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FOREIGN TRIP REPORT

ORNL/FTR-2813

Date: February 19, 1988

Subject: Report of Foreign Travel of Jere P. Nichols, Group Leader, Engineering Technology Division

To: Alexander Zucker

From: Jere P. Nichols

Purpose: To participate in a team to investigate a consolidation and cost reduction program for Thule Air Base.

SITES VISITED:

1 to 5 February, 1988	Thule AB, Greenland	Col. William Pine, Base Commander Maj. Peter Blaise, Base Director of Engineering

ABSTRACT: Four members of the headquarters staff of the Air Force Space Command, Steve Cohn of ORNL, and the author visited Thule AB to investigate a plan for consolidation and cost reduction at the base. An example plan was developed to show how third-party financing might be used to consolidate, modernize, and increase the cost effectiveness of the base.

DISCLAIMER

UCN-2383A
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1. INTRODUCTION

As part of an existing Work-for-Others Program, the sponsor, Mr. Al Nixon of the Air Force Engineering and Services Center (AFESC), requested that ORNL (J. P. Nichols of Engineering Technology Division and S. M. Cohn of Energy Division) participate with a team that would visit Thule Air Base in Greenland to discuss a plan for a Base Consolidation and Cost Reduction Program. The ORNL work is sponsored by the AFESC at Tyndall AFB (Interagency Agreement Number 1489) under the U.S. Air Force Coal Utilization program, Task 6, B&R No. 47 01 48 99 6.

There were six numbers of the visiting team. Col. William Butler and Maj. Ted Wang of the XPX organization at HQ AFSPACECOM (Peterson AFB) are responsible for the development of plans for consolidation and cost reduction at the base. Mr. Michael Bratlien and Capt. Henry Rosoff of the DE organization at HQ AFSPACECOM are responsible for engineering aspects of the plan. Capt. Rosoff is directly responsible for a study of privatization — the use of private funds, repaid with a long-term lease — to modernize and increase the efficiency of the base. Steve M. Cohn of the ORNL Energy Division was responsible for explaining to the staff at Thule the basics of financing methods pertaining to privatization and to review information relating to the feasibility of privatization as the method for financing the consolidation and modernization of the base. The author was primarily responsible for gathering and reviewing information on the needs for improvement of electrical and thermal energy systems at the Base.

The purpose of the Thule Consolidation and Cost Reduction Program is to minimize the cost for operation of the base by efficiently adapting it to its present missions. Most base facilities were built 20 to 30 years ago for a Strategic Air Command flying mission that required a base population of 12,000 to 14,000. The base is now operated by the Space Command with two primary missions: (1) Missile early warning and satellite tracking with a new phased array radar system at the "J-Site," approximately 7 miles from the main base, and (2) satellite communications and control with new antenna and transmitter systems at the "Det. 3 site," approximately 2 miles from the main base. The main base is used for housing and logistical support through the airport and shipping port (the latter open only for two months during the summer).

These present missions are now accomplished with a base population of about 1300, but it is clear that the base population could be reduced even further because a substantial fraction of the total population is now required to maintain the old, oversized, widely distributed, and inefficient facilities. It is also clear that base operating costs could be reduced substantially through capital investments to consolidate and modernize the facilities. Since capital funds for Government Line-Item and Military Construction projects are increasingly difficult to obtain, methods for financing of the needed new projects with private capital funds are being investigated.

The following sections of this report will present names and affiliations of the contacts, the sequence of events during the visit, an example plan for base consolidation through privatization that was developed, comments on alternative energy systems, and possible follow-up activities at ORNL.

2. CONTACTS

Air Force Space Command (HQ AFSPACECOM), Peterson AFB, CO

1. Col. William Butler/XPX, Director of Planning
2. Michael D. Bratlien/DEOT, Deputy to Col. Richard Bauer, DEO at HQ AFSPACECOM.
3. Major Ted Wang/XPXI
4. Capt. Henry Rosoff/DEPD

1012 Air Base Group (1012th ABG), Thule

5. Col. William S. Pine/CC, Base Commander
6. Lt. Col. George L. Burrus/LG, Base Deputy Commander
7. Major Peter J. Blaise/DE, Base Director of Engineering
8. Capt. Bruce L. Willing/DEP, Plans and Engineering
9. 1 Lt. James A. Branch/SV, Base Services
10. MSgt. Frank Brown, Civil Engr. Monitoring (Elect. Power Plants)
11. MSgt. Ingianni, Civil Engr. Monitoring (Electrical)
12. TSgt. Kimmet, Civil Engr. Monitoring (Heating Plants)

