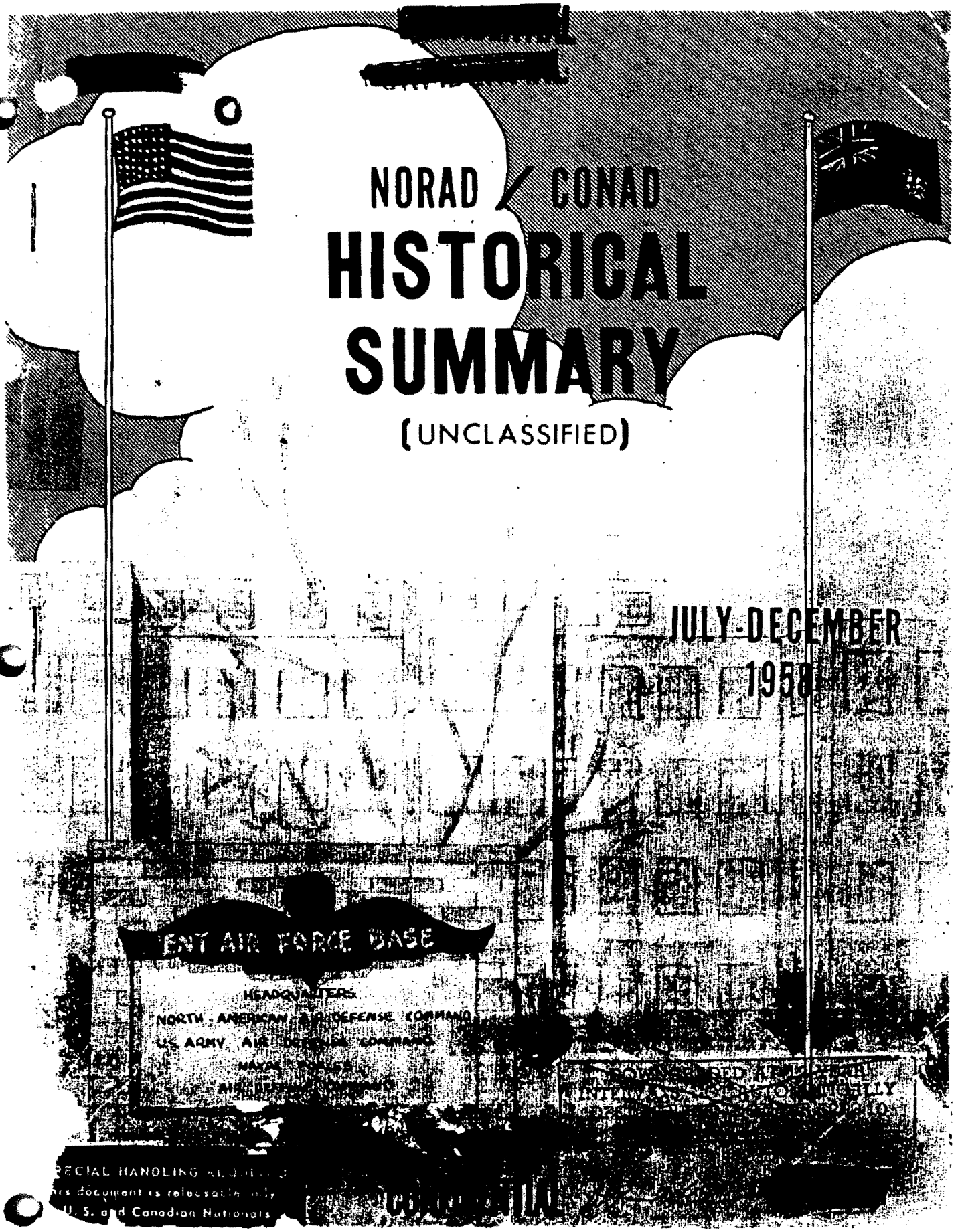
NORAD / CONAD
HISTORICAL SUMMARY

(UNCLASSIFIED)



JULY-DECEMBER
1958

DEC 14 2006

MEMORANDUM FOR HQ NORAD/USNORTHCOM/HO

FROM: HQ NORAD/J3

SUBJECT: Declassification Review of Histories

1. The NORAD/CONAD histories for the periods specified in your 30 October 2006 memo have been reviewed and are now declassified except for the following sections below. The justification for retaining the classification follows each description.

a. NORAD/CONAD Historical Summary, July—December 1958, page 65. (c) Document still has information based on today's concepts tactics and objectives.

b. NORAD/CONAD Historical Summary, July—December 1958, pages 110-111. (s) Document describes readiness conditions that are still valid today.

c. NORAD/CONAD Historical Summary, January—June 1959, pages 67-71. Document describes some current rules of engagement.

d. NORAD/CONAD Historical Summary, January—June 1959, pages 73 and 74. Document describes some current tactics and rules of engagement.

e. NORAD/CONAD Historical Summary, July—December 1959, pages 55-58. Document describes some current capabilities and procedures.

f. NORAD/CONAD Historical Summary, July—December 1959, pages 59-61. Document describes current rules of engagement.

g. NORAD/CONAD Historical Summary, January—June 1960, pages 37-39. Document describes readiness conditions that are still valid today.

h. NORAD/CONAD Historical Summary, January—June 1961, pages 23-26. Document describes some current tactics and rules of engagement and also could reveal information that would impact the application of state of the art technology.

i. NORAD/CONAD Historical Summary, January—June 1961, page 37. Document describes information that would impact the application of state of the art technology.

j. NORAD/CONAD Historical Summary, January—June 1962, pages 35 and 36. Document describes information that would seriously and demonstrably impair relations between the United States and a foreign government.

k. NORAD/CONAD Historical Summary, July—December 1962, pages 47 and 48. Document describes current tactics.

l. NORAD/CONAD Historical Summary, July—December 1963, pages 59 and 60. N/J3 does not have the authority to declassify these pages. Recommend deferring to NSA for resolution.

m. NORAD/CONAD Historical Summary, July—December 1963, pages 63-65. Document describes current capabilities and tactics.

n. NORAD/CONAD Historical Summary, January—June 1964, pages 57-

58. Document describes capabilities, limitations and deficiencies of warning systems.

o. CONAD Command History, 1968, pages 111 and 112. Document describes current limitations, tactics, and capabilities.

p. CONAD Command History, 1968, page 117. Document reveals current vulnerabilities of systems or projects relating to the national security.

q. CONAD Command History, 1968, pages 171-173. N/J3 doesn't have the technical expertise to evaluate the classification of Chapter VII, Communications. Please refer to N-NC/J6.

2. The POC for this review is Mr. Michael Allen, 4-3607.

BRETT D. CAIRNS
Major-General, CF
Director of Operations

NORTH AMERICAN AEROSPACE DEFENSE COMMAND
AND
UNITED STATES NORTHERN COMMAND

30 October 2006

MEMORANDUM FOR HQ NORAD/J3

FROM: HQ NORAD-USNORTHCOM/HO

SUBJECT: Declassification Review of Histories

1. HO requires the attached documents to be reviewed by 30 November 2006. Executive Order (E.O.) 12958, "Classified National Security Information," as amended by E.O. 13292 requires a review of classified documentation more than 25 years old. The attached documents have undergone prior declassification review, however, the E.O. requires that the still classified sections be reviewed again by the end of this calendar year, to prevent them from being automatically declassified.

2. The NORAD-USNORTHCOM History Office (HO) maintains NORAD, Continental Air Defense (CONAD), and Air/Aerospace Defense Command (ADCOM) histories, studies, and other documentation that fall into this category. In order to comply with the Executive Order, HO will forward these documents on a systematic basis to functional experts within the NORAD staff to complete this review.

3. During the review process, if any of the material within the documentation still requires protection, please mark those portions (e.g., words, phrases, sentences, paragraphs, pages) with red brackets([ ]). Justification must be rendered for any material that is determined to be exempt from the 25-year declassification process per E.O. 12958, as amended (E.O. 13292) Section 3.3 (b) -- An agency head may exempt from automatic declassification ... the release of which could be expected to:

-b(1) reveal the identify of a confidential human source, or a human intelligence source, or reveal information about the application of an intelligence source or method;

-b(2) reveal information that would assist in the development or use of weapons of mass destruction:

-b(3) reveal information that would impair U.S. cryptologic systems or activities;

-b(4) reveal information that would impair the application of state of the art technology within a U.S. weapon system;

-b(5) reveal actual U.S. military war plans that remain in effect:

-b(6) reveal information, including foreign government information, that would seriously and demonstrably impair relations between the United States and a foreign government, or seriously and demonstrably undermine ongoing diplomatic activities of the United States;

-b(7) reveal information that would clearly and demonstrably impair the current ability of United States Government officials to protect the President, Vice President, and other protectees for whom protection services, in the interest of the national security, are authorized;

-b(8) reveal information that would seriously and demonstrably impair current national security emergency preparedness plans or reveal current vulnerabilities of systems, installations, infrastructures, or projects relating to the national security; or

-b(9) violate a statute, treaty, or international agreement.

4. Once the declassification review is complete, please prepare a memorandum for the director's / vice director's signature, i.e., the directorate's Original Classification Authority (OCA), which states:

a. The CONAD/ADC/ADCOM/NORAD/USSPACECOM (as appropriate) history(ies) for the period(s) have been reviewed and are now declassified; or

b. The CONAD/ADC/ADCOM/NORAD/USSPACECOM (as appropriate) history(ies) for the period(s) have been reviewed and are now declassified except for the following sections: _____. The justification for retaining the classification is *(per paragraph 3)*.

5. Request the NJ3 staff review the attached documents per Executive Order 12958 and the instructions in paragraphs 2 and 3 above. HQ NORAD/HO POC is Patricia Goude at 4-5999. Please complete the review by 30 November 2006.

THOMAS FULLER
Command Historian

Attachments:

a. NORAD/CONAD Historical Summary Jul 58 to Dec 58 — p 65 remains (C); pp 110 & 111 remain (S)
Pages: 57-59, 64-66, 68, 69, 76, 89 (CONFIDENTIAL); 110, 111 (SECRET) pp. 57-59, 64, 66, 67, 69, 76, & 89 (U)

b. NORAD/CONAD Historical Summary Jan 59 to June 59 - all pages remain (C)
Pages: 67-71, 73, 74 (CONFIDENTIAL)

c. NORAD/CONAD Historical Summary Jul 59 to Dec 59 pp. 55-59 (55-56 (-), 57-58 S)
Pages: 55-65 (CONFIDENTIAL) pp. 59-61 remain (C)
pp. 62-65 (U)

d. NORAD/CONAD Historical Summary Jan 60 to Jun 60 pp 37-39 remain (C)
Pages: 37-39 (CONFIDENTIAL)

e. NORAD/CONAD Historical Summary Jul 60 to Dec 60 pp. 45-50 (U)
Pages: 45-50 (CONFIDENTIAL)

f. NORAD/CONAD Historical Summary Jan 61 to June 61
Pages: 20, 22-26, 28-32, 37-39 (CONFIDENTIAL)
pp 23-26 remain (c)
p. 37 remains (c) pp. 20, 22, 28-32, 38, 39 (u)

g. NORAD/CONAD Historical Summary Jul 61 to Dec 61
Pages: 17, 18 (CONFIDENTIAL)
pp. 17 & 18 (u)

h. NORAD/CONAD Historical Summary Jan 62 to Jun 62
Pages: 35, 36 (CONFIDENTIAL)
pp. 35 & 36 remain (c)

i. NORAD/CONAD Historical Summary Jul-Dec 62 / Apr 63
Pages: 47, 48 (CONFIDENTIAL)
pp. 47 & 48 remain (c)

j. NORAD/CONAD Historical Summary Jul 63 to Dec 63
Pages: 59, 60, 63-65 (SECRET)
pp. 59 & 60 - refer to NSA
pp. 63-65 remain (s)

k. NORAD/CONAD Historical Summary Jan 64 to Jun 64
Pages: 57, 58 (SECRET)
pp. 57 & 58 remain (s)

l. NORAD/CONAD Historical Summary Jan 68 to Dec 68
Pages: 6-10, 43, 44, 67-70, 81-88, 93-96, 98-122, 147-154, 159-162, 171-174
(CONFIDENTIAL/SECRET)
pp. 6-10, 43, 44, 67-70, 81-88, 93-96, 98-110, 113-116, 118-122, 147-154, 159-162, 174 (u)
pp. 111 & 112 remain (s), 117 remains (s)
pp. 171-173 refer to N-NC/JS

NORTH AMERICAN AEROSPACE DEFENSE COMMAND

SEP 2 1 2006

MEMORANDUM FOR HQ NORAD/USNORTHCOM/HO

FROM: HQ NORAD J3

SUBJECT: Declassification Review of Histories

pp. 81 & 85 declass per 21 Sep 06 memo

1. The CONAD/ADC/ADCOM/NORAD/USSPACECOM histories requested in your 19 May 06 memorandum have been reviewed and are now declassified except for the following sections (justification for retaining classification follows each description).

a. NORAD Historical Summary, Jan-Jun 1958, p. 56. N/J3 does not have the technical expertise to evaluate the classification level of the described communications architectures. Please refer this to N/NC J6 for evaluation.

b. NORAD/ADCOM Historical Summary, Jul-Dec 1959, p. 58. Document still contains information classified in CONPLAN 3310.

c. CONAD Command History, 1970, p. 78. Information classified per Ballistic Missile Early Warning System (BMEWS) Security Classification Guide (SCG).

d. CONAD Command History, 1971, p. 115. Information classified per BMEWS SCG.

e. History of Space Command/ADCOM/ADC, Jan-Dec 1982, pp. 25, 34. Document contains information still classified per the Defense Support Program SCG, and the BMEWS SCG.

f. History of Space Command/ADCOM, Jan-Dec 1984, p. 131. Please refer to N/NC J52 for declassification instructions.

g. History of Space Command/ADCOM, Jan-Dec 1984, p. 146. Information still indicates a potential vulnerability to National Defense.

h. History of NOARD, Jan-Dec 1986, p. 61. Document contains information classified in NI 10-4.

i. History of NORAD, 1990-91, p. 11. Source of the document is the National Defence Headquarters, Ottawa. Please refer to NDHQ for declassification instructions.

j. History of NORAD, 1990-91, p. 20, 29. Document contains information classified in CONPLAN 3310.

k. History of NORAD, 1990-91, p. 36. Please refer to SJTFHQ-N for declassification instructions.

l. History of NORAD, 1 Jan-31 Dec 1992, p. 69. Information still indicates a vulnerability and capabilities of adversary weapons systems.

m. History of NORAD, 1993-94, p. 97. Information classified per FPS 117 SCG and FPS 124 SCG.

2. N/J3 POC for this review is Lt Col Reilly, 4-3410.

BRETT D. CAIRNS
Major-General, CF
Director of Operations

SECRET (11)

NORTH AMERICAN AEROSPACE DEFENSE COMMAND
AND
UNITED STATES NORTHERN COMMAND

19 May 2006

MEMORANDUM FOR HQ NORAD/J3

FROM: HQ NORAD/USNORTHCOM/HO

SUBJECT: Declassification Review of Histories

1. Executive Order 12958 requires a review of classified documentation more than 25 years old. The materials attached have been reviewed during previous declassification reviews, but still retain a security classification. The following documents have been identified as potential enclosures for a NORAD historical supplement currently being prepared by the NORAD/USNORTHCOM History Office.

2. During the review process, if any material within still requires protection, please mark those portions (e.g., words, phrases, sentences, paragraphs, pages) with red brackets ([ ]). Along with this, please provide justification for retaining the security classification for these portions.

3. Once the declassification review is completed, please prepare a memorandum for the director's / vice director's signature which states:

a. The CONAD/ADC/ADCOM/NORAD/USSPACECOM (as appropriate) history(ies) for the period(s) have been reviewed and are now declassified; or

b. The CONAD/ADC/ADCOM/NORAD/USSPACECOM (as appropriate) history(ies) for the period(s) have been reviewed and are now declassified except for the following sections: _____. The justification for retaining the classification is: _____.

4. Request the NJ3 staff review the following documents per Executive Order 12958 and the instructions in paragraphs 2 and 3 above. Please complete the review by 30 September 2006.

a. CONAD Historical Summary, Jul 1956-Jun 1957, p. 80.
b. CONAD and NORAD Historical Summary, Jul-Dec 1957, p. 128.
c. NORAD Historical Summary, Jan-Jun 1958, pp. 45-46, 48-49, 56, and 58.
d. NORAD and CONAD Historical Summary, Jul-Dec 1958, pp. 81 and 85.
e. NORAD and CONAD Historical Summary, Jan-Jun 1959, p. 72.

except p.128 per Sept 06 memo

except P 56 per Sept 06 memo

SECRET (11)

SECRET (U)

part of page remains classified

f. NORAD and CONAD Historical Summary, Jul-Dec 1959, p. 58.
g. NORAD and CONAD Historical Summary, Jan-Jun 1961, p. 49.
h. NORAD and CONAD Historical Summary, Jul-Dec 1961, p. 32.
i. CONAD Command History, 1968, pp. 5 and 97.
j. CONAD Command History, pp. 78, 97, and 114.
k. CONAD Command History, pp. 115, 126, 131, and 137.
l. CONAD Command History, p. 106.
m. History of ADCOM, 1 Jul-31 Dec 1975, pp. 55-56.
n. History of ADCOM/ADC, 1 Jan-31 Dec 1979-80, p. 58.
o. History of Space Command/ADCOM/ADC, Jan-Dec 1982, pp. 25 and 34.
p. History of Space Command/ADCOM, Jan-Dec 1983, pp. 94-96, 100, and 128.
q. History of Space Command/ADCOM, Jan-Dec 1984, pp. 131, 139-140, 146, 158, and 179.
r. History of U.S. Space Command/ADC/AFSPACE, 1 Jan-31 Dec 1985, pp. 21 and 178.
s. History of NORAD, Jan-Dec 1986, pp. 25, 61-65, and 68.
t. History of NORAD, Jan-Dec 1987, pp. 26-28, 100, 103-104, and 107.
u. History of NORAD, Jan-Dec 1988, pp. 85, 106, 108-110, and 113.
v. History of NORAD, Jan-Dec 1989, pp. 232, 234-237, and 240.
w. History of NORAD, 1990-1991, pp. 11, 14-15, 17, 20, 22-23, 29, 36, 49, 91, and 126.
x. History of NORAD, 1 Jan-31 Dec 1992, pp. 43, 69, and 96.
y. History of NORAD, 1993-1994, pp. 107 and 163.
z. History of NORAD, 1995, p. 97.

