a

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Greenland area or parts thereof, it must not be forgotten that the defense of the area is closely bound up with the defense of the North American Continent. The size and position of Greenland preclude a purely national defense. For these reasons, it is essential to American, Canadian and Danish interests that clear, up-to-date and mutually acceptable guidelines and agreements exist for the defense of Greenland.

The overall conclusion is that the

development of Greenland—political as well as economic—must be of concern to the United States and Canada, as well as to Denmark. The many activities going on around Greenland certainly must have an influence on North American security and the realization of this influence is important to adopt while there is still the opportunity to influence the development in all aspects in order to retain Greenland as a part of the free world.

NOTES

1. Different sources give either the number 50,000 or 40,000 inhabitants. The most recent source gives the number to be 40,000. Mette K. Bjoernsen and Erik Hansen, *Facts About Denmark* (Copenhagen: POLITIKENS Forlag, 1976), p. 97.

2. U.S. Treaties, etc., *United States Treaties and Other International Agreements* (Washington: U.S. Dept. of State, 1973), Cumulative Index, v. 3, Country—Denmark, pp. 100-102.

3. *Ibid.*

4. Denmark's attitude on nuclear-free zones is not related to this peacetime political decision which prevents nuclear weapons in Denmark. Denmark is against the Finnish proposed nuclear-free zones in the Scandinavian countries (the so-called Kekkonen-Plan) as such an agreement would preclude Denmark from receiving nuclear weapon assistance from NATO in war. Niels Jørgen Haagerup, *Danmarks sikkerheds-politik* (Vedbaek: Forsvarskommandoen, 1976), p. 43.

5. Udenrigsministeriets Nyhedsoversigt, *Dansk-Canadisk Olie - beredskabsplan* (Copenhagen: Udenrigsministeriets presseog Kulturafdeling, Torsdag den, 11 August 1977, No. 153), p. 2.

6. Secretary of Defense, *Annual Defense Department Report FY 1978* (Washington: U.S. Govt. Print. Off., 1977), pp. 31-33.

7. M. Ovanesov and R. Sorokin, "The International Legal Regime of the Arctic," *Selected translations from Morskoy Sbornik* No. 6, 1973, pp. 92-96.

8. H.C. Bach and Jørgen Taagholt, *Grønland og polarområdet - sikkerhedspolitisk set* (Vedbaek: Forsvarskommandoen, 1976), p. 22.

9. *Ibid.*, p. 11.

10. O. Kelly, "Surprise Attack by Russia—Still Unthinkable?" *U.S. News & World Report*, 5 September 1977.

11. *Ibid.*

12. *Ibid.*

13. SRAM is not covered by SALT I agreements, as they were regarded as tactical weapons systems. However, the development of the cruise missile will probably change this point of view.

14. "Soviet Submarine 'Through the Backdoor'" (Sovjet-ubaade gennem bagdøren), *Weekendavisen Berlingske Aften*, 2 September 1977, p. 7.

15. On 1 January 1977 Denmark established a 200 nautical mile economic zone around the Faroe Islands and Greenland. The necessary inspection of this huge area will require quite a change in the Danish policy for fishery inspection. It has not yet been decided how this inspection will be done and who will do it but it is expected that it will be a combined effort of the Danish Navy and the Danish Air Force. The expected improvement of the inspection around Greenland will, of course, make it more difficult for nuclear submarines to operate and hide in the waters around Greenland.

16. The decision on whether nuclear plants are going to be used in the future in Denmark is, for the moment, a sensible political question. Most scientists in Denmark believe that Denmark has to decide for the nuclear plant and must do so as soon as possible. However, large numbers of people in Denmark are afraid of nuclear power and are pressing for a solution by plebiscite.