12th Missile Warning Sqdn. (12th MWS), J-Site

13. Maj. David R. Stephens/CC

DET 3 Satellite Control/Communications Site

14. Maj. Ron Robert/CC
15. Capt. Pat Lee, Deputy

Greenland Contractors

16. Rasmus Lau, Site Manager and Senior Site Representative of Danish Arctic Contractors (DAC)
17. Aksel Pedersen, Manager, Civil Engineering at J-Site and Acting Base Civil Engineer.

3. SEQUENCE OF EVENTS

The six member team traveled to Thule via Military Airlift Command flights from and to McGuire AFB in New Jersey and were present at Thule

from approximately 1330 on Monday, 1 February until 1030 on Friday, 5 February. We toured and collected information on base facilities on Monday, Tuesday, and Wednesday. On Tuesday, Steve Cohn led a briefing on privatization for representatives of the base Air Force staff and the general contractor for operating and construction of the base (Greenland Contractors, owned by a consortium of Danish firms named Danish Arctic Contractors). On Thursday afternoon, Cohn again led a briefing on an example consolidation/privatization plan that was developed by the team for the base commander and senior representatives of Danish Arctic Contractors.

4. AN EXAMPLE PLAN FOR MODERNIZATION AND CONSOLIDATION THROUGH PRIVATIZATION

The team members sought to make a first, preliminary determination of privatization by constructing an example plan for modernization and consolidation of the base. Information for the example plan was obtained from visits to the facilities and References 1 through 9 that are listed at the end of this report.

Before and after information that was developed for the example plan is shown in Figs. 1 and 2 and Tables 1 through 4. The example illustrates that a capital investment of approximately $112,500,000 might result in an annual savings of operating and maintenance costs of approximately $32,500,000. The relatively short nominal payback period of 3.5 years indicates that there should be potential for financing of the modernization/consolidation projects with private funds.

5. ALTERNATIVE ENERGY SYSTEMS AT THULE

The Air Force desires that coal-fired plants for electric power generation and heating be considered at Thule to replace plants that are now fueled with arctic-grade diesel fuel. This option is worthy of more detailed consideration but does not presently appear to be attractive for the following reasons:

1. A new and efficient diesel-fueled power plant has recently been installed on the main base. This plant contains five new diesel generators with heat recovery each having a capacity of 3,000 kW(e) and equivalent boiler capacity of 270 horsepower. Thus, a new power/heating plant is not needed for the main base. A replacement power plant is required for the J-Site but coal-firing is not attractive for this application because of the rather large distance from the J-Site to the port and the very substantial existing facilities for storage and management of diesel arctic fuel.