5. HQ NORAD/HO/POC is the undersigned, Mr. Jerry Schroeder, 4-3385/5999.

Jerome E. Schroeder
Deputy Command Historian

THIS MEMORANDUM IS UNCLASSIFIED WHEN ATTACHMENTS ARE WITHDRAWN.

(U)
SECRET

NORTH AMERICAN AEROSPACE DEFENSE COMMAND

[redacted]

RELEASABLE TO CANADA-US

MEMORANDUM FOR HQ NORAD/USSPACECOM/HO

5 JUN 1993

FROM: HQ NORAD/J3

SUBJECT: Declassification Review of Histories

1. The North American Air Defense Command Historical Summary for the period of January to June 1958, has been reviewed and is now declassified except for the following pages: 29, 30, 33, 34, 35, 37, 38 and 39-61 inclusive. These pages should retain a classification of Confidential due to the details of radar coverage discussed therein. Pages 88, 89 and 90 should retain a classification of Secret as this information is so classified in CONPLAN 3310-96.

2. The NORAD /CONAD Historical Summary for the period of July to December 1958 has been reviewed and is now declassified except for the following pages: 57, 58, 59, 64, 65, 66, 69, 76, 81, 85 and 89 should retain a classification of Confidential and pages 110 and 111 should retain a classification of Secret as this information is so classified in CONPLAN 3310-96.

K. McDonald

G. KEITH McDONALD
Major-General, CF
Director of Operations

2 Attachments
1. North American Air Defense Command, History Summary, January – June 1958
2. NORAD/CONAD, Historical Summary, July – December 1958

THIS MEMORANDUM IS UNCLASSIFIED WHEN ATCHS 1 & 2 ARE WITHDRAWN

[redacted]

RELEASABLE TO CANADA-US

FOR THE COMMON DEFENCE *POUR LA DEFENSE COMMUNE*

NORTH AMERICAN AEROSPACE DEFENSE COMMAND

[redacted]

RELEASEABLE TO CANADA-U.S.

MEMORANDUM FOR HQ NORAD/J3 23 April 1998

FROM: HQ NORAD/USSPACECOM/HO

SUBJECT: Declassification Review of Histories

1. Executive Order 12958 requires a review of classified documentation more than 25 years old. The NORAD/USSPACECOM History Office (HO) maintains NORAD and Continental Air Defense Command histories, studies, and other documentation that falls into this category. In order to comply with the Executive Order, HO will forward these documents on a systematic basis to functional experts within the NORAD staff to complete this review.

2. During the review process, if any of the material within the documentation still requires protection, please mark those portions (e.g. words, phrases, sentences, paragraphs, pages) with red brackets ([ ]). Along with this, please provide the justification for retaining the security classification for these portions.

3. Once the declassification review is completed, please prepare a memorandum for the director's/vice director's signature which states:

a. The CONAD/ADC/ADCOM (as appropriate) history(ies) for the period(s) have been reviewed and are now declassified; or

b. The CONAD/ADC/ADCOM (as appropriate) history(ies) for the period(s) have been reviewed and are now declassified except for the following sections: . The justification for retaining the classification is:

4. Request the NJ3 staff review the following documents per Executive Order 12958 and the instructions in paragraphs 2 and 3 above. Please complete the review by 29 May 98.

a. North American Air Defense Command, Historical Summary, January -Jun 1958

b. NORAD/CONAD, Historical Summary, July - December 1958

5. HQ NORAD/HO POC is the undersigned to Mr. Schroeder, 4-5999/3385.

THOMAS FULLER
Command Historian

2 Atch
1. North American Air Defense Command, Historical Summary, January - June 1958
2. NORAD/CONAD, Historical Summary, July - December 1958

THIS MEMORANDUM IS UNCLASSIFIED WHEN ATCHS 1 & 2 ARE WITHDRAWN

PLEASE TREAT ATCH #1 AS "[redacted]" DURING THE REVIEW PROCESS

FOR THE COMMON DEFE[redacted]UR LA DEFENSE COMMUNE

[redacted]

RELEASEABLE TO CANADA-U.S.

NORTH AMERICAN AIR DEFENSE COMMAND and

CONTINENTAL AIR DEFENSE COMMAND

HISTORICAL SUMMARY

July - December 1958

Directorate of Command History
Office of Information Services
Headquarters NORAD/CONAD

SECURITY NOTICE

CLASSIFICATION

This document is classified SECRET in accordance with paragraph 30b (2), AFR 205-1, and Canadian Air Publication 425. It will be transported, stored, safeguarded, and accounted for as directed by AFR 205-1, AR 380-5, OPNAV Instruction 5510.1A, CAP 425, CAO 255-1, and CBCN 5101.

WARNING

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- It will be used only for purposes of national security.
- Individual or corporate rights originating in the information, whether patented or not, will be respected.
- The information will be provided substantially the same degree of security afforded it by the Department of Defense of the United States and the Department of National Defence of Canada.

PREFACE

This historical summary is one of a series of semi annual reports on the North American Air Defense Command and Continental Air Defense Command. Its purpose is two-fold. First, it provides a ready reference to NORAD and CONAD activities by bringing together in a single document the key data found in several hundred documents. Secondly, it records for all time the activities of NORAD and CONAD during the period of the report.

The source materials from which this history was written are on file in the historical office and are available for use by all authorized persons. For security reasons, a list of the documents is not included with this history.

Colorado Springs, Colorado
15 April 1959

L. H. BUSS
Director of Command
History

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MAPS

TABLES

[redacted]

[redacted] CHAPTER I

Proposed NORAD/CONAD Reorganization

DEFENSE REORGANIZATION ACT

During the period of this report, July to December 1958, an overhaul of the Defense Department was started. This involved new concepts, new channels of command, and shifts in authority. This realignment and reorganization, which would take some time to complete, was required by the Department of Defense Reorganization Act of 1958. To carry out this legislation, a number of Department of Defense and Joint Chiefs of Staff directives had to be rewritten. This act and other pertinent directives are considered briefly as a basis for a discussion of the proposed NORAD/CONAD reorganization.

On 3 April 1958, the President of the United States went before Congress to propose a reorganization of the Department of Defense. The President stated that what he wanted to achieve and what was absolutely essential was that there be complete unity in strategic planning and basic operational direction. It was mandatory, he declared, that the initiative for this planning and direction not be with the separate services, but that it be with the Secretary of Defense and his operational advisers, the Joint Chiefs of Staff. This unified effort should apply, he said, not only to long range planning, but also to command over military operations.

To accomplish this unity in planning and direction, the President outlined a number of requirements. He asked that all doubts be removed as to the full authority of the Secretary of Defense. He asked that the military staff of the Secretary of Defense be increased to provide him and the President with the professional help needed for strategic planning and operational direction of unified commands.

He asked that command channels be cleared so that orders could go directly from the Commander-in-Chief and Secretary of Defense to the commanders of unified commands. Every additional

[redacted]

[redacted]

level between these commanders and the President caused delay, confusion, and diffusion of responsibility, he said. Under the current system, the channel ran from the President to the Secretary of Defense, then to the Secretary of one of the service departments, then to a chief of the service, and then to the unified commander. President Eisenhower said that he considered this chain cumbersome and unreliable in time of peace and unusable in time of war.

He stated that, accordingly, he had directed the Secretary of Defense to discontinue the use of military departments as executive agencies for unified commands.*

Lastly, the President asked that the fighting forces be organized into operational commands that were truly unified. He told Congress that:

> Our unified commands (by which term I also include the joint and specified commands which exist today) are the cutting edge of our military machine -- the units which would do the fighting. Our entire defense organization exists to make them effective. ... Because I have often seen the evils of diluted command, I emphasize that each unified commander must have unquestioned authority over all units of his command. Forces must be assigned to the command and be removed only by central direction, by the Secretary of Defense or the Commander-in-Chief, and not by orders of individual military departments.

These requirements for achieving unified strategic planning and operational direction were, for the most part, provided for by Congress in the reorganization act. This became law on 6 August 1958.

Secretary of Defense authority was clarified and strengthened by the provision that each military department would be separately organized (rather than administered as had been previously provided)

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* See page 7.

under its own secretary and would function under the direction, authority, and control of the Secretary of Defense. The department secretaries and their assistants were responsible for cooperating fully with the Office of the Secretary of Defense to achieve efficient administration and effective direction, authority, and control by the Secretary of Defense.

The military chiefs of the services were to exercise supervision (rather than command) over such members and organizations of the services as the civilian secretary determined. And this supervision was to be exercised in a manner consistent with the "full operational command" vested in unified or specified commanders.*

Finally, the act provided that unified and specified combatant commands would be established by the President with the assistance of the JCS and through the Secretary of Defense. Such commands were to be responsible to the President and Secretary of Defense for the strategic missions assigned to them by the Secretary of Defense with the approval of the President. The President would also determine the force structure of these commands. The forces were to be assigned by the service departments. These forces were then to be under the full operational command of the unified or specified commander. No forces could be removed except as authorized by the Secretary of Defense with the approval of the President. Normally, each military department would be responsible to the Secretary of Defense for administration of the forces assigned from its department to the unified or specified commands.

DOD FUNCTIONS DIRECTIVE

Passage of this act made it necessary to revise existing directives on functions and responsibilities of the Department of Defense. A basic directive was the statement of functions of the DOD, the latest one of which was issued in March 1954. A new functions directive was issued by the Secretary of Defense on 31 December 1958.

This directive provided that commanders of unified and specified commands were responsible to the President and the Secretary

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* For definition, see Page 5.

of Defense for the missions assigned. The chain of command ran from the President to the Secretary of Defense and through the JCS to the unified and specified commanders. The latter were to have full operational command over the forces assigned to them.

The JCS were to serve as advisers and as military staff in the chain of operational command for unified and specified commands and provide a channel of communications from the President and Secretary of Defense to these commands. The JCS were to be responsible for preparing strategic plans and providing for the strategic direction of the armed forces, including the direction of operations conducted by unified and specified commands. They were also responsible for any other functions of command as directed by the Defense Secretary. The JCS were to review the plans and programs of commanders of unified and specified commands to determine their adequacy, feasibility, and suitability. Also of interest was the fact that the JCS were to determine the headquarters support required by unified and specified commanders and to recommend the assignment of responsibility for giving such support.

UNIFIED COMMAND PLAN

A new unified command plan was issued by the JCS on 8 September 1958. In this plan, CONAD was listed as a unified command.* The plan provided that CINCONAD would be the commander of a unified command comprising all forces assigned for the accomplishment of his missions. CINCONAD was to be responsible to the Secretary of Defense, then the JCS.

FULL OPERATIONAL COMMAND

Congress did not define the full operational command given to unified and specified commanders. The only place, upon passage of

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* CONAD had always been a joint command, for this had been considered the best arrangement for CONAD's functional mission carried out on a geographic basis. For a discussion of joint versus unified command arrangements for CONAD, see CONAD Historical Summary, July 1956-June 1957, pp 1-3.

the act, where even a quasi-official definition could be found was in a House of Representatives report, dated 22 May 1958, which explained the legislation. The definition given by the House report was exactly the same as the definition for operational control which had existed for years.*

A definition for operational command was approved by the Secretary of Defense early in 1959 and it and accompanying specific authority guidance was made effective 2 February 1959. The definition of operational command was similar to the existing definition of operational control. The two are compared.

Operational Command	Operational Control
Those functions of command over assigned forces involving the composition of subordinate forces, the assignment of tasks, the designation of objectives, the over-all control of assigned resources, and the full authoritative direction necessary to accomplish the mission.**	Those functions of command involving the composition of subordinate forces, the assignment of tasks, the designation of objectives, and the authoritative direction necessary to accomplish the mission.

Along with this definition, the Secretary of Defense approved a statement of specific guidance for unified and specified commands. These commands were authorized to:

a. conduct joint training exercises and establish training policies for joint operations;

b. exercise directive logistics authority (the services to have responsibility for logistical support of component commands);

c. establish personnel policies required to insure uniform standards of military conduct;

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* For example as found in Joint Action Armed Forces, 19 September 1951.

** Italics mine.

d. exercise directive authority over all command elements in relationships with foreign governments, including the armed forces thereof, and other agencies of the U. S. government;

e. establish and coordinate intelligence matters;

f. review budget recommendations of component commands to their services to assure agreement with plans and programs; and

g. plan for, deploy, direct, control, and coordinate the actions of assigned forces.

The paper also provided that unified commanders would exercise operational command through the service component commanders or through the commanders of subordinate commands (when such commands were established by the unified commander).

TERMS OF REFERENCE FOR CINCONAD

New terms of reference for CINCONAD, as commander of a unified command, were approved by the JCS on 31 December 1958 and made effective on 1 January 1959. The terms provided that CINCONAD was the senior U. S. officer in Headquarters NORAD. In the absence of CINCONAD, his U. S. responsibilities were to be discharged by the next senior U. S. officer.

CINCONAD's missions and tasks remained essentially the same as those prescribed in the preceding terms: defending U. S. installations in Greenland against air attack, assisting in the air defense of Mexico in accordance with approved plans and agreements, handling purely national matters pertaining to air defense, and supporting other commands in their missions.

ASSIGNMENT OF FORCES TO CONAD

The Defense Reorganization Act provided that the forces making up unified and specified commands would be assigned to these commands, that these forces would then be under the operational command of these commands, and that no forces could be removed

without Secretary of Defense approval. Accordingly, on the same dates that the unified and specified commands shifted to JCS control, the combat forces were transferred. For CONAD, this date was 1 January 1959. To CONAD went 62 battalions of the Army, ten ships (DER's) and one-fourth AEW squadron (blimps) of the Navy, and 60 fighter-interceptor squadrons of the Air Force.

These forces represented what the JCS considered to be the forces available at that time. It was not accurate for CONAD, however. It left out, for example, the YAGR-type radar ships of the Navy, the AEW&C squadrons of the Air Force, and the ground-based radar units of the Air Force.

TERMINATION OF THE EXECUTIVE AGENCY SYSTEM

The President stated to Congress on 3 April 1958 that he had directed the Secretary of Defense to discontinue the use of military departments as executive agencies for unified commands.

The executive agency system was not actually discontinued until some months later, however. A phased transfer was made after passage of the Reorganization Act, issuance of a new unified command plan, and a reorganization and staff build-up of the JCS. The dates of transfer were as follows: for U. S. European Command, 15 September 1958; for Alaskan Command and Caribbean Command, 1 December 1958; and for Continental Air Defense Command, Strategic Air Command, Atlantic Command, Pacific Command, and U. S. Naval Forces, Eastern Atlantic and Mediterranean, 1 January 1959.

ASSUMPTION OF OPERATIONAL COMMAND

By general order, effective 1 January 1959, CINCNORAD assumed operational command over ARADCOM, NAVFORCONAD, USAF ADC, the air defense forces of these commands, and over all other U. S. air defense forces that might be assigned to NORAD.

A similar general order was not issued for assumption of operational command by CINCONAD. There were two reasons for this:

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* As of 1 December 1958, Alaskan Command was assigned two Army battalions and three fighter-interceptor squadrons.

the thinking at Headquarters NORAD/CONAD that since CINCNORAD and CINCONAD were one and the same person, a separate general order was unnecessary and redundant, for the CINCONAD authority was incorporated within CINCNORAD; and the desire of CINCNORAD that NORAD be the important, predominant command, that there be no separate CONAD organization, and that CONAD affairs be handled by U. S. members of the NORAD staff. This matter had not been settled definitely, however. The distinction between NORAD and CONAD was yet to be determined.

PROPOSED REORGANIZATION OF HEADQUARTERS NORAD/CONAD

Just prior to passage of the Defense Reorganization Act, preparations were started at Headquarters NORAD/CONAD for drawing up a reorganization plan to meet the new law. On 24 July 1958, General Partridge established an ad hoc committee to prepare a plan for what he termed the "United States Forces, NORAD," which was to take the place of CONAD. The committee was made up of senior officers from NORAD/CONAD and each component command headquarters.

The tasks of the committee included determining USFORNORAD functions and recommending elimination of duplicating component functions, developing a command headquarters and subordinate headquarters organization, and determining functions of subordinate USFORNORAD organizations.

Among the criteria provided for use as guidelines were that the service components were to continue to exist, USFORNORAD would have direct command over the U. S. components, and that the components would conduct training, administration, and logistic support of USFORNORAD.

It very soon became obvious that attempting to reorganize the entire command in one gulp was too much. Efforts were concentrated on a plan for the headquarters only. By 15 August 1958, this ad hoc committee produced a very general statement of functions and organizational structure for USFORNORAD. Shortly thereafter, the unified command plan was issued by the JCS which continued the command designation of CONAD, and the term USFORNORAD was dropped.

The work of the ad hoc committee (which was now disbanded) became the basis for the next step. A working group was formed to

closely examine the realignment of functions, using the ad hoc group's statement as a starting point.

CONAD advised the components in September that this working group would examine the functions performed by the different headquarters at Ent Air Force Base, determine whether a component or NORAD/CONAD should perform a function, determine to what degree NORAD/CONAD should perform a function, and determine the number of spaces to come to NORAD/CONAD. A tentative schedule was made in September under which the NORAD/CONAD organization was to be implemented on 1 January 1959.

CONAD also advised the components that it interpreted the combatant forces, over which the Defense Reorganization Act gave operational command, to mean the operational units assigned, their integral headquarters and supporting elements, and their component headquarters.

By 20 October, a proposed organization and functions plan for Headquarters NORAD/CONAD had been prepared and sent to the component commands. This plan contained the proposed structure, functions, and manpower.

The guidelines approved by CINCNORAD for this plan were as follows:

a. CINCNORAD/CONAD would have full authority to direct, control and coordinate the operational activities of assigned forces and the logistics essential to accomplish the mission.

b. Component operational and planning functions might have to be realigned, consolidated, or absorbed by NORAD/CONAD to prevent duplication and to increase efficiency.

c. Manpower spaces for absorbed functions should remain within current authorizations for both component and NORAD/CONAD Headquarters.

d. Manpower spaces taken from components should equal the magnitude of the functions taken.

The headquarters staff established by this plan provided for a NORAD side under a chief of staff for operations who would have

under him deputies for operations, plans, communications and electroncis, and intelligence; and a CONAD side under a chief of staff for administration, training, and logistics. The latter would have under him a "J" staff which would include personnel, operations, logistics, and fiscal affairs.

Not one component agreed with the proposal. Both ARADCOM and NAVFORCONAD said that NORAD/CONAD was interpreting the reorganization act and DOD and JCS directives incorrectly. Much greater authority was being assumed than was actually given, they said. Both commands declared that too much was being taken and too little left.

ARADCOM wrote that:

> The proposed reorganization does not show residual functions of component commands. Contrarily, it provides for absorption by NORAD of functions and personnel to perform these functions. The net effect is that all authority and responsibilities of CINCNORAD/CINCONAD are assigned as functions to the NORAD/CONAD staff and are exercised through NORAD subordinate commanders. The only responsibilities of component commanders are those derived from their respective services. ... The significance of greatest importance to this headquarters is that its mission remains the same, while it is apparently without functions to perform in support of the unified command, since the training of units prior to assumption of an on-site role is a responsibility of CONARC.

NAVFORCONAD echoed these words:

> The paper did not appear to spell out the residual functions left to the component commands. In fact, the size and scope of the organization seems to leave little or nothing for the components to do other than to pass on to their commands directives from the headquarters staff on matters concerned with training, logistic support, and operational readiness.

The USAF Air Defense Command took an entirely different approach: the proposal did not go nearly far enough in absorbing functions and people. ADC recommended a highly centralized,

monolithic type of organization. Two steps were proposed to achieve it. First, on 1 January 1959, the three component command headquarters would be eliminated and three U. S. Vice Commanders to CINCONAD/CINCNORAD would be established. These Vice Commanders would advise the commander-in-chief, exercise direction through the unified staff to the component elements, and maintain contact with the military departments. Then, six to twelve months later, the three Vice Commanders would be eliminated.

While these component command comments were under consideration, a new staff structure for Headquarters NORAD/CONAD was approved by General Partridge. The idea of having a NORAD and a CONAD side, each with four sections, was dropped.

Two chiefs of staff remained (one for administration and logistics and one for operations), but they were brought together to have authority flow through both. Under the previous plan, both the NORAD and the CONAD side had operations sections. Under the new plan, the operations sections were combined. Seven sections remained: J-1, Personnel; J-2, Intelligence; J-3, Operations; J-4, Logistics; J-5, Plans and Policy; J-6, Communications and Electronics; and Programs (there was also a secretariat and an information services). Those matters that were purely U. S., or CONAD, were to be handled by the U. S. personnel that would be in each staff agency of the headquarters. This would simply be a continuation of the procedure currently used at NORAD/CONAD Headquarters.

On 5 December 1958, NORAD replied to each component that the "Commander-in-Chief has considered your comments...and has made the decision to proceed with plans for the reorganization of this headquarters in general accordance with the revised staff structure...."

General Partridge wanted to complete the plans for reorganization by 10 December 1958. To finish up the plan, another ad hoc committee of component and NORAD/CONAD representatives was formed. This committee was to refine the functional statements and manpower space requirements, determine the functions to be left to the components, and develop a schedule for the transfer of functions and manpower spaces.

A new organization and functions proposal was completed on 15 December and submitted to the JCS. Submission of a reorganization plan had been asked by the JCS on 4 December. The JCS stipulated

that reorganization would not be implemented until approved by them.

This plan differed from the one of 20 October mainly in that it was geared to the new staff structure, which resulted in a different alignment of functions, manpower spaces, etc. Also, unlike the preceding plan, this plan carried no manpower space requirements. This was left for separate submission. However, in the overall scope, in the extent of functions absorbed, and in the number of manpower spaces that would be required to be taken, this plan was essentially the same as that of 20 October.

NORAD explained to the JCS that in preparing its plan it had these principles and objectives in view:

a. NORAD will be predominant; specifically, the NORAD commander will have unquestioned authority over all assigned forces and will write the effectiveness reports or rate subordinates on their performance in his area of responsibility, as well as approve the appointments of subordinates and request their replacement for cause.

b. Certain specific functions in the areas of operations, plans and requirements, communications and electronics, intelligence and systems integration, which are now being performed in part by the components, will be consolidated and absorbed by NORAD.

c. To fulfill additional manpower requirements occasioned by the absorption of functions, appropriate reallocation of manpower spaces from the component headquarters will be made, consistent with the magnitude of the functions absorbed.

d. There will not be a separate CONAD organization. CONAD actions essential to fulfill U. S. requirements will be accomplished by the U. S. members of the NORAD organizations.

e. U. S. Service responsibilities -- administration, training and logistics -- are technical matters and will be handled by appropriate Service elements, in a manner responsive to the needs of NORAD commanders at all levels.

[redacted]

SUMMARY

The JCS did not approve the NORAD/CONAD reorganization proposal by 1 January 1959 and there was no reorganization by this date. A number of actions did take place on 1 January, as discussed in separate sections of this chapter. Briefly, these were:

1. The termination of executive agency control by the Air Force and the shift to control by the JCS.

2. The establishment of CONAD as a unified command with new terms of reference.

3. The assumption by CINCNORAD of operational command over the component commands and their forces. *

4. The assignment of the Services' combat forces to CONAD.

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* See Page 7.

CHAPTER 11

Region/Division Organization

SAGE GEOGRAPHIC REORGANIZATION PLAN

The first SAGE air defense sector, New York, became operational on 26 June 1958, the second one, Boston, on 15 September 1958.* For the next few years, SAGE installations all over the country would be phased into the air defense system, replacing the manual system. During this transition, the manual system would be operating everywhere that SAGE was not operating. Also, to accommodate the SAGE system, the geographic structure would have to be altered. To realign boundaries and to avert problems arising from coexistence of manual and SAGE operations, NORAD prepared a reorganization plan. The stated purpose was to provide a means for the orderly transition and phasing from the manual to the SAGE system.

NORAD completed its plan on 25 July 1958 and sent it to the components for comment. Under this plan, there were to be eight SAGE divisions -- seven in the U. S. and one in Canada (the solid state computer program would change this, see Chapter Three). These divisions were to be directed from NORAD Headquarters. The existing region headquarters, which were not to get SAGE computers, were to be phased out when SAGE was implemented.

To ease the transition, NORAD proposed to organize the current manual boundaries to conform to the SAGE boundaries as soon as possible. This would mean inactivation of certain manual divisions as soon as possible, the establishment of SAGE divisions, and the consolidation of areas of responsibility.

The Canadian SAGE division was designated the 35th in NORAD's plan. The 1st, 2d, and 3d Divisions were to be consolidated into

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* These sectors were in the 26th SAGE Division area which became operational on 1 January 1959 -- the first SAGE division.

the 35th when practicable. When the latter became operational under SAGE, the Bangor Sector was to be detached from the 26th NORAD Division and attached to the 35th. Although not explicitly stated, it was inferred in NORAD's plan that the Northern NORAD Region should be disbanded. The 35th Division (later to be a region) would incorporate the 1st, 2d, 3d and 64th Divisions and the Bangor Sector and take the place of the region. The 5th Division area was to be incorporated into the 25th Division.

NORAD asked in its plan for recommendations on the dates for disestablishment of the Eastern, Central and Western Region/Defense Forces. The components were told that, although the plan was not finally approved, they could go ahead with realignment of component boundaries consistent with the plan. NORAD told its field commanders about the plan on 21 August 1958.

All four component commands concurred with the plan. USAF ADC objected to a minor point, but this was resolved informally.* NAVFORCONAD recommended that the seaward element impact on the reorganization be determined and that the organization include use of contiguous surveillance data. ARADCOM said, at first, that it did not plan to realign its boundaries to coincide with the projected NORAD boundaries. However, on 14 November 1958, ARADCOM advised that it had changed its mind and had submitted a parallel seven-region plan to the Department of the Army. DA had approved. DA had also approved the collocation of ARADCOM Region Headquarters with NORAD Region Headquarters. RCAF ADC advised that the matter of disbanding the Northern Region would have to be referred to the Canadian Chiefs of Staff.

USAF ADC submitted a SAGE phasing plan to NORAD early in December. In effect, ADC's plan was an implementation of NORAD's basic plan. ADC laid out in detail the plan for inactivation of manual organizations, the expansion or realignment of boundaries, the establishment of temporary detachments to maintain integrity of operations, and the establishment of SAGE units. Included were

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* NORAD proposed to change control of the 30th Division from Eastern to Central Region. ADC objected; the plans for reconfiguration of the 30th under Eastern were well underway and the regions were to be phased out anyway. NORAD agreed that the 30th should remain with Eastern.

the dates for inactivation or redesignation of the defense forces. Eastern was to be inactivated on 1 January 1960, Central was to be redesignated the 33d Air Division (SAGE) on the same date, and Western was to be redesignated the 28th Air Division (SAGE) on 1 July 1960.

On the 27th of January 1959, NORAD replied that it approved the ADC plan for implementation.

U. S. ORGANIZATIONAL CHANGES - JULY - DECEMBER 1958

During this period, five manual divisions were eliminated, two SAGE divisions were established, boundaries were expanded and realigned, and four temporary detachments were established (see the table and map following).

The manual divisions eliminated were the 9th, Geiger Field, Washington; 32d, Syracuse AFS, New York; 35th, Dobbins AFB, Georgia; 58th, Wright-Patterson AFB, Ohio; and 85th, Andrews AFB, Maryland. The SAGE divisions established were the 26th at Syracuse and the 32d at Dobbins. Because of the fact that the 32d was re-established as a SAGE division, the net reduction in number of NORAD divisions was four -- from 23 at mid-year to 19 at the end of the year.

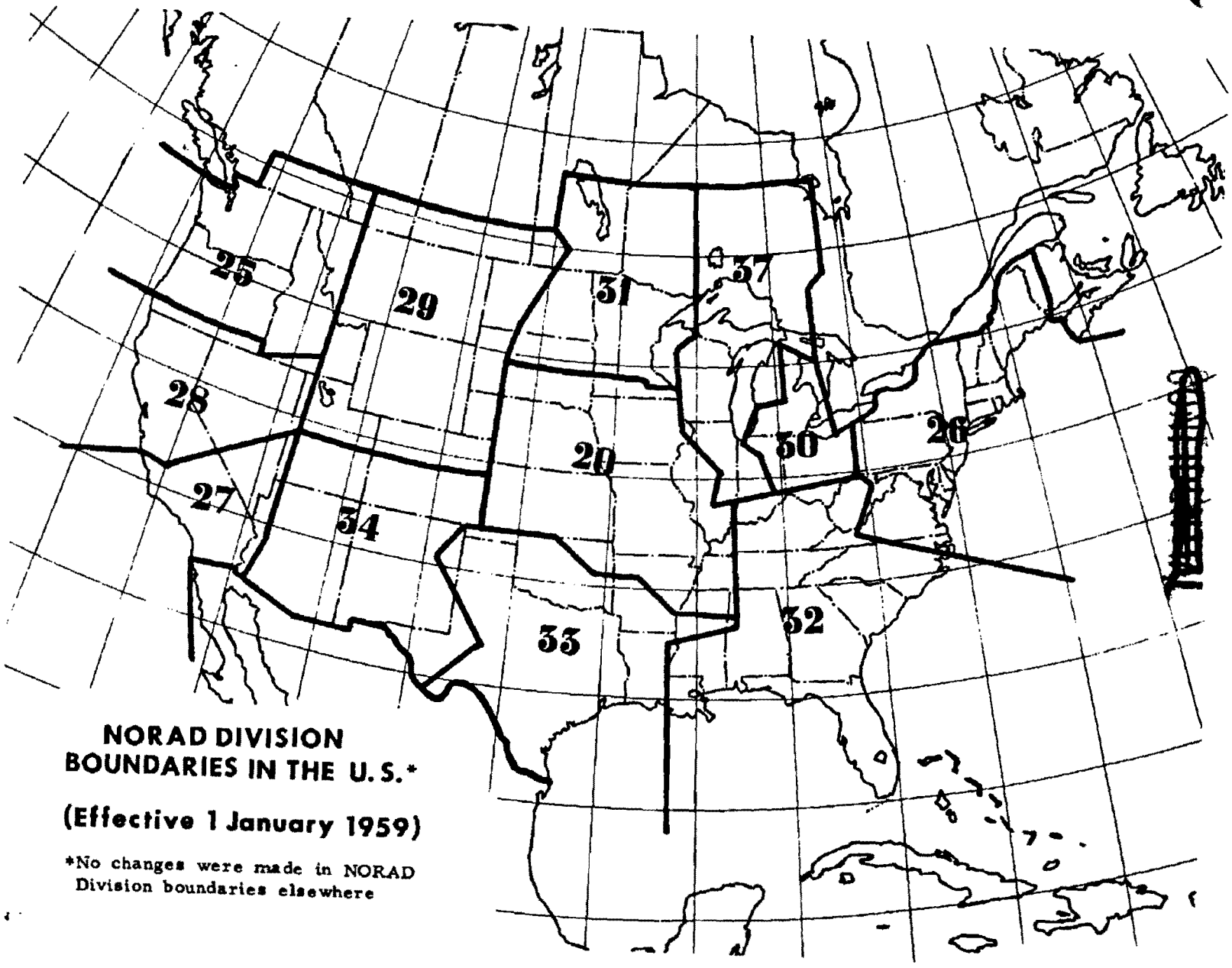
Temporary detachments were set up to maintain continuity of operations until the new SAGE or enlarged manual divisions could assume responsibility for their areas. Detachment 1 of the 25th took over the Geiger control center when the 9th was inactivated. This detachment was inactivated on 6 October when the 25th was able to assume responsibility for the 9th's area. On the east coast, three detachments were needed. The 26th was moved out of Roslyn and established at Syracuse as a SAGE division on 1 September. But it did not become operational until 1 January 1959. Also on 1 September, the 85th at Andrews, which was in the 26th's area, was inactivated. Therefore, on 1 September three detachments were established: one for the control center at Roslyn, one for Syracuse, and one for the control center at Andrews.

TABLE 1

DIVISION ORGANIZATIONAL CHANGES

JULY-DECEMBER 1958

Number and Location of Unit	Air Div (Def) (USAF ADC)	Air Div (SAGE) (USAF ADC)	CONAD Div	NORAD Div
9th, Geiger Fld.	Inactivated - 15 Aug		Disestablished - 1 Sep	Disestablished - 1 Sep
Det 2, 25th, Geiger Fld.	Established - 1 Sep Disestablished - 15 Oct		Established - 1 Sep Disestablished - 6 Oct	Established - 1 Sep Disestablished - 6 Oct
26th, Syracuse		Redesignated from 26th, Roslyn AFS - 8 Aug	Established at Syracuse on 1 Sep (originally at Roslyn)	Established at Syracuse on 1 Sep (originally at Roslyn)
Det 1, 26th, Roslyn AFS		Established - 15 Aug	Established - 1 Sep	Established - 1 Sep
Det 2, 26th, Syracuse AFS		Established - 15 Aug	Established - 1 Sep	Established - 1 Sep
32d, Syracuse	Inactivated - 15 Aug		Disestablished - 1 Sep	Disestablished - 1 Sep
32d, Dobbins		Redesignated from 35th Air Div (Def) - 15 Nov	Established - 15 Nov	Established - 15 Nov
35th, Dobbins		Redesignated the 32d Air Div (SAGE) - 15 Nov	Disestablished - 15 Nov	Disestablished - 15 Nov
58th, Wright-Patterson AFB	Reduced to 1 & 1 and ceased air def mission - 1 Sep 1958		Disestablished - 1 Sep	Disestablished - 1 Sep
85th, Andrews	Inactivated - 1 Sep		Disestablished - 1 Sep	Disestablished - 1 Sep
Det 3, 26th, Andrews AFB		Established - 1 Sep	Established - 1 Sep	Established - 1 Sep



NORAD DIVISION BOUNDARIES IN THE U. S.*

(Effective 1 January 1959)

*No changes were made in NORAD Division boundaries elsewhere

[redacted]

[redacted]

[redacted]

NORTHERN NORAD REGION AND DIVISIONS

In July 1958, RCAF ADC sent a proposed Northern Region Headquarters organization to NORAD. In general, it met NORAD requirements and the latter concurred. NORAD forwarded on 27 August 1958 the proposed organization to the Chief of the Air Staff, RCAF, as the Executive Agent for NORAD, for review and approval of the Canadian manning. The proposal was also submitted to the U. S. Joint Chiefs of Staff for review and approval of the U. S. manning.

NORAD then heard informally that the JCS was delaying consideration of the manpower requirement until a proposal for all NORAD subordinate units was submitted. NORAD wired the JCS that provision of U. S. personnel for the Northern Region staff was urgently required and that approval should not be delayed.

On 24 December 1958, the JCS concurred in NORAD's need for the U. S. manpower spaces (although they withheld approval of the overall proposal). Accordingly, the Army and Air Force were asked to provide the spaces.