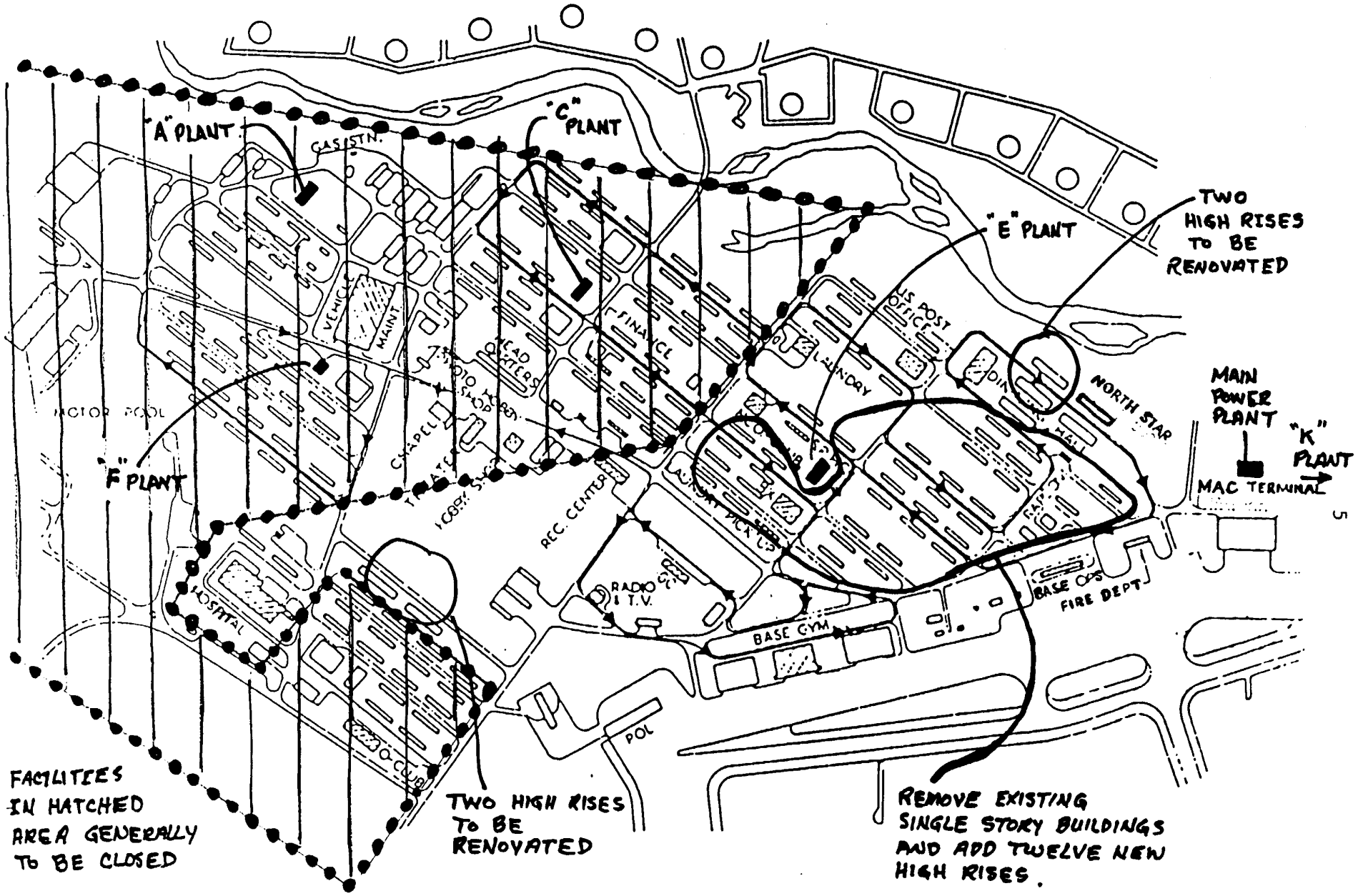

Fig. 1. Map of Thule main base showing one example of base consolidation.