On 25 February 1959, NORAD advised the CSC of the JCS action and urged early approval of the Canadian manpower space allocation and the formation of the Northern Region Headquarters. NORAD expressed its concept for joint U. S.-Canadian manning the following way. Those geographical areas lying wholly in one country and containing forces of only that country should have a commander and staff from that country; however, if forces of another country were to be employed over the area, the commander should have adequate staff assistance from the other country. In those geographical areas including territory and/or forces of both countries, the commander and his deputy should not normally be from the same country. The staff should be joint. And national representation in the NORAD organization should generally be based on the composition of forces and territory involved.

NORAD proposed the following commanders and deputy commanders of border divisions:

25th Division -- U. S. commander, Canadian deputy
29th Division -- U. S. commander, U. S. deputy

[redacted]

[redacted]

30th Division -- U. S. commander, Canadian deputy
35th Division -- Canadian commander, U. S. deputy
26th Division -- U. S. commander, U. S. deputy

The 1st, 2d, 3d, and 5th NORAD Divisions had not been formed. On 14 October 1958, RCAF ADC asked for terms of reference and manning tables for these organizations as a start toward forming them. These documents would probably not be available for several months, NORAD replied. But this should not prevent formation of these divisions on an interim basis.

There were no great problems in responsibility, duties, or personnel as NORAD saw it. NORAD had been given operational control of Canadian air defense forces. The accomplishment of NORAD's mission in Canada had been delegated to the Northern Region. Its commander could further delegate responsibilities to the NORAD division commanders. The duties of the NORAD echelons would be much the same as those performed by the operational elements of the RCAF ADC. By the same token, the personnel of the RCAF ADC 1st, 2d, and 3d Sectors, and 5th Division, that had been employed in operational duties, could be assigned to the NORAD organization.

These divisions were not formed, however. On 3 December, Air Vice Marshal W. R. MacBrien advised that in his dual capacity as Commander of ADC and Northern NORAD Region his authority was circumscribed by the executive agent in matters involving money, men, materials, and matters having political overtones. For this reason, the implementation of many NORAD regulations and directives, such as formation of the Northern NORAD Region headquarters and the 1st, 2d, 3d, and 5th Divisions, had to await instructions from the executive agent.

INTEGRATION OF THE 25TH AND 5TH DIVISIONS

On 21 November 1958, Western Region forwarded a joint proposal, which it approved, of the 5th and 25th Divisions for a shift in control of radar units. Their proposal was to place the 917th (C-19), 918th (C-20), 919th (C-21), and 825 (SM-153) ACW Squadrons under the command and operational control of the 25th Division. These were USAF manned and operated units in Canada, currently under the 5th Division. The plan was to have C-19, C-20, and C-21 report to SM-153, which would report to SM-151 at Spokane, Washington.

RCAF ADC/NNR concurred on 19 December 1958 and on 16 January 1959, NORAD approved the plan and directed implementation.

Following this, because of these changes and the later boundary realignment required to implement SAGE, both Northern and Western Regions recommended that the 5th be disbanded and its area of responsibility and control of forces be transferred to the 25th. NORAD concurred and requested formal approval from the CSC and JCS to accomplish the overall plan.

The change was planned in phases. It could not be accomplished all at once because of insufficient communications facilities. Western Region advised on 21 February 1959 that complete installation of needed circuitry would take six to eight weeks. However, operational control could be taken in steps. The first step would be to assume operational control of the four USAF-manned sites mentioned above, using existing circuitry and through close coordination of the 5th and 25th COC's. This step was planned for 2 March 1959.

ALASKAN NORAD REGION

Alaskan Command published, on 18 December 1958, an air defense annex (N) to its capabilities plan (ALCAP 1-58). This annex outlined the functions and responsibilities of CINCAL as commander of the Alaskan NORAD Region (ANR); the functions and responsibilities of the commanders of the Alaskan Air Command, U. S. Army Alaska, and Alaskan Sea Frontier in air defense; and policies and procedures for exercising operational control. Operational control was also covered by Alaskan Command Regulation 55-14, 29 December 1958.

Both Annex N and the regulation provided that CINCAL was responsible to CINCNORAD for all air defense activities in Alaska, that CINCAL would function as Commander, Alaskan NORAD Region, and that he would exercise operational control over all forces assigned or allocated for air defense of Alaska. However, operational control was to be exercised through the Commander, Alaskan Air Command. The latter was made responsible for conducting the active air defense of ANR. CG USARAL was to place forces under the operational control of CINCAL for exercise by Commander, Alaskan Air Command.

CINCAL told NORAD that he planned to change this arrangement, however. In October 1958, CINCAL said that when the Joint Direction Centers became operational, he would exercise direct control. Joint Direction Centers were planned for Fire Island and Murphy Dome (see Chapter Four). Fire Island was scheduled to become operational on 1 March 1959, Murphy Dome on 10 May 1959.

An Alaskan semi-automatic defense system was scheduled for operation in Alaska in January 1961 (for details, see Chapter Four). When implemented, Alaska was to be divided into two sectors, a Northern and Southern, each with two subsectors.

[redacted]

CHAPTER III

SAGE Solid State Computer

DEVELOPMENT BY IBM

The SAGE system being installed in 1958 was expected to provide a significant improvement to the air defense system. But SAGE, along with all other elements of the air defense system, needed to be continually modernized to keep pace with the threat.

For this reason, back in 1956, the Air Force's Air Research and Development Command sponsored a computer development program with International Business Machines Corporation. By mid-1958, IBM had made important advances in such items as transistors, magnetic cores, drum systems, and computer circuitry and was able to propose a new type of SAGE computer. This new, transistorized computer, ADC told CONAD in June 1958, was estimated to have a computer capability of some seven times that of the current SAGE computer. IBM proposed that the Air Force support the design, construction and testing of an advanced prototype computer.

NORAD replied that this new computer appeared to be an important advancement and recommended that funds be provided for its further development. NORAD asked, however, that no program be started that would impede the currently scheduled SAGE operational dates.

ADC OPERATIONAL EMPLOYMENT PLAN

In August, the Air Force directed ADC to determine the best plan for putting in these new computers. ADC completed an operational employment plan on 5 November 1958.

Because of the advent of long range, high speed weapons, ADC concluded that the overriding consideration was to provide hardened data processing facilities capable of control over large geographical areas. It was also mandatory, ADC felt, that the ground

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[redacted]

environment during the period covered by its plan (1960-1965) have greatly increased data processing capability, flexibility, and growth potential.

Two other important requirements had to be met by ADC planners. The first was the matter of timeliness. Obviously it was essential that the switch to the new computer should not significantly delay the SAGE operational dates beyond those currently scheduled. ADC's plan was to dovetail the new computers into SAGE Schedule 7 (Improved) in such a way as to cause the least interruption and delay. The other requirement was economy. The switch should not mean a vast outlay of money.

ADC felt that the solid state computer, termed AN/FSQ-7A, with accessory equipment, would provide the improvements needed. And ADC felt that its plan would meet the requirements of timeliness and reasonable cost. ADC planned to make maximum use of currently installed and planned SAGE facilities and to put in a minimum of solid state equipment. Money could also be saved by deleting some scheduled AN/FSQ-7's and AN/FSQ-8's. In all, the solid state computers would cost $272 million more than the current SAGE program, according to ADC's plan.*

The ADC plan established the following schedule:

1. Full direction center capability for the entire country by 1 January 1963, six months ahead of the current Schedule 7 (Improved).

2. Full combat center capability by 1 April 1963, in accordance with Schedule 7 (Improved).

3. A complete hardened back-up capability by 1 April 1964 -- the scheduled operational end point -- about nine months later than Schedule 7 (Improved).

The AN/FSQ-7A was to be installed at 13 locations. Ten of these were to be in what ADC termed Super Combat Centers (SCC).

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* ADC's figures:

Schedule 7 (Imp)	-	$2,195,000,000
Proposed	-	$2,467,000,000
Difference		$ 272,000,000

The latter were to have hardened buildings, and hardened communications to a minimum of a 21 mile radius of the SCC. These ten SCC's were to be divisions.

Each SCC would function as a combat center in Mode I and would fulfill a back-up role, Mode II, to the unhardened SAGE direction centers by acting as a DC for any combination of sectors in the division not having a functioning DC.* Necessary radar and weapons connections would be made to the SCC in order that it could perform this back-up role. An automatic, separate Mode III system would not be necessary because of the effective Mode II capability and the physical invulnerability of the facilities.

In addition to the ten SCC's, ADC planned to install the AN/FSQ-7A at three unhardened direction centers in the Miami, Albuquerque, and Shreveport sectors. Hardening was not possible without delaying the overall schedule by at least six months.

As a result of these changes, the SAGE boundary map was redrawn. As noted above, there were to be ten SAGE divisions, two more than previously planned (nine in the U. S. and one in Canada versus the previous seven in the U. S. and one in Canada). The boundaries were redrawn in accordance with the criteria for the AN/FSQ-7A. These included a maximum of 20 long-range radar inputs and a maximum dimension of just over 1000 miles in both north-south and east-west directions. The sector boundaries also had to be followed.

The SCC's/Divisions in order of proposed operational dates

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* Modes were used to describe conditions of degradation of weapons control from full, centralized SAGE DC control to autonomous, local control by weapons systems or units. Mode I was the primary, normal operating condition, under which a SAGE DC had full responsibility and control of its sector. Mode II described a condition wherein a SAGE DC became inoperative and adjacent SAGE DC's took over its responsibilities. Mode III condition prevailed when a DC and the adjacent DC's were all out and responsibility had to be exercised by the division commander through the NORAD control center. Mode IV provided for autonomous operation when the SAGE DC, NORAD control center, and Manual DC could not be contacted by a weapons system or unit.

were: Ottawa, St. Louis, San Antonio, Raleigh, Syracuse, Chicago, Spokane, Minot, Portland, and Phoenix.

On 17 November, on the recommendation of the NORAD staff, CINCNORAD decided to request the solid state computer and hardened facilities.* This was followed up on the 2d of December with a message to the JCS.

NORAD followed this with a letter to the Joint Chiefs on 16 December. In it, NORAD explained that the current SAGE system had three major limitations. These were that the system could not be expanded to absorb foreseen requirements, that the DC was vulnerable to enemy attack which necessitated back-up facilities, and that there was no provision for completely integrating Army-provided weapons with SAGE. For full integration of Army weapons, NORAD recommended digital data switching equipment for 23 non-Missile Master defenses and Fire Unit Integration Facilities for all Nike and Hawk batteries.

NORAD urged approval and funds for the solid state computer be provided without delay.**

USAF objected to the cost. One large stumbling block was that five AN/FSQ-8's would be made surplus by the ADC plan. Accordingly, ADC modified its proposal. The main portion of this change was to hold up on establishment of combat centers at Minot and Phoenix. This would save buying two AN/FSQ-8's. Two others could possibly be used in the Air Force computer maintenance training program. NORAD agreed to the modified program and so advised the JCS early in January.

On 5 February 1959, USAF informed ADC that it approved the concept of employing the solid state computer in a hardened configuration. USAF said, however, that the degree of hardness had

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* NORAD approved the ADC plan formally, with certain exceptions pertaining mainly to requiring integration of Army equipment, in a letter to ADC on 20 December 1958.

** NORAD later qualified its 16 December letter with a message asking that it be allowed to comment on any proposals to modify SAGE Schedule 7.

TABLE 2

SOLID STATE COMPUTER DEPLOYMENT SCHEDULE

OPERATIONAL DATES

ADC Proposed Deployment Schedule - November 1958		USAF-Established Dates - 5 Feb 1959
Miami DC	1 Aug 62	
Albuquerque DC	1 Sep 62	1 Oct 62 (collocated with FAA facilities)
Shreveport DC	1 Nov 62	
Ottawa SCC (DC program only)	1 Jan 63	1 Aug 62
St. Louis SCC/ DC	1 Apr 63	1 Jun 63
San Antonio SCC	1 May 63	1 Jun 64
Raleigh SCC	15 May 63	1 May 63
Syracuse SCC	1 Jul 63	1 Jun 63
Chicago SCC	1 Sep 63	1 Jul 63
Spokane SCC	1 Nov 63	1 Nov 63
Minot SCC	1 Jan 64	1 Sep 63
Portland SCC	1 Mar 64	1 Jan 64
Phoenix SCC	1 Apr 64	1 Mar 64

not been determined. USAF also set down a new schedule (see table preceding). This schedule was to be included in an entirely new SAGE schedule (Schedule A) to be prepared by the SAGE Project Office. The phasing was to be as follows. The last combat center, AN/FSQ-8, to be installed under SAGE Schedule 7 (Improved), was to be at McChord AFB (25th Air Division). Subsequent combat center facilities and equipment were to be cancelled with the exception of (1) one AN/FSQ-8 that was to be converted to an AN/FSQ-7, using FY 1959 funds, to be installed at the Sioux City DC, and (2) the combat center building at Minot.

The improved schedule seven dates were to be in effect for all items through Sioux City -- with the exception of the Minot and Phoenix combat centers. Facilities and equipment after Sioux City were to be cancelled or adjusted to coincide with the new program. The Albuquerque DC was to be designed to include the solid state computer and FAA facilities.

OTTAWA SECTOR

As shown above, a solid state computer in a hardened site was planned for the Ottawa sector. It was first to be a direction center only with an operational date of 1 August 1962. Later, it would become a super combat center also (i.e., the DC and SCC would be collocated) and its responsibility would encompass the Bangor sector. The location planned for the DC/SCC was North Bay, Ontario, Canada.

On 28 August 1958, RCAF Headquarters informed NORAD that cabinet approval had been received for the Ottawa SAGE sector and for other additions to the Canadian system.* RCAF said that certain

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* This joint Canada-U. S. program provided for seven heavy radars, forty-five gap fillers, two BOMARC squadrons, and the SAGE installation covered above. Two of the heavy radars and twelve of the gap fillers were to be the supporting radar environment for the SAGE and BOMARC in the Ottawa-North Bay area. The remaining five heavy radars and 33 gap fillers were to be added to the Pinetree Line. At the end of 1958, there were 33 operating prime radars in Canada and two more under construction, and six operating gap fillers. The approved program would bring the totals to 42 prime radars and 51 gap fillers. This would only partially satisfy NORAD's requirements which were for 61 prime radars and 93 gap fillers. For additional details, see Chapter Six.

locations had tentatively been picked out. RCAF suggested that a conference be held with USAF, NORAD and other interested agencies to determine the sites. A conference was held on 10 September 1958. It was agreed at this conference that there was a requirement for a combat center and a direction center and that they should be collocated. It was agreed that North Bay was a satisfactory location.

In a message dated 5 January 1959, USAF informed NORAD that the governments of Canada and the U. S. had agreed in principle to a cost sharing arrangement on joint air defense programs in Canada. Included was the Ottawa sector SAGE installation. For the entire program, Canada was to be responsible for construction and unit (TO&E) equipment. The breakdown of capital cost, the Air Force message said, was 2/3 U. S. and 1/3 Canada. The RCAF was to man and operate the SAGE units (in addition to the heavy radars and the BOMARC units).

FIRE DIRECTION AND CONTROL EQUIPMENT

NORAD asked USAF ADC and ARADCOM, in February 1958, to explore the feasibility of combining the requirements for an antiaircraft fire direction system (for areas without Missile Master) and a SAGE back-up (Mode III) control system for BOMARC. The following June, ADC recommended the AN/GPA-73 to CINCNORAD. The latter expressed dissatisfaction with it because of its impact on the SAGE system.

ARADCOM recommended two systems on 18 November 1958 based on a recommendation of the U. S. Army Signal Air Defense Agency. The latter recommended the Hughes Aircraft Company AN/GSG-3 for defenses having three or less batteries, and the Martin Company system for defenses of four or more batteries (not scheduled for Missile Master) and for those defenses where Mode III control of NORAD weapons was required.

In making its proposal, ARADCOM was well prepared: (1) the AN/GSG-3 was an adaptation of equipment already in production and could be available in six to twelve months; (2) Martin was ready to sign a contract with an assured operational date of 23 months after the contract was signed; and (3) if NORAD and JCS approved, DA was ready to reprogram limited FY 1959 funds for immediate implementation and would give full support with FY 1960 funds.

A system for Mode III operations would not be needed, NORAD replied on 22 December, if timely and complete implementation of the solid state computer proposal was made. However, SAGE would not extend throughout all areas, so some additional weapon direction and control device would be required. The ARADCOM proposal, NORAD said, appeared to meet the requirements for non-SAGE areas. Therefore, NORAD asked ARADCOM to proceed with the development of a single prototype model of the Martin Company equipment (Missile Master, Jr.)

[redacted]

CHAPTER IV

Collocation of Army-Air Force Facilities

COLLOCATION OF MISSILE MASTER AND AN/GPA-37

Background. In seeking to achieve centralized operational control of weapons systems, CONAD saw the necessity of integrating the Army's Missile Master, AN/FSG-1, into the SAGE system. However, the Missile Master would be available ahead of SAGE. Therefore, CONAD saw that the first problem was integration of Missile Master with the manual system. This would do two things: it would provide early integration of weapons systems and centralized control capability and it would provide experience that would be helpful in the later SAGE integration.

In September 1956, CONAD proposed to the JCS the collocation of the Missile Master and the Air Force's AN/GPA-37 in ten areas. The Office of the Secretary of Defense concurred on 30 October 1956. These ten areas, the sites eventually selected for location of the collocated facility, and the radars chosen for the NORAD Control Centers were as follows:*

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* For a complete historical account from early 1956 to June 1958, see CONAD Historical Summary, June 1957, CONAD/NORAD Historical Summary, December 1957, and NORAD/CONAD Historical Summary, June 1958. The NORAD Control Centers were referred to by such terms as Joint Fire Direction Centers and Joint Manual Direction Centers. In October 1958, NORAD asked that the term NORAD Control Center be used for the collocated facility.

[redacted]

Defense Area	Facility Site	Radar
New York	Highlands, N. Y. (P-9)	FPS-7
Niagara-Buffalo	Lockport AFS, N. Y. (P-21)	FPS-7
Detroit	Selfridge AFB, Mich. (P-20)	FPS-20
Philadelphia	Gibbsboro-Pedrickstown, N. J. (split site) (RP-63)	FPS-20
Chicago	Arlington Hts, Ill. (RP-31)	FPS-20
Washington-Baltimore	Ft. Meade, Md. (RP-54)	FPS-20
Boston	Ft. Heath, Mass. (MM-1)	ARSR-1A (CAA)
Pittsburgh	Oakdale, Penn. (RP-62)	ARSR-1A (CAA)
Seattle	Ft. Lawton, Wash. (RP-1)	ARSR-1A (CAA)
Los Angeles	Ft. MacArthur-San Pedro Hill (split site) (RP-39)	ARSR-1A (CAA)

The estimated operational dates provided to NORAD early in 1958 ranged from May 1960 for the first site (Highlands) to April 1961 for the last site (San Pedro-Ft. MacArthur). NORAD told USAF that operational requirements justified earlier availability of all ten sites. NORAD recommended higher priority to the extent that all ten would be operating by the end of calendar year 1960. USAF replied on 24 February 1958 that because of economic considerations, significant speed-up of the program was not possible.

However, by early 1959, new dates were forecast by the Joint Collocation Technical Steering Group that did show considerable improvement.* If these dates held true, Missile Master/AN/GPA-37 capability would be achieved at all ten NCC's by October 1960. These dates are discussed below under New Operational Dates. NORAD's part in this was mainly to urge faster action in every

* The JCTSG was formed by the Army and Air Force in July 1957 to support implementation of collocation.

[redacted]

area by everyone concerned. A major problem was funding.

NORAD Control Center Funding. A main concern of nearly everyone involved with NORAD Control Centers during the last six months of 1958 was funding. The problem was in funding for the Air Force portion of the NCC's, especially for the one at Philadelphia.

Funding problems were brought up at a meeting of the Joint Collocation Technical Steering Group on 27 August 1958, which was attended by two NORAD representatives. They learned that for the Air Force, nine of the sites had been approved by Congress. The Philadelphia project had been submitted as a single site, despite the fact that a split site had been agreed to by Army and Air Force. Congress denied allocation of funds for Philadelphia, these NORAD observers reported, until the matter of a single or split site was settled.

For the Army, Congress had approved $19,000,000 for the Missile Master. Contracts had been let for five of the ten sites. Letting of contracts for the others was being delayed on instructions from DOD, apparently because of a review of the overall missile program.

The NORAD representatives told the group that CINCNORAD was not satisfied with the currently-established operational dates. They recommended also that Fort Meade be made an operational NCC as soon as possible.

Following this meeting, on 18 September, CONAD asked the Air Force to have funds allocated without delay for the Philadelphia site. ARADCOM asked DA to determine whether the Air Force could reprogram FY 1959 funds from other sources to implement the Gibbsboro portion of the Philadelphia NCC. If the Air Force could not, ARADCOM wanted DA to install one AN/FPS-33 and two Army FPS-6's at Gibbsboro as an interim measure. The Air Force would then have to reprogram funds only for land at Gibbsboro. If the Air Force could not get the real estate, ARADCOM wanted DA to acquire land at the original Army site at Glassboro and proceed with installation there as an interim measure.

ARADCOM also wired DA in September on hurrying up real estate

and construction directives for Los Angeles and Chicago in order to improve the operational dates. DA advised that these two NCC projects were under DOD freeze order.

Later in September, ADC, ARADCOM, and NORAD learned that the Air Force facilities at NCC's were placed in a category that would not receive funding in FY 1959. ADC protested to the Air Force on 22 September. ADC said that Air Force construction at the NCC's had to be funded in FY 1959 to prevent delay in both the NCC and SAGE sector operational dates.

ARADCOM told DA that further delay in the Missile Master program was intolerable and that it was prepared to submit a unilateral program for installation of Missile Master if the Air Force facilities were not funded in FY 1959.

NORAD backed the ADC message with one to the executive agency, concurring and urging Air Force action to get funds.

The Air Force Chief of Staff replied to CINCNORAD on 2 October that "You are assured of our support in providing the required FY 1959 and FY 1960 funds for this program."

On 21 October, NORAD asked JCS assistance in getting Department of Defense and Congressional approval for the acquisition of real estate and the allocation of funds for NCC's. NORAD said that it had been informed that (1) the NCC projects for Chicago, Los Angeles, Pittsburgh, Fort Meade, and Philadelphia were under DOD freeze, (2) real estate planning reports for Los Angeles, Chicago, and Pittsburgh had not received DOD and Congressional approval, and (3) funds had not been allocated to USAF for the Philadelphia site and that a low priority was given by USAF to the other NCC's.

The JCS replied on 7 November that the Air Force was preparing an allocation request for twelve million dollars that would provide funding for all Air Force projects except Philadelphia. Funds for Philadelphia would be requested in the Air Force FY 1960 MCP. All Army projects had been cleared. Real estate planning reports for Los Angeles, Chicago, and Pittsburgh were cleared by DOD and sent to Congress on 31 October.

This information on a delay at Philadelphia caused ARADCOM to ask DA to go ahead with its (ARADCOM's) earlier proposal. This was to proceed unilaterally at Philadelphia. DA said that this would

be unnecessary. Informal information indicated that DOD was directing the Air Force to start construction on facilities at Gibbsboro in FY 1959. DOD had released Missile Master on 25 November.

At another meeting of the Joint Collocation Technical Steering Group held on 25 November, NORAD representatives learned that release of funds for all Air Force sites except Philadelphia was expected by 6 December. Funds for Philadelphia were expected by February 1959.

Funds for Philadelphia were not released, however. On the 25th of February, USAF notified NORAD that the request for Gibbsboro funds had been refused by the House and Senate Appropriations Committee. The Air Force was asking a reconsideration.

At this same meeting of the JCTSG, NORAD representatives learned that for the Army, contracts had been let for five of the ten sites. Release of funds for the remaining sites was expected by 6 December.

Among other matters discussed at this meeting that had an influence on operational dates was a delay in completion of Air Force operational buildings at Fort Meade, Seattle, and Los Angeles, It was also learned that there were only four sets of the digital data converter equipment available. The remaining sets were ordered in October and had an estimated 18 months delivery time. Digital data converters were mandatory for compatibility of SAGE and AN/FSG-1 systems.

On 10 December, NORAD asked ADC to investigate the possibility of advancing the availability of the buildings mentioned above. ADC said this was being done. On the digital data equipment, NORAD wired the SAGE Project office that delivery of the initial equipment should be October 1959 and the rest consistent with approved installation dates of the AN/FSG-1.

New Operational Dates. As a result of information gained at the 25 November meeting discussed above, the JCTSG decided to revise all of its implementation schedules. New schedules were presented to CINCNORAD on 30 January 1959; these are shown on the table following. The forecast dates for Missile Master/AN/GPA-37 capability ranged from November 1959 for Fort Lawton (Seattle) to October 1960 for Gibbsboro (Philadelphia).

[redacted]

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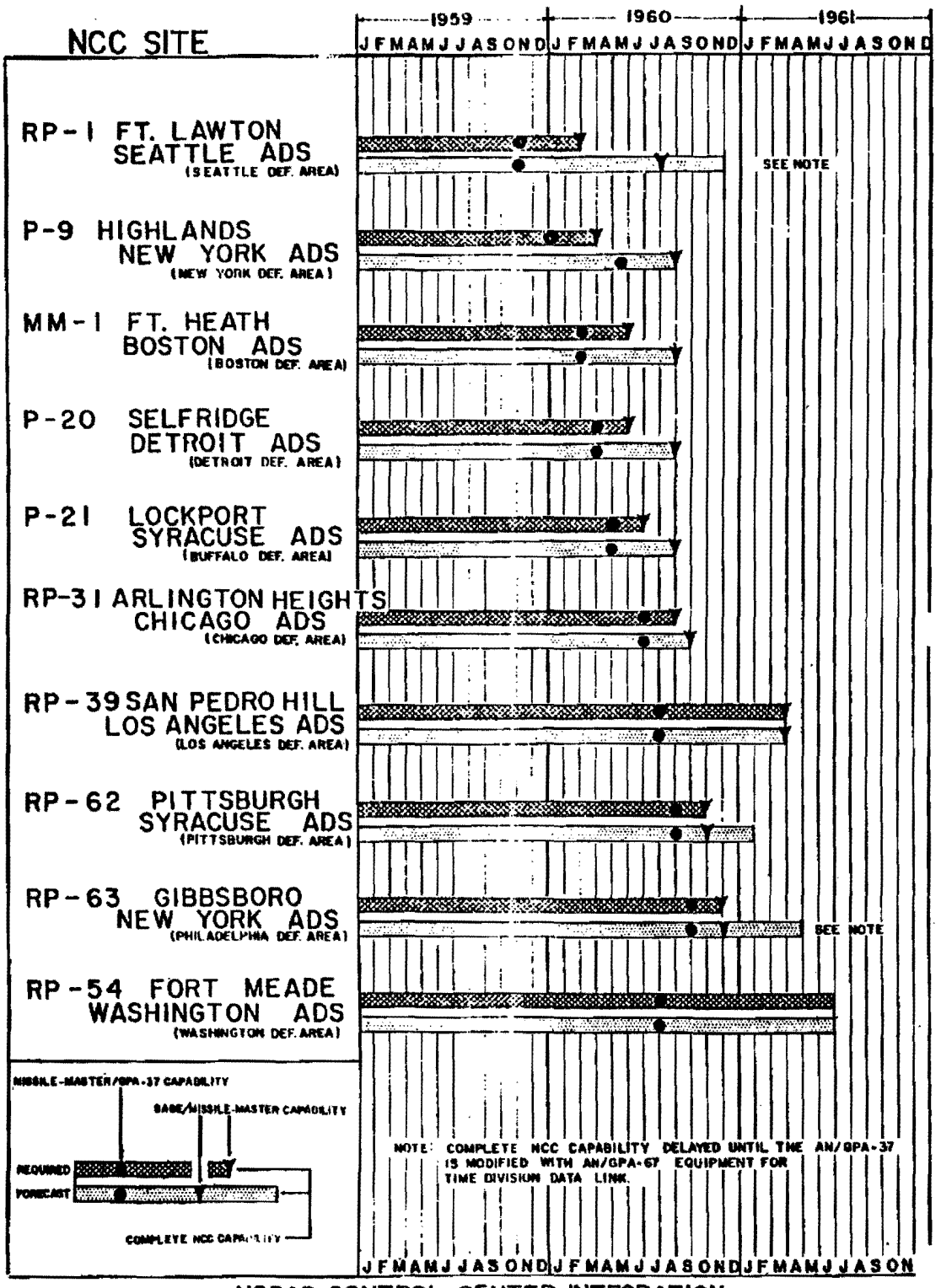

NORAD CONTROL CENTER INTEGRATION

TABLE 3 MASTER SCHEDULE

DATE: 1-20-59

PREPARED FOR THE JOINT COLLOCATION & TECHNICAL STEERING GROUP

[redacted]

SAGE-MISSILE MASTER INTEGRATION TESTS

Collocation of Missile Master and AN/GPA-37 was one problem, integration of Missile Master with the SAGE system was another. CONAD's September 1956 proposal for collocation of Missile Master and AN/GPA-37, discussed above, also contained a proposal for integration in the SAGE era. The OSD concurrence of 30 October 1956 to collocation also stated that a technical plan for integration of Missile Master into the air defense system, both manual and SAGE, was being prepared.

A Secretary of Defense memo to the Secretaries of the Army and Air Force, dated 28 January 1957, advised that this technical plan had been completed. In addition, the memo directed the Air Force to request CONAD to submit an overall test plan. The purpose of the test was to determine the feasibility and operational desirability for centralized control of AA weapons through economical implementation of SAGE and Missile Master, or some modification thereof, for the more effective use of AA units. CONAD was to monitor the studies, programs, and contract actions and tests outlined in the OSD technical plan. The memo was forwarded to CONAD by the Air Force on 11 March 1957.

A plan for testing SAGE-Missile Master integration was completed by CONAD on 5 September 1957 and sent to the executive agency. A letter from the C/S USAF, dated 24 February 1958, approved this plan subject to Army and Air Force comments. DOD approved the plan for implementation in a memo to the Army and Air Force dated 2 May 1958.

CONAD proposed that a special test group be set up to manage the tests. It was to be under the chairmanship of CONAD and to be composed of representatives of the services concerned. CONAD would convene the group as required and provide guidance as necessary.

The test group was formed by NORAD on 24 February 1958. Its membership consisted of a chairman and assistant chairman from NORAD, and one member each from ADC, ARADCOM, and CONARC. The first meeting of the group was held 24-28 February and the executive agent was informed of its establishment on 4 March 1958. Also on 4 March, CINCNORAD issued a letter of instructions to the

group stating that it would undertake immediately the necessary implementing action for the SAGE/Missile Master test program. On 28 April, CINCNORAD amended these instructions with added responsibilities. These were to include the development and delineation of functional and operational procedures to ensure that the essential elements of the integrated SAGE/MM systems conformed to NORAD operational concepts.

It was decided at the first meeting of the test group that there would be four categories of tests:

(1) Implementation Testing. This was to be a checkout of equipment and interconnections and, insofar as possible, an examination of operational procedures. This was planned for the Washington Air Defense Sector between the Ft. Lee SAGE DC and the Ft. Meade Missile Master for the period September 1958 to February 1959.

(2) Experimental Testing. This was to prove out the revised SAGE computer program in relation to M/M with particular emphasis on the Automatic Target and Battery Evaluation (ATABE) portion of the revised program. This was planned for the Experimental SAGE Sector and the Ft. Heath M/M, beginning in September 1959.

(3) Operational Testing. This test was to determine the optimum air defense doctrine, concepts, tactics and techniques for employment of SAGE/M/M. This test was planned for the Detroit sector, using the Ft. Custer SAGE DC and the Detroit and Pittsburgh M/M systems during the period July 1960 to July 1961.

(4) Live Fire Testing. This would consist of the firing of Nike Missiles at drone targets under the control of SAGE/M/M.

First Phase - Implementation Testing. This test was held in the Washington Air Defense Sector, which was the first to include both Missile Master and SAGE. It was held during the installation period of this sector to determine the extent of any equipment implementation problems or incompatibilities.

The objectives established by NORAD on 29 July 1958 for this test were the following.

(1) Determine the ability of SAGE to transmit accurate and timely target track data to the Missile Master complex.

(2) Determine the ability of Missile Master to receive and process reference track data received from SAGE.

(3) Determine the ability of the fire unit to acquire assigned tracks based on track reference data received from SAGE.

(4) Determine the ability of Missile Master to receive and process battery and track channel information for transmittal to SAGE.

(5) Determine the ability of SAGE to receive and process data from Missile Master.

Each of the agencies involved in the test had specific responsibilities. It was the job of the NORAD Test Group to approve the overall test specifications, make the final evaluation, and prepare a report for CINCNORAD. Two test directors were appointed by and were directly responsible to the NORAD Test Group. One, provided by ADC, served at Fort Lee, the other, provided by ARADCOM, served at Fort Meade. It was the responsibility of these directors to coordinate the test specifications, direct the conduct of tests, and evaluate the data in coordination with ADES, USASADEA, and Lincoln Laboratory.

The latter agencies' responsibilities included assisting the test directors, preparing test specifications and methods, and collecting and reducing data.

The implementation tests got underway as scheduled during the first week of September (the first progress report was issued on 11 September). They were completed also as scheduled. On 6 February 1959, NORAD notified USAF and DA that the tests had been completed. Preliminary test results were expected to be ready by early March.

Second Phase - Experimental Testing. This test was originally scheduled for the Lincoln Experimental SAGE Sector and the Fort Heath Missile Master. However, it was found that the Fort Heath

Missile Master would not be operational until about August 1960. NORAD then asked that an abbreviated Missile Master be made available elsewhere in the Boston area by 1 July 1959. DOD approved the request and directed the Departments to provide the funds.

The reason for the 1 July 1959 date was that this phase of testing was to verify the design of the ATABE function prior to its evaluation in an operational SAGE sector. The first operational ATABE function was scheduled for inclusion in a SAGE computer program to be finalized for production in October 1959. Therefore, to provide a four-month testing period, the tests had to start on 1 July.

The Fort Banks Missile Master site was chosen. Only a very abbreviated Missile Master could be provided by this date (seven of twelve pallets of equipment). However, the NORAD Test Group decided that use of this equipment was better than delaying the experimental tests and the operational date of the ATABE function. On 19 December 1958, NORAD directed that the experimental tests be carried out with the abbreviated Missile Master at Fort Banks.

NORAD was to again appoint two test directors -- one for Lincoln Laboratory and one for Fort Banks. And the NORAD Test Group was again to approve the overall test specifications and to make the final evaluation and report.

Integration of Testing Efforts. Wherever possible, the NORAD Test Group sought to integrate the SAGE-Missile Master testing with similar tests being carried out by other agencies so as to cut down on effort and money.

A case in point was the USAF ADC system operational tests and evaluation (Category III tests) of the SAGE system in the New York and Boston sectors. In August 1958, NORAD proposed an integration of test efforts. ADC would control the SAGE evaluation tests that involved solely Air Force equipment. The NORAD Test Group would assume responsibility for the combined efforts of Air Force and Army testing agencies for the Phase Three operational evaluation where system components of ADC and ARADCOM were involved. ADC and ARADCOM concurred.

On 1 October 1958, NORAD explained the plan to Army, Air Force, and other interested agencies. NORAD pointed out the over-lap in ADC Category III testing and NORAD SAGE-Missile Master operational

testing. The scope of the latter, as approved by DOD, was sufficiently broad, NORAD said, in the light of the DOD and NORAD reorganization, to permit integration of these tests. Therefore, on 1 January 1959, CINCNORAD planned to assume responsibility for Category III testing of the integrated air defense system for which NORAD was responsible. In addition, new elements to the system, such as interceptors, missiles, and fire direction and control systems, would be tested as they were integrated.