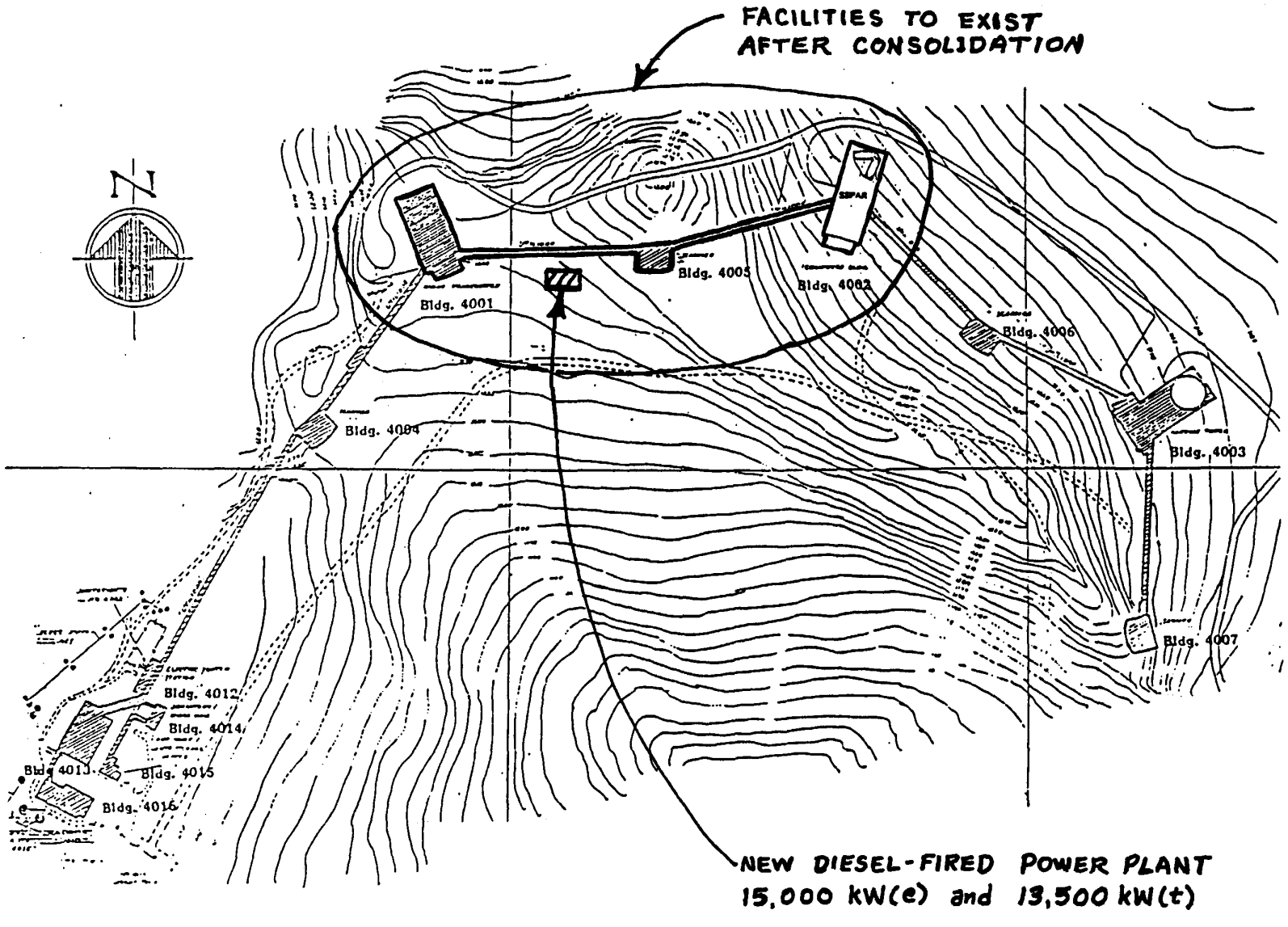

Fig. 2. Map of Thule J-Site showing facilities that would exist after one example of base consolidation.

Table 1. Fuel consumption at Thule AFB
(before consolidation)

	Fiscal year			
	85	86	87	88
Diesel Fuel Arctic, gal				
Main Base Power Plants	3,000,000[a]	3,000,000[a]	-	-
Main Base Heating Plants	4,200,000[a]	4,200,000[a]	-	-
Water Treatment Plant	110,000[a]	150,000[a]	-	-
Det. 3	220,000[a]	220,000[a]	-	-
J-Site	6,000,000[a]	6,000,000[a]	-	-
Total	15,000,000[a]	14,880,000[b]	-	-
JP-4, gal	4,700,000[a]	-	-	-
Mogas, gal	400,000[a]	-	-	-
Cost, $				
Diesel Fuel Arctic	-	12,120,000[b]	10,887,000[c]	8,000,000[c]
Mogas	-	-	656,000[c]	706,000[c]
Aviation POL (Other Than Flying)	-	-	33,000[c]	24,000[c]
Total[d]	-	12,120,000[b]	11,576,000[c]	8,730,000[c]

[a]Data extrapolated from Energy Vulnerability Analysis (Ref. 7).

[b]Data from DIAS Code (Ref. 9). Cost was $0.82/gal from October 1985 through August 1986, and $0.75/gal thereafter.

[c]Data from AFSPACECOM/DCS (Ref. 5) including estimates for FY 1988.

[d]Total fuel cost does not include cost of JP-4 aviation fuel (not paid by AFSPACECOM).

Table 2. Properties of electric power and heating plants before and after the proposed example of consolidation

	Present		Projected	
	Electricity [kW(e)]	Heating (bhp)[a]	Electricity [kW(e)]	Heating (bhp)[a]
Average Demand				
Main Base	6,500	1,600	4,000	800
J-Site	4,000	700	4,000	700
Total	10,500	2,300	8,000	1,500
Capacity				
Main Power Plant	15,000	1,400	15,000	1,400
Plants A, E, F, &K	(11,000)[b]	5,200	-	2,700
Units in 12 new buildings	-	-	-	1,200
J-Site Old Plant	17,000	1,300	-	-
J-Site new Plant	-	-	15,000	1,400
Total	32,000	7,900	30,000	6,700

[a] 1.0 bhp (boiler horsepower) = 10 kW(t) = 34 lbs steam/h.