CINCNORAD would establish an Air Defense Systems Test Group. The nucleus was to come from the NORAD Test Group. To conduct and evaluate the tests, the new group would form a Joint Test Force.

Air Force objected to the idea and recommended that NORAD hold off on assuming responsibility. Air Force wanted more information and asked for a conference to discuss the whole plan. In the USAF view, ADC should continue to function as the "using command" for all aspects of its Category I, II, and III testing. Air Force said it recognized the requirement for testing new systems for integration into the overall system. And close coordination and direct participation in this function by NORAD was desirable. But the testing responsibilities that NORAD was to assume on 1 January might overlap USAF responsibilities vested in ADC.

NORAD replied that under the Unified Command Plan, operational responsibility for air defense was shifted from the service components to NORAD on 1 January 1959. NORAD, thus, was the using command, not ADC, as Air Force had maintained.

NORAD said it felt that prior to the time a system element became operational, it was properly the concern of the responsible services. But when it was integrated into the active air defense, it became a NORAD responsibility. NORAD agreed to hold a meeting with Air Force.

COLLOCATION OF AADCP'S AND ADDC'S

Background. Besides collocating ADDC's with Missile Master, NORAD sought to collocate ADDC's with other AADCP's wherever possible. During 1957, surveys were made by the regions to determine which, if any, AADCP's and ADDC's should be collocated. Little resulted from this other than for NORAD to advise ADC and ARADCOM that it desired collocation of Geiger-Fairchild and that they should study the logistics feasibility.

[redacted]

In November 1957, NORAD completed an AADCP-ADDC collocation study which showed many advantages to collocation. Among these were timely and accurate transmission of evaluated air intelligence and better operational control for the NORAD Division Commander.

Early in January 1958, NORAD met with ADC and ARADCOM to discuss this collocation.

The conferees agreed that collocation should be considered for only those areas that were not among the ten already approved Missile Master ADDC sites or that would not have SAGE operational within two years. The reason was that by the time funds were allocated for altering the communications networks, the work accomplished, and operational procedures established, there would not be enough time left to warrant changing the system. In general, this policy was followed. However, NORAD recommended collocation at Seattle and Los Angeles -- both of which were to get collocated ADDC-Missile Master centers.

At this and subsequent meetings in January, fourteen areas were suggested as possibilities for collocation. These were: Travis AFB, San Francisco, Geiger, Hanford, Seattle, Ellsworth, Fort Meade, Savannah River, Sault Ste. Marie, St. Louis, Kansas City, Cincinnati, Dallas, and Minneapolis-St. Paul. Collocation in the Cincinnati area was decided against because of the great distance between the AADCP and the ADDC. Fort Meade was left to Missile Master-ADDC collocation.

Geiger Field. At an ADC, ARADCOM, NORAD meeting on 28 January 1958, agreement was reached that collocation at Geiger was feasible. Action to collocate the Fairchild-Geiger facilities was started soon thereafter, and on 15 May 1958, operations began. This was the first NORAD Control Center.

It was not officially recognized by general order until 1 September 1958. Effective this date, the Geiger center was established and assigned to the 25th NORAD Division.

Dallas, Kansas City, St. Louis, and Minneapolis.* On 4 April 1958, ADC and ARADCOM jointly concurred, with certain conditions

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* These were new ARADCOM defenses.

attached, in collocating the AADCP's at the ADDC's shown below:

ARADCOM Defense	ADDC
Dallas-Fort Worth	Duncanville AFS, Texas
Kansas City	Olathe AFS, Kansas
St. Louis	Belleville AFS, Illinois
Minneapolis-St. Paul	Osceola, Wisconsin

The conditions attached concerned locating the entire headquarters battery at the ADDC. ARADCOM said that its concurrence was predicated on the assumption that if the entire headquarters battery could not be located at the ADDC site, it could be placed near enough so that personnel could commute without undue inconvenience. ARADCOM set, as a general guide, a distance that would not exceed ten minutes travel time by light military vehicle. ADC said it saw no requirement for the whole headquarters, but would not object if there was enough land and water, if the Army paid for all its own building, and if on-site location would obviate the necessity of buying additional land.

NORAD approved on 22 April and asked that it be brought any logistics problems for resolution. Collocation had not been accomplished by the end of 1958, but plans were being prepared for funding, construction, and other requirements necessary to achieve collocation.

Travis AFB, Savannah River, Sault Ste. Marie, and Seattle. On 14 February 1958, ARADCOM and ADC recommended against collocation of any of these sites. NORAD concurred except on Seattle. NORAD asked that Seattle be reconsidered. However, NORAD provided that if ARADCOM could get its Missile Master operating soon enough to permit the joint center to begin operations in early 1960, interim AADCP-ADDC collocation would not be attempted.

ARADCOM replied in April that it had information which indicated that it might be possible to greatly advance the operational date of the Missile Master. ARADCOM again recommended against collocation at Seattle. NORAD would not make a decision, however, until a firm date was set for operation of the whole NORAD Control Center.

Nothing further was done toward interim collocation until 9 October 1958. NORAD wrote ADC and ARADCOM that it had determined

that it was feasible and desirable to collocate the Seattle AADCP with the McChord ADDC. NORAD said it would assist in getting funds for collocation and requested that a cost study be made.

ADC replied on 6 November 1958 that it had learned that the Missile Master would be installed within 12 to 17 months and that early realization of Missile Master prevented collocation at McChord.

A decision against interim collocation at Seattle was finally made at NORAD Headquarters. This was made early in December after NORAD learned that the Seattle Missile Master and the NCC operational dates had been moved up considerably.

San Francisco, Hanford, and Ellsworth. ADC forwarded, in June 1958, recommendations of ARADCOM against collocation in these areas. ADC concurred. The reason for not collocating was that there was not enough room in existing buildings and neither ADC nor ARADCOM had money for new construction. Both said that if they had to process requests for funds through their departments, it would take two to three years for collocation to become a reality.

Both felt that collocation was feasible if NORAD could get the funds.

NORAD wrote to ADC and ARADCOM on 9 October that it was feasible and desirable to collocate in these areas (and also at Seattle, as mentioned above). NORAD would request funds from the services and asked for a cost study. NORAD said that it had no requirement for the collocation of the administrative and logistic functions of the ACW squadrons and artillery units, just the operations portion of the AADCP and the ADDC.

New Nike Hercules Defenses. ARADCOM sent to NORAD in August a list of 52 new Hercules defenses, marking eleven of them as feasible for collocation. The eleven were in areas where the AADCP and ADDC were within 20 miles of each other.

NORAD then sent the complete list to ADC and ARADCOM asking them to report jointly on the feasibility in all areas. The mileage factor, by itself, NORAD said, was not sufficiently significant to warrant a recommendation for not collocating.

Both components replied on 4 September that they were planning

to send out survey teams from the defense forces and regions. ADC asked for concurrence on certain parameters to be used to establish firm guidelines for the studies:

a. Collocation would be considered only with Master Direction Centers.

b. Normally, only the operational function of the AADCP would be considered for collocation.

c. Electronic means of collocation would be considered only when physical collocation was not feasible.

ARADCOM disagreed with a. and b., concurred with c., with modifications. Item a. should be rewritten to provide that collocation of the AADCP and the nearest ADDC would be considered. Collocated sites would then become NCC's. On b., ARADCOM said that it wanted the entire headquarters battery to be accommodated at the site, if possible. If not, it had to be close enough so that personnel would be within ten minutes travel time by light motor vehicle. In regard to point c., ARADCOM said that physical collocation should be considered only when the ADDC was approximately on or within the ring of missile batteries comprising the defense. Electronic collocation would be considered when physical collocation was not feasible (apparently according to this criterion).

NORAD agreed with ADC. The parameters expressed by NORAD were as follows:

a. Collocated facilities would be master direction centers in all cases.

b. Collocation of the operational functions only was required by NORAD, but there was no objection to collocating the administrative and logistic functions if it would save land and money.

c. Electronic collocation would be considered only when physical collocation was not feasible. The mileage factor, by itself, was not considered sufficiently significant to warrant recommendation for not physically collocating the AADCP with the ADDC.

This did not settle the matter. On 19 December, ADC wrote that a joint report could not be submitted because ARADCOM did not concur with separation of the Army Defense Commander from the battalion headquarters by more than ten minutes travel time in light vehicle. NORAD answered on 9 January that it did not accept ARADCOM's non-concurrence for this reason and this was not an acceptable parameter for the feasibility study. NORAD directed that the parameters it laid down (above) be used.

AADCP-ADDC TELEVISION LINK

Test Results. CONAD and the component commands decided to test the use of television to exchange data between AADCP's and ADDC's where physical collocation was impractical. The Norfolk-Cape Charles area was selected for the television test. The latter was completed on 23 June 1958.

The test showed the following:

a. Exchange of data between the AADCP and the ADDC is technically feasible.

b. Correlation of tracks generated by the Army AN/FPS-36 radars and the Air Force prime radars is greatly improved by utilizing a closed circuit TV loop.

c. TV gives the NORAD air defense commander a complete picture of the air defense situation.

d. Exchange of data between the ADDC and the AADCP can be accomplished with TV and microwave equipment that is presently in stock.

e. The TV equipment can be operated by the personnel normally on duty in the AADCP and the ADDC.

f. TV equipment should be serviced by technically qualified military or civilian maintenance men normally not found on duty at the AADCP's and ADDC's.

g. There is no saving in personnel by employing TV for the exchange of data between the AADCP and the ADDC over the present system used.

h. The cost of military owned and operated closed circuit TV link would be approximately $250,000 (estimated).

Proposal for Los Angeles. Following the test, the only proposal made was in regard to Los Angeles. NORAD's primary aim was physical collocation everywhere possible. Television or some other similar means was only to be used as a last resort. A collocated NORAD Control Center was planned for the Los Angeles area at Fort MacArthur/San Pedro Hill. This was one of the ten Missile Master-ADDC sites. Collocation here would be for the period prior to operation of the NCC.

On 25 September 1958, NORAD asked ADC and ARADCOM to jointly report on the feasibility of collocating the functions of the AADCP and the ADDC in the Los Angeles area. If this was not feasible, link by television or other means was to be considered.

ARADCOM and ADC passed NORAD's request along to their units in the area, the Sixth Region and WADF. Both of the latter replied in December recommending against physical collocation on the grounds of excessive cost and time. Both also felt that television was too costly and would require too long a lead time. Both felt that the Iconorama, developed by the Fenske, Fedrick and Miller Company, would cost much less and should be considered. ARADCOM concurred with the 6th Region and recommended Iconorama. ADC agreed that Iconorama was the most suitable, but stated that because of the apparent long lead time no collocation prior to that at the NCC was economically feasible.

COLLOCATION AT THULE

Background. CONAD directed USAF ADC and ARADCOM, on 2 August 1957, to report on the feasibility of collocating the Thule AADCP and ADDC. ADC recommended collocation in a new facility to be built near Thule AFB, with the radar data remoted from Pinguassuit Mountain. ARADCOM agreed that this was feasible. On 8 October, CONAD approved the ADC recommendation and directed implementation.

The 64th Air Division submitted two plans to ADC, which were forwarded to CONAD on 21 April 1958. The 64th's Plan "A" provided simply for a collocated AADCP-ADDC. Plan "B" provided for a collocated AADCP-ADDC, a joint command post which would include the

SAC commander, and operational and administrative space for the SAC wing.

CONAD approved Plan B on 30 June 1958 and directed ADC and ARADCOM to implement it.

Change in Plans. On 22 August 1958, ADC told CONAD that SAC, as host command at Thule, had done nothing toward construction of housing required in the collocation project. CONAD then found that SAC had received no information on the project. Following this discovery, ADC forwarded both Plans A and B to SAC. On 1 October, SAC answered, disagreeing with Plan B. The cost was too high considering a planned reduction in SAC activities at Thule. SAC considered available facilities adequate for its mission. SAC thought Plan A was suitable and would include the items in the FY 1960 MCP.

CONAD went along, directing on 6 November that ADC and ARADCOM implement Plan A.

On 7 January 1959, USAF informed SAC that the Thule collocation project, in competition with other high priority Air Force requirements, was not approved for inclusion in the FY 1960 MCP.

CONAD sent a strong reclama to the JCS on 24 February 1959. The USAF decision would seriously impair the operational efficiency of the air defenses in the Thule area, CONAD said.

ALASKAN JOINT DIRECTION CENTERS

Background. The Alaskan Command Air Defense Requirements Plan, 1957-1966, submitted in March 1957, stated a requirement for Air Force BADGE (Base Air Defense Ground Environment) equipment and two AN/MSG-4 Army antiaircraft fire direction systems. There was no mention, however, of collocating the two.

CONAD then stated a requirement for such to ALCOM, and in June 1957 to the JCS, for collocation of BADGE and MSG-4 at two locations: one in the 11th Division in the Fairbanks area, and one in the 10th Division in the Anchorage area.

In response to this requirement, ALCOM recommended Murphy Dome for the 11th Division, Fairbanks area, and Fire Island for the 10th

Division, Anchorage area. NORAD approved and recommended both to the JCS. The executive agency informed NORAD on 29 November 1957 that both sites had been approved.

Operational Dates. CINCAL advised in October 1957 that three stages of operation were planned, progressing from a manual mode to a semi-automatic mode with all equipment installed. Also, CINCAL said that it had learned that possibly the BADGE equipment and the AN/MSG-4 could not be used together. NORAD forwarded CINCAL's letter to the executive agency. On 5 December 1957, the latter replied that an Interservice Coordinating Group had been formed to evaluate the BADGE and MSG-4.

NORAD heard nothing more. On 14 May 1958, NORAD asked USAF for information on what this group had found and when the joint centers would begin operating. USAF answered on 6 June that no conclusions had been reached by this group (see ALSADS below). The joint centers, using BADGE/MSG-4 equipment, were scheduled for operation during the third quarter of FY 1961.

NORAD asked ALCOM if it could recommend any means of getting capability earlier than 1961. ALCOM answered that it could suggest none -- January 1961 would be the earliest.

However, ALCOM stated, joint direction centers operating in the manual mode were to be operational by January 1959. Six months later, both centers were scheduled to reach operation in the semiautomatic mode using AN/MSQ-18 BOC equipment.

The operational date for the joint manual direction centers was later changed. On 30 October 1958, ALCOM advised CAA and USARAL that the dates were changed to 1 March 1959 for Fire Island and 10 May 1959 for Murphy Dome. The reason was a change in operational dates for Nike Hercules. The first battery was scheduled for Elmendorf defenses on 1 March 1959, and for Eielson defenses on 10 May 1959. ALCOM stated that theater communications facilities would not permit effective operation of the centers before the Nike Hercules units became operational.

Alaskan Air Command's Semi-Automatic Defense System (ALSADS). The BADGE equipment, mentioned above, scheduled for Alaska was to be the AN/GPA-73. On 19 August 1958, USAF advised AAC and NORAD that the Office of the Secretary of Defense had approved the AN/GPA-73 system for Alaska.

[redacted]

[redacted]

AAC completed an operational plan for its system on 5 September 1958, which was approved by USAF on 22 December 1958. AAC planned to employ the AN/GPA-73 components to form the ALSADS in four subsectors: Fire Island, King Salmon, Murphy Dome, and Campion.

There were to be two sectors. The Northern Sector, the 11th NORAD Division, was to be divided into two subsectors. One would be controlled by the joint direction center at Murphy Dome and the other by the air defense direction center at Campion. The Southern Sector, the 10th NORAD Division, would also be divided into two subsectors. One would be under the joint direction center at Fire Island, the other under the ADDC at King Salmon. The NORAD Division control centers were to be eventually at the joint direction centers. AAC set January 1961 as the target date for implementation of the complete ALSADS.

AN/MSQ-18 Fire Direction System. On 5 August 1958, Department of the Army informed USARAL that two AN/MSQ-18 systems were to be delivered in the second quarter FY 1960.

USARAL told DA in October that these systems would have to be modified for integration into the joint direction centers. This included dismounting the systems to fit into the centers and modifying them to accept either AN/MPS-20 or AN/FPS-36 radar data.

At the end of December, DA was still considering the proposal. DA had replied that the proposal was feasible, but that other problems, such as funds, availability of equipment as scheduled, and training of personnel, had yet to be solved.

[redacted]

CHAPTER V

Status of Radar: U.S. System

GENERAL STATUS

On 31 December 1958, USAF ADC had 187 operational land-based radar stations, 68 of which were gap fillers. Also, USAF ADC had two operational Texas Towers and seven AEW&C stations in the contiguous system. The U. S. Navy was maintaining one AEW station and ten picket ship stations. The table below gives a breakdown of these figures and a comparison of the June 1958 status with that of December 1958.

TABLE 4

PROGRAM	PROGRAMMED Jun 58	PROGRAMMED Dec 58	OPERATIONAL Jun 58	OPERATIONAL Dec 58	OPERATIONAL PRIME SEARCH Equip (December 1958)	No
Permanent (P-sites)	75	74*	75	74	CPS-6B/FPS-10	25
					MPS-7/FPS-3	15
					FPS-20	34
1st Phase Mobile (M-sites)	31	31**	27	29**	MPS-11/FPS-8	9
					MPS-7/FPS-3	12
					FPS-20	8
2nd Phase Mobile (SM-sites)	20	20**	13	13	MPS-11/FPS-8	5
					MPS-7/FPS-3	3
					FPS-20	5

* P-site No. 8 was deleted from Permanent Program 9 December 1958.

** Two M-sites were in Canada, one operational. One SM-site was in Canada.

[redacted]

[redacted]

PROGRAM	PROGRAMMED Jun 58	PROGRAMMED Dec 58	OPERATIONAL Jun 58	OPERATIONAL Dec 58	OPERATIONAL PRIME SEARCH Equip (December 1958)	No
3rd Phase Mobile (TM-sites)	21	21	2	3	FPS-3 FPS-20	2 1
ZI Gap Fillers	237	235*	54	68	FPS-14 FPS-18	56 12
Texas Towers	3	3	1	2	FPS-20	2
East Coast AEW&Con Stations	5	5	4	3		
West Coast	5	5	5	4		
AEW Station East Coast	1	1	1	1		
East Coast Picket Ship Sta	5	5	5	5		
West Coast	5	5	5	5		

RELOCATION AND INTEGRATION OF AN/FPS-36 RADARS

Background. Back in October 1957, ARADCOM said that it needed to relocate its AN/FPS-36 radars to get better coverage against low and very low approaching targets. ARADCOM's requirement stemmed from three causes: (1) USAF ADC surveillance radar program had not been fully implemented, (2) radars in the existing surveillance system did not in all cases provide the radar coverage required for Nike defense systems, and (3) existing problems in data handling from the existing surveillance system to the Nike defenses.

General Partridge told the ARADCOM Commander that he desired that these radars be used in places recommended by the Army, but also that they be placed where they would contribute to the overall surveillance system. It was subsequently found that each new planned location would have to be coordinated and analyzed carefully. Some of the same locations were to get USAF ADC or CAA radar.

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* Sites RP-1B and P-46B were deleted from program.

NORAD agreed to let ADC examine each ARADCOM proposal before it came to NORAD.

ARADCOM furnished the proposed site locations for the 5th Army Air Defense Command Region to ADC in December 1957. ADC recommended that seven of 15 sites be eliminated and suggested that two others could be deleted with certain changes in siting.

At this time, NORAD saw a need for issuing firm policy guidance on surveillance. This was issued on 20 March 1958. NORAD stated that the siting of all radars used for surveillance purposes, regardless of the agency furnishing the radars, was to be carried out in such a manner as to provide the best possible overall surveillance system. USAF ADC was assigned primary responsibility for furnishing surveillance radars in the U. S. But NORAD provided that although ADC had this responsibility, other agencies might be required to furnish surveillance radars. Ordinarily, this would be on an interim basis. ADC was also made the coordinating agency responsible to NORAD for the U. S. portion of the surveillance system.

Following issuance of this policy, NORAD overrode ADC on ARADCOM's 5th Region AN/FPS-36 relocation proposal. On 21 March 1958, NORAD approved ARADCOM's proposal. NORAD told ADC that if it could not provide surveillance to agencies having a need on a timely basis, NORAD reserved the right to authorize interim radar installation by any NORAD agency. NORAD told ARADCOM, however, that it could deploy and operate interim installations of FPS-36 radars to provide required coverage until ADC radars could provide the coverage (amplified by NORAD policy guidance - see item d, below).

Integration of AN/FPS-36 Radars. On 5 June 1958, NORAD laid down policy guidance on the location and integration of FPS-36's into the NORAD surveillance system.

a. FPS-36 sites required to fill gaps in coverage and chosen to augment the surveillance system , will be provided with the communications and equipment required to function as interim surveillance radars. When a USAF ADC radar is placed in operation to cover the gap for which the FPS-36 was sited, the latter will be withdrawn. Proposed sites will be submitted to ADC for coordination and selection of sites that can be used to augment the system.

b. Wherever it is necessary to site an FPS-36 that does not augment the system, it is assumed that the USAF ADC surveillance system cannot provide the coverage required for Nike defenses.

c. Wherever an FPS-36 is sited, a potential back up for an existing or programmed USAF ADC surveillance radar exists. In order to use this potential, provisions shall be made for cross telling FPS-36 surveillance information to an appropriate Direction Center.

d. The completion of the programmed surveillance system in those areas where Nike defense exists, the correction of possible technical deficiencies in radar coverage, and the provision of appropriate data handling means will eliminate the requirement for the FPS-36 in the air defense system. However, existing FPS-36's will give a Nike defense the capability of autonomous operation (Mode IV). Unless otherwise directed by NORAD, this standby capability may be kept, if feasible, within the resources allotted to USARADCOM.

In response to this letter, ARADCOM furnished ADC with the locations (actual or planned) of 82 AN/FPS-36 radars. ADC found that 14 of these locations were suitable for integrating the radars into the NORAD surveillance system. ADC recommended that 29 other locations be changed so as to increase overall coverage and minimize electromagnetic interference and that 39 locations not be used for AN/FPS-36 radars. The radars in the latter areas, ADC felt, would duplicate coverage and aggravate the interference problem.

ARADCOM's Lieutenant General Hart pointed out to General Partridge that of the 29 locations that ADC recommended be changed, eight were in permanent type installations that cost several hundred thousand dollars. General Hart wondered whether the benefit to the NORAD system that could be gained by moving them would be worth the cost. He also pointed out that several of the 39 locations, at which ADC recommended no FPS-36 radars be operated, had been in operation for enough time to determine that no interference existed. Finally, he reminded General Partridge that the primary mission of the AN/FPS-36 was to extend the low altitude acquisition capabilities of the Nike Defenses. This, thought General Hart, had

not been considered by ADC when it recommended against FPS-36's at these locations.

On 24 November 1958, NORAD advised ARADCOM that it approved integration of the FPS-36's into the NORAD system at 14 locations. Six of these were in the 5th Region and already properly located. These could be immediately integrated.

Site	Location
CM-1	Argyle, Wisc.
CM-2	Dixon, Ill.
CM-5	Bunker Hill, Ind.
CM-8	Tisch Mills, Wisc.
CM-9	Ludington, Mich.
CM-10	Princeton, Wisc.

The other eight were to be relocated.

Site	Location
L-4	Grand Falls, New Brunswick
NB-6	Hamilton, Ontario
NB-1	Barker, New York
CL-2	Widowville, Ohio
E-1	Terry Peak, So. Dakota
E-2	Parker Peak, So. Dakota
LA-1	Indio, California
H-3	Okanogan, Washington

NORAD also requested that ARADCOM evaluate the ADC proposal to change the locations of 29 other sites.

On 24 December, ARADCOM requested that DA approve the relocation of the radar sites approved by NORAD for integration.

In the meantime, NORAD determined that little effective use was being made by the Direction Centers of the data available from the AN/FPS-36's. For this reason, on 14 August, NORAD cited its 5 June integration policy letter and directed each region and division to determine how maximum benefit could be obtained from the coverage afforded by Army radars. Those radars that were to fill gaps in existing coverage or to augment the system, would be provided with communications and equipment to function on a full-time

basis as interim surveillance radars. Other FPS-36's were to be tied to the ADDC by means of bridging or patch circuits. When an AN/FPS-36 picked up a target, NORAD directed, that was not being carried by an Air Force radar, the FPS-36 would report the target position directly to the plotters at the ADDC and the AADCP via the bridged circuits.

Each region was asked to submit quarterly reports on their progress on effectively employing AN/FPS-36 radars. Also, following NORAD's approval of 14 locations on 24 November 1958, each region was asked to state additional requirements for the integration of FPS-36 radars in their next quarterly reports.

Northern NORAD Region replied to the August letter that there were no radars operated by the Canadian Army which could be beneficially employed in the manner suggested. As noted above, ARADCOM's relocation plan included the deployment of two AN/FPS-36's in Canada. NORAD approved these two sites for integration, but stipulated that DA had to take action to get approval for this deployment. ARADCOM requested DA on 24 December 1958 to take action on this matter.

In Alaska, USARAL was directed by ALCOM to site two AN/FPS-36's in accordance with NORAD's directives. USARAL recommended Site "JIG" in the Fairbanks complex and Site "Bay" in the Anchorage complex. On 4 December, ALCOM approved the "JIG" installation, but turned down the "Bay" site as not being in consonance with NORAD's siting policy. ALCOM said that a radar coverage study showed that the coverage from Bay, Site Point and Site Summit in the Anchorage area was for all practical purposes identical with that provided by the air defense radar at Fire Island. Permission could not be given to install an AN/FPS-36 at any of the existing Nike sites in the Anchorage area.

ECCM MODIFICATIONS TO US AF ADC RADARS

In September 1957, the JCS asked CINCONAD to outline his needs in the ECCM field. A list of five fields that needed strengthening was submitted on 20 January 1958. The fields and their priorities are shown below:*

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* For more detailed information see: CONAD/NORAD Historical Summary July-December 1957, pp 87-89.

PRIORITY	FIELD
I	ECCM Operator Training and Facilities
II	ECCM Improvements for Ground Environment
III	ECCM Improvements to Weapons Systems
IV	Communications
V	Defensive ECM and Passive Defense

(U) NORAD issued a policy statement on electronic warfare in regulation 101-2 on 6 January 1958. This regulation, as well as the 20 January letter to the JCS, stressed a need for a retrofit program to provide all possible antijamming devices for existing weapons and ground environment equipment. Retrofit of the radar network had been left in the hands of ADC and USAF.

(C) still a valid requirement in Today's concept of ops. *

(U) ADC advised that every effort over a 15 months period to obtain FY-1959 funding for ECCM modifications had proven fruitless. USAF had made no FY 1959 funding commitments in its buying program for modification of the FPS-20's, FPS-6's, or FPS-7's.

(U) On 27 May 1958, General Partridge wrote the Executive Agent, (C) Same as above * emphasizing the need for ECCM modifications to current radars. He pointed out that the Weapons System Evaluation Group (WSEG) tests had shown that modified radars could counter the ECM threat. And with the possible delay in the Frequency Diversity (FD) Radar Program, it was essential that all programmed FPS-20's, one FPS-6 height finder at each site, and all FPS-7's be ECCM modified. He stated that if it were not possible to divert funds to accomplish immediate modification, a phased funding program through the FY-1959 and FY-1960 buying programs should be accomplished. "I feel," he said, "that the ECM threat to the air defense system is such that any further postponements of the procurement of ECCM modifications for the current radars incurs a risk out of proportion to the cost."

(U) A reply was received in June. (C) Same as above * It pointed out that USAF planned to provide all FPS-7's, and those FPS-6 and FPS-20 radars that were to remain in operation, with a capability to combat the enemy ECM threat. The FY-1959 radar modification program had been completed in May and included ECCM modifications for the FPS-6's and FPS-20's.*

(U) * ECCM modifications included: for the FPS-6 (1) adjustable Antenna Nod-Angle, and (2) Adaptor for Tunable Magnetron; for the FPS-20, (1) Dual Frequency Simultaneous Transmission (Duplexing), (2) Azimuth versus Amplitude, (3) Video Integration, (4) Dickie Fix, (5) Cross-Gating, and (6) Wave Guide Switching.

* although existing weapons and ground environment equipment have changed significantly since, the concept of ECCM remains the same.

(u) Other new ECCM techniques for these radars were programmed for service testing in FY-1959 and were to be included in the FY-1960 modification program. Any new techniques that could not be included during production would be considered in future retrofit programs.*

(u) CONAD was still not satisfied. In July, it wrote that if the FPS-6, FPS-7, and FPS-20 radars were to be effectively employed in the 1960-61 time period, additional funding was needed. CONAD also stated that the modifications proposed by USAF for the FPS-20 fell short of that expected. An anti-jam console for each set was needed concurrently with the other modifications to make the FPS-20 an effective ECCM radar. The FPS-6 height finder radars needed an improved antenna if the programmed tunable magnetron was to be of value.

(u) Proposed Class V ECCM modifications, that USAF ADC and CONAD felt were necessary to get an effective ECCM environment, were submitted with the July letter.** CONAD stated that it was equally important to provide funds to Air Materiel Command to test the proposed modifications. Without FY-1959 test funds, it would be impossible to place the modifications in the FY-1959 and FY-1960 buying programs.

(u) * The Executive Agent told CONAD also that a new device that would passively track enemy bombers using their own jamming signals -- the AN/TLQ-8 Jammer Tracker -- was being developed. It was to be tested in FY-1959 and production models would be included in the FY-1960 budget.

(u) ** Modifications for the FPS-6 included: Controllable Nod Angle Including Azmiuth Control; Improved Antenna; Tunable Magnetron; Video Integration; Dickie Fix; Logarithmic Receiver with Fast Time Constant Circuit; Monopulse; PRF Jitter; Pulse Compression; and an A.J. Control Box. For the FPS-7, CONAD wanted: Improved A-J Console, Simultaneous Dial transmission and Duplexing, matched filters, Angular Power Adjustment, Pulse-to-pulse Frequency Shift. For the FPS-20: Tunable Duplexing, including Multiple Pre-amplifiers, Cross-gating and Wave-Guide Switching; A-J Console; Improved Video Integration; Side Lobe Cancellation, including Amplitude Versus Azimuth; Velocity Filters; Dickie Fix; PRF Jitter; Pulse Interference Separation and Blanking; MTI Constant False Alarm Rate; Improved Antenna; and Pulse-to-Pulse Frequency Shift.

(u) On 27 August, the Executive Agency replied that it was in general agreement with the Class V modifications requested by ADC. The proposals were being processed through the Air Research and Development and Air Materiel Commands. Once these commands submitted their recommendations and cost estimates, a firm ECCM modification program could be approved. Until then, the adequacy of FY-59 funding could not be determined. The modification of ADC radars to combat ECM was considered an essential program, USAF stated, and several ECCM techniques and devices were being evaluated. Once completed and the most desirable configuration of each modification program determined, the programs would be funded on a priority basis.

(u) As of October 1958, it appeared that the joint NORAD-ADC efforts were getting favorable action by USAF. RADC advised that USAF had approved and funded a total of $3,121,000 for five ECCM modifications on 61 FPS-20's. And funds for an additional twenty FPS-20's had been requested by RADC.

THE FREQUENCY DIVERSITY (FD) RADAR PROGRAM

(u) NORAD's concern about getting ECCM modifications for the existing radars was heightened by what appeared to be certain delay in the FD Program. As of 31 December 1958, the FD program was fairly unstable due to budget reductions and technical production problems.

(u) The FD program was designed to provide the surveillance system with a "family" of radars having improved capability in search, height, and ECCM functions. Radars included in the FD program were the FPS-7, FPS-20, FPS-24, FPS-26, FPS-27, FPS-28, FPS-35, and FPS-53.* These radars would provide a maximum ECCM capability consistent with the "state-of-the-art." They were to operate at widely separate frequencies between 200 and 5600 megacycles with the capability of switching operating frequencies within a few seconds.

(u) A preliminary operational plan for the FD radar program was sent to USAF by ADC in 1957. It was approved on 10 January 1958. Then on 1 June 1958, ADC published a final operations plan approved by both NORAD and USAF. The plan provided that the FD radars would be deployed within the U. S., Canada, and the 64th Air Division.

(u) * The FPS-53 was a combined FPS-24 and FPS-35.

First priority installation would be directed toward establishing an FD capability in the ADC combat zone of the U. S. The FD radars would replace most of the existing radars. Exceptions to the replacement policy were that one FPS-6 would be retained at each prime site and ten FPS-20's would be kept in the active network. Phasing in of the new ZI radars -- at 175 sites -- was to take place in the 1959-1964 time period.

When the plan was written, no official governmental agreement to deploy FD radars in Canada had been reached, so no priorities for Canada or the 64th Air Division were established. However, it was noted that priorities for these areas were not to be lower than for sites in the ZI.

On the basis of the approved FD plan, ADC submitted its FD Communications Electronics Implementation Plan (CEIP) to USAF in July 1958. It was September before USAF replied that portions of the plan had been approved.* The ZI program was approved in its entirety. The Canadian program, USAF stated, had been deleted and would have to be re-submitted. The approved CEIP provided for installation of radars at 144 sites.**

On 16 and 17 October, representatives of USAF ADC, RCAF ADC, 64th Air Division, and NORAD met in Colorado Springs to reexamine the FD program for Canada. A new program was drawn up and submitted to NORAD for approval. It provided for installation of FD radars at 52 sites between FY-1961 and FY-1963. NORAD approved the proposed deployment in December, but pointed out that the projected operational dates did not meet those set forth in the North American Air Defense Objectives Plan 1959-1963 (NADOP 59-63). It directed that every effort be made to meet these dates.

Meanwhile, in November, representatives of USAF ADC and RCAF ADC met again to examine the program for Canada. It was concluded

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* The CEIP was returned on 17 November 1958.

** The program was for 33 FPS-26 and FPS-27's; 34 FPS-26 and FPS-28's; 22 FPS-26 and FPS-35's; 15 FPS-26 and FPS-24's; and 41 FPS-26's. At 18 of the latter sites, towers were to be constructed for FPS-7's.

that operational dates for the FD radars would have to be advanced approximately two years from those listed in the USAF ADC FD operations plan to meet NORAD's requirements. After the conference, a new CEIP was handcarried to USAF. It had not been approved as of 31 December 1958.

In December, Headquarters USAF provided bad news on the U. S. FD program. It told ADC that some $29,000,000 had been dropped from the FY-1960 buying program which would reduce the radar procurements for FY-1960 by five FPS-7's and 24 FPS-26's.

ADC immediately protested. In a message, coordinated with NORAD, ADC pointed out that deferring the equipment in FY-1960 was acceptable only if the monies and radars were picked up in subsequent budgets. The reduction, the message continued, could not be accepted if it extended completion of the FD environment past calendar year 1964.

USAF's reply was not encouraging. It stated that changes extending implementation of the FD program were undesirable, but unavoidable. Although ADC wanted complete implementation of the program by 1964, this was apparently not possible before 1965.