[b] The diesel electric generators at these plants are on standby.

NOTE: One gal of diesel fuel produces approximately 13.2 kW(e)h in a diesel generator (32.5% efficiency), approximately 93.2 lbs steam [27.3 kW(t)h or 2.78 bhp] in a boiler (67.2% efficiency), or 13 kW(e)h plus 11.6 kW(t)h in a diesel electric unit with heat recovery (60.5% overall efficiency).

Table 3. Capital investment estimate for the example plan

	Capital Cost ($ 000)
1. Renovate four high-rise dorms	12,000
2. Construct 10 new high-rise dorms (each to house 60 persons and to be heated with two 50-hp oil-fired water heaters)	65,000
3. Construct two new high-rise office buildings	13,000
4. Construct new 15,000 kW(e) oil-fired power plant with heat recovery at J-Site.	22,500
TOTAL	112,500[a]

[a]Additional Government O&M funds are assumed to be used to accomplish part of the base consolidation work.

Table 4. Estimated population and operating and maintenance costs at Thule before and after the example of consolidation

	Present	Projected
Population		
USAF	180	165
Contractors		
Greenland Contractors/DAC	883	511
ITT/FSI	87	77
Raytheon	53	53
Ford Aerospace	65	38
Others	37	25
Miscellaneous	23	22
	1,328	891
Annual Operation and Maintenance Cost ($ 000)		
Military Personnel	6,900	6,300
Fuels	11,200	6,300
FSI Support	6,000	4,000
Greenland Contractors/DAC	23,000	8,000
Other	16,000	6,000
TOTAL	63,100	30,600

2. The diesel arctic fuel does not require heating because it has a freezing point of about -60°F, which is below the minimum normal temperature at Thule. Facilities for coal — including those for storage, crushing, conveying, and firing — would require a substantial investment for heating and insulation costs.

6. POSSIBLE FOLLOW-UP ACTIVITIES

Possible follow-up activities at ORNL for consideration by the Air Force Engineering and Services Center and the Air Force Space Command include the following:

1. An "Energy Audit". Perform engineering evaluations to determine, more precisely, the energy usage and wastage at Thule and savings that might result from consolidation, conservation, and the use of more modern technology.
2. Economic Analysis. Make more precise determinations of the savings in annual operating costs and life cycle costs that would result from capital improvements to (a) provide modern, energy efficient facilities for the mission-critical operations, and (b) eliminate excessive costs due to staff, housing, vehicles, and fuel for the operation and maintenance of the inefficient facilities.
3. Treatise on Privatization. Prepare a tutorial document that describes privatization, practical steps that would be required to make it happen, and how it can be beneficial for a private investor to build and lease new facilities to the Government.

7. REFERENCES

1. Col. Edward S. Moore II/DCS/Engineering and Services, HQ AFSPACECOM, "FY-88 '2809' Privatization Proposals (HQ AFESC/CC Msg., 291900Z Dec. 87)," Letter to HQ AFESC/DEQ (6 Jan., 1988).
2. 1012 Air Base Group, "Thule 2002 — An Action Plan for the Future — A Base Comprehensive Planning Initiative" (August 1985).
3. Col. Richard Bauer/DEO/HQ AFSPACECOM, "Thule Tomorrow — Long Range Development Study, 28 Sept. — 9 Oct. 1987" (9 Oct. 1987).
4. 1012 ABG/DP, "Thule Air Base Strength Report" (28 Jan. 1988).
5. Maj. Robert L. Graves/DCS/AFSPACECOM, Letter to DEPD (13 Jan. 1988).
6. Aksel Pedersen, Manager, Civil Engineering, BMEWS Site 1, "Greenland Contractors BMEWS Site 1 Consolidation" (December 1987).
7. Black and Veatch, Engineers-Architects, "Energy Vulnerability Analysis of Space Command Sites _ Thule AFB" (October 1986).
8. Black and Veatch, Engineers-Architects, "Energy Vulnerability Analysis of Space Command Sites — Clear AFS" (October 1986).
9. "Base and Input Data Report — FP 2573 — Thule AB — FY 1986 (25 Feb., 1987).

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