THE CONTIGUOUS SYSTEM

AEW&C Status. On 31 December 1958, USAF ADC's Airborne Early Warning and Control force totalled 70 RC-121D's and seven RC-121C's with 32 operationally ready. Available to man this fleet on this same date were 67 crews, of which 64 were combat ready. The AEW&C force was composed of six tactical squadrons -- three at Otis AFB, Massachusetts, and three at McClellan AFB, California. The squadrons at McClellan were assigned to WADF's 552nd AEW&C Wing, those at Otis to EADF's 551st Wing. The two wings were manning a total of seven stations -- three on the East Coast and four on the West Coast -- on 31 December 1958. Propeller failures, lack of flying hours, and a shortage of operations and maintenance personnel were the reasons for the wings' failure to man the ten stations (five on each coast) required by NORAD.

On the East Coast, the 551st was manning stations 6, 4 and 2, 24 hours a day. Stations 8 and 10 were to be manned when Intelligence indicated it was necessary. In addition to these stations outboard of the picket line, the Navy's Airship Airborne Early Warning Squadron One (ZW-1) manned the only inboard station on the east coast -- station 16 -- every odd day of the month. The 552nd Wing on the West Coast was manning stations 13, 17, and 19, 24 hours a day, station 15 for eight hours during darkness, and station 11 when Intelligence dictated.

Replacement for the RC-121. One of the main concerns of NORAD in 1958 was that of getting an aircraft to replace the RC-121. Both General Partridge and General Atkinson took a strong stand in supporting a replacement program in the first six months of 1958, but they had been unable to get follow-on aircraft funding included in the Air Force FY-1959 budget.

In July 1958, General Partridge asked the NORAD Deputy Chief of Staff for Plans and Operations to see if single service support of the entire contiguous program might not be better than dual service support. In the current program, the Air Force was responsible for providing a portion (AEW&C - Texas Towers), and the Navy a portion (picket ships - blimps). He also requested that the component commanders comment on the proposal.

ADC felt that the concept in being was best. It pointed out that neither the Navy nor Air Force had a new AEW&C system under development. The Air Force had agreed that the AEW&C program would be a first-priority program. ADC said it realized that no funds had been allocated in the FY-1959 budget for a follow-on AEW&C system; however, USAF had stated that it would fund development of long lead time components during FY-1959. A meeting with representatives of Lockheed Aircraft Corporation and members of the ADC and NAVFORCONAD staff had been held to determine a priority listing of mutually needed components. And this list was to be presented to the respective service departments at an early date. Also, USAF had already approved and funded several modifications to the RC-121. The improvements would provide more reliable communications capable of a higher data rate and greatly improved detection capability with a search radar specifically designed for the mission. Completion of these modifications was set for the end of calendar year 1960.

In August, General Partridge approached General Atkinson with another proposal. He pointed out that the stumbling block to getting

a follow-on aircraft seemed to be the fact that a complete new system had to be produced. It might be possible to use a Canadian airframe and engine with American communications and electronic components. He asked General Atkinson to study the new CL-44 being produced by CANADAIR in Montreal. This was done by ARDC at ADC's request.

In October 1958, a presentation was made to the Air Defense Panel and the USAF Aircraft and Weapons Board. As a result of this meeting, it was decided to set up a source selection board to pick an aircraft. This board was established in November by USAF, composed of representatives from ADC, AMC and ARDC. The board and a committee of evaluators from the same three commands met at Headquarters ARDC from 9 through 17 December 1958.

Picket Ship Status. On 31 December 1958, the number of manned picket ship stations remained unchanged from the number on 30 June. Ten picket stations (five on each coast) were being manned around-the-clock. Seven stations (four of them on the East Coast) were being manned by YAGR's, the remaining three by DER's.*

In January 1958, the CNO had proposed reducing the contiguous system to eight stations so as to provide adequate forces for the DEW barrier operation. NORAD had protested and by May a compromise had been worked out. It was decided that only one station would be dropped from the contiguous program leaving a total of nine -- five on the West Coast and four on the East Coast. Later, however, the CNO decided that the barriers could be adequately manned and ten picket stations still kept for the contiguous system (five on each coast).

After the decision to keep all ten picket stations, NORAD began a study on how to best use the forces allocated. It was tentatively decided to use four stations for East Coast operations and six for the West Coast. ENR immediately protested. ENR stated

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* The composition of the West Coast fleet was such that manning of the five stations varied. Sometimes three stations were manned by YAGR's and two by DER's. At other times, the ratio of DER's and YAGR's was reversed.

that any reduction in the number of picket forces would reduce the number of coastal targets that could be adequately defended.

(U) NAVFORCONAD was asked to comment on the proposed re-allocation of ships also. It replied that the deployment of the picket ships off the East Coast was considered wasteful. Ample medium and high altitude coverage could be furnished with four stations. West Coast operations would require six stations. Naval Forces also stated that the proposed re-allocation would result in a higher degree of use of picket ship capabilities in the air defense system.

(U) The matter was still being studied as of 31 December 1958.

(U) Contiguous System Operations. During the first six months of 1958, there had been much dissatisfaction with the contiguous program. Both Eastern and Western Regions and NAVFORCONAD felt that the concept of operations in CONAD Operations Plan 9-57 was less than adequate. Each had different reasons for feeling as it did.

(U) ENR felt that the CONAD plan did not allow for maximum use of interceptor capability. It wanted to move the AEW&C (Sentinel*) aircraft from positions inboard the picket vessels to ones outside. This would, ENR reasoned, extend the medium and high altitude control capability sufficiently to permit employment of interceptors to the extent of their combat radii. WNR wanted to delete control from the AEW&C functions. Also, it too wanted to test various deployment configurations. NAVFORCONAD felt that the system did not meet minimum air defense requirements for warning or intercept of potentially hostile aircraft. It submitted an alternate plan for consideration. (C) Tactics

(U) NORAD allowed the regions to test their proposed deployment plans and asked ADC and NAVFORCONAD to write a new operations plan. By 30 June 1958, two of the deployment proposals had been tested

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(U) * In April 1958, General Partridge stated that the name "Airborne Early Warning and Control" and its abbreviation AEW&C were awkward to use. He directed the staff to find a new name. The name Sentinel was suggested. On 15 May, NORAD asked ADC to consider adopting the new name. It was rejected, however. The decision was then made by General Partridge that NORAD would use the name. Both names appear in the text.

[redacted]

equipment was needed before knowledgeable positioning of the seaward elements was possible. WNR pointed out also that it considered continuous manning of the system mandatory. Lastly, Western Region still wanted the control function deleted from the AEW&C mission.

(U) [Eastern Region said it felt that placing the AEW&C aircraft outboard of the picket ships was the best deployment during a normal preparedness condition even though this meant limited defense capability against a low level attack. AEW&C aircraft could always be scrambled inboard of the picket ships when a condition of Air Defense Readiness or higher condition existed.] (C) ~~Tactics~~

(U) NAVFORCONAD stated that the draft 3-58 was almost identical to 9-57 and the new ideas in the plan could be issued as a change to 9-57. "The proposed plan," it wrote, "is merely a compromise document based upon meager information...and is not the result of a reasonable attempt to produce a good workable plan." It recommended that a staff section or committee be appointed to work out a better plan.

(U) Because of the opposition, NORAD decided not to publish its plan. Instead, in September, a seaward extension conference was called at NORAD Headquarters in an attempt to find a solution to the extension problems. The conferees differences of opinion were too great. [ENR maintained its stand for Sentinel stations outboard of the picket vessels.] WNR wanted additional testing before it prepared a final deployment plan. (C) ~~CONFED~~ TACTICS

(U) The issue was settled on 8 September when General Partridge told the region commanders that the contiguous forces could be deployed as they saw fit.

(U) ENR returned to the concept of operations in its Operations Plan 9-58 (manning Sentinel stations seaward of the picket ships); WNR returned to the picket ship extension pattern of deployment (manning Sentinel stations that extended the picket line).

(U) On 10 October, WNR issued an interim mission directive for the contiguous forces using the new authority. [The new mission was as follows: (1) provide airborne early warning in the seaward extension for WNR; (2) search for medium and high altitude air targets; (3) report air surveillance information in accordance with existing directives and operations orders; and (4) perform such other missions as directed by the WADF commander.] (C) OBJECTIVES

Shortly thereafter, NORAD wired the regions that although CINCNORAD had authorized the region commanders to deploy the seaward elements as they felt best, it was still necessary to achieve a maximum amount of contiguous coverage at all altitudes. NORAD directed the regions to continue to explore all possible tactics and techniques to achieve a satisfactory low altitude and control capability at the earliest possible date. It also directed them to submit operations plans so that NORAD could keep abreast of their operational concepts.

ENR replied first. It stated that its operations plan then in use -- 9-58 -- needed revising before it could be submitted. Although no changes were anticipated in the overall concept of operations, some revisions were needed to bring the plan into line with the increased capability expected from conversion of the YAGR's to SPS-17 radars, the expected operations of Texas Towers Three and Four, and the use of M-120 -- a land based radar station that had recently become operational -- in the contiguous network. Such revisions would include realigning reporting responsibilities, changing communications requirements, and minor readjustments of the seaward extension stations. NORAD approved the changes on 20 October 1958.

In the meantime, WADF wrote ADC and NORAD that it was still concerned with the control function assigned the 552nd Wing. Limitations of the APS-45 height finder and APS-20 search radars, it felt, were such that control capability in the Sentinel aircraft were virtually non-existent. WADF requested that the control portion of the AEW&C mission be deleted permanently. NORAD advised ADC that it did not approve permanent deletion of the control function. However, since CINCNORAD had authorized the region commanders to modify operations as they felt necessary, and pending receipt of improved radar equipment for the wing, approval was granted for dropping the control function temporarily. On 5 December 1958, WADF informed NORAD that it had removed the control portion from the mission of the 552d AEW&C Wing for an interim period.

Meanwhile, in November, WADF submitted its concept of operations to ADC and NORAD for approval. The seaward elements were to be deployed to provide maximum early warning, surveillance, and control. Deployment had to be "fluid," WADF wrote, and as the enemy threat might vary from month to month, so would the deployment configuration. The radar coverage required for low (500 feet), medium (25,000 feet), and high (40,000 plus feet) altitude would

partially govern deployment. The extension of control capability required for the IM-99 (BOMARC), the F-101, and the F-89J would also affect the placing of the seaward elements.

(U) The deployment planned by WADF would provide defense in depth, early warning detection in ranges of 700 miles, and a control capability seaward to 400 miles. Picket ships were to use a synchronized patrol along the axis of their barrier to shift any gaps in coverage. However, a fixed patrol would be used when necessary. The sentinels were to patrol an aerial barrier either inboard or outboard of the ships as directed by the WNR commander. When deployed inboard, the aircraft would normally fill the low and medium altitude gaps between the shore-based radars and the ships; deployed outboard, the primary mission would be to furnish tactical early warning to the picket ships and DC's. (C) Tactics

(U) On 9 December, NORAD told ADC that WADF's concept of operations was approved, except that the seaward elements had to be deployed to counter the enemy threat as stated in the NORAD Intelligence Estimate (the estimate did not indicate that the enemy threat might vary from month to month). Until improved radar equipment was available, or until a change in the enemy threat was issued, NORAD continued, deployment was to be based on fixed locations rather than on shifting locations. (C) Tactics

(U) Following NORAD's disapproval of shifting locations, WNR approved a deployment which placed the Sentinel aircraft outside the picket line.* The picket ship line was established approximately 240-260 Nautical Miles (NM) off-shore, primary Sentinel stations 470-510 NM off-shore, and secondary Sentinel stations 300-330 NM off-shore. (C) Tactics

(U) * On 1 December, WADF submitted a communications plan to USAF ADC to support the operations concept. It asked that the plan be approved and made an appendix to NORAD Operations Plan 3-58. USAF ADC forwarded the plan to NORAD for review. NORAD approved the plan on 22 January 1959 and returned it to USAF ADC for implementation. It was later pointed out that the WADF plan would have to be an appendix to 9-57 since this plan was still being used. Once 3-58 was published, the WADF plan would become an annex to it.

(U) The 552nd Wing had been manning the primary stations but a short time when the Sentinels began experiencing propeller and/or engine failures. A preliminary investigation of the problem indicated that the RC-121's had faulty propellers. Until a more thorough study could be made, WRAMA restricted the aircraft to a takeoff weight of 135,400 pounds. Because of this restriction, the WNR commander decided to redeploy the Sentinels to their secondary stations rather than risk loss of the planes. This placed the aircraft approximately 50-90 NM from the picket line and reduced the amount of medium and high altitude coverage provided. Because (C) Tactics the two lines were so close, the radar coverage of the two elements overlapped resulting in lack of coverage for some areas and wasted coverage in others. In January 1959, the WNR commander was considering moving the stations once again to correct the situation.

(U) On the east coast, the weight restriction had little effect. For one thing, ENR's primary Sentinel stations were closer than those of WNR. ENR planes took off right from the coast at Otis whereas WNR had a 100 mile over-land flight from McClellan. This cut down the time that could be spent on station and the distance that could be traveled to and from a station to make manning profitable. ENR also had an advantage in that an alternate base equipped to stage the RC-121's from was available at Kindley AFB, Bermuda. No such base was available to WNR. As of 31 December 1958, ENR was manning its primary Sentinel stations outboard of the picket line.

(U) Improving Contiguous Communications. On 7 July 1958, NORAD told ADC that HF radio communications between the seaward extension elements and the shore sites were operationally unsatisfactory. Conversion to single-sideband (SSB) communication should be accomplished as soon as possible. NORAD also directed ADC to tell COMNAVFORCONAD when the conversion would be completed so that the Navy might have adequate time to provide SSB equipment for the picket ships. ADC replied that it hoped to have the AEW&C aircraft and the shore stations converted to SSB by June 1959. The equipment in the existing shore facilities would be modified to operate SSB. The stations would also maintain the existing capability of amplitude modulation, Frequency Shift Keying (FSK) teletype, and Dualex tone teletype modes of operation. ADC went on to state that the East Coast shore stations were being equipped to operate FSK teletype in their operations with the airships. Dualex equipment was being installed in the AEW&C aircraft and was to be placed in

operation in August 1958 on the East Coast, and October 1958 on the West Coast.

The request for modifying the RC-121 and installing SSB radio equipment had been sent to AMC on 23 July. ADC requested installation of a SSB set AN/ARC-58 or an alternate Collins 18Z-3 or 18Z-4.

In the meantime, NAVFORCONAD requested the Navy Department to install suitable SSB radio equipment in its picket ships to meet the operational date of June 1959. It had planned to install at least three separate equipments in the YAGR's (these included an AN/WRT-2 transmitter, AN/URC-32 transceiver, and an AN/WRT-1 low frequency transmitter). However, in August, it was discovered that of the equipments requested, only the URC-32 would be available for installation in FY-1959. So in September, NAVFORCONAD asked that the Bureau of Ships insure programming of one URC-32 transceiver aboard each ship in the contiguous system by June 1959. Installation would be accomplished by forces on board the ships. It further requested that a second URC-32 set be installed as early as possible.

By December 1958, the Navy conversion to SSB operation was in full stride; that of ADC had fallen behind. The Department of Navy had programmed and funded for the equipment. It was anticipated that in addition to one voice SSB, the ships would have the following equipment by June 1959: two FSK RATT circuits; two AM voice; and two 100 watt voice AM or FSK standby, or one 500 watt voice AM or FSK RTT standby.

The ADC improvement program had been held up in USAF. Lack of specific plans for detailed improvement had prevented USAF from including the equipment in the FY-1959 budget. To correct this situation, ADC proposed that Wilcox equipment, then in use, be modified for SSB operation. USAF agreed and by 3 February 1959 had included funds to modify the Wilcox equipment (the 99c and T158) in the FY-1959 budget. It was anticipated that the conversion of the shore stations on both coasts would be completed by October 1959.

This change (use of modified equipment) would provide SSB service to the picket ships only. Equipment for airborne SSB operation was still under study. The Sacramento Air Materiel Area (SAAMA) was studying two pieces of equipment -- the AN/ARC-72 and the AN/ARC-58. It was expected that procurement of one of the two sets would be made from FY-1960 funds. Based on this, ADC estimated that SSB operations with the RC-121D's would not be available until the spring of 1961.

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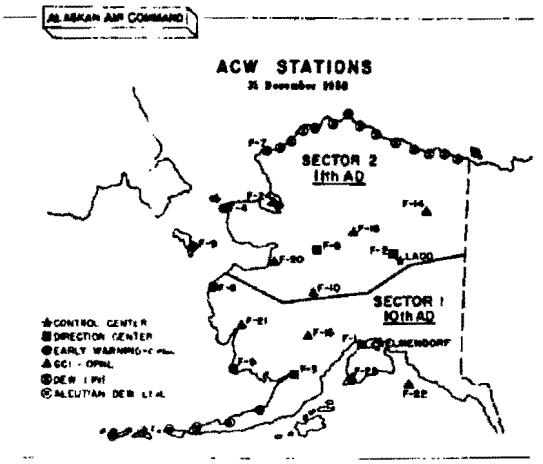
CHAPTER VI

Status of Radar: Canada - Alaska - Greenland

ALASKA

Status. On 30 June 1958, 17 heavy radar stations were operational in Alaska and two more were programmed. By 31 December 1958, 18 stations were operating. The nineteenth station had been changed to a gap filler radar. This was scheduled for operation in 1960 at Gulkana. In addition, CINCAL had programmed a gap filler radar for Mulgraves Hill to become operational in 1960.

Radar Improvement Program. In the Alaskan system there were 13 AN/FPS-3's, 2 AN/CPS-6B's, and 3 AN/FPS-8's. Each of the 18 stations were to be converted to AN/FPS-20 (either by modification of existing radar or by installation of an AN/FPS-20). One program called for converting nine of the 13 AN/FPS-3's in the network to AN/FPS-20's by adding the AN/GPA-27. On 31 December 1958, the six stations at Sparrevohn, Indian Mountain, King Salmon, Campion, Tatalina, and Lisburne had been converted and were operating the FPS-20. Only the stations at Cape Newenham, Cape Romanzof, and Wales remained to be converted. It was anticipated that this program would be completed in the third quarter of FY-1959.



A second program had originally provided for replacing the two AN/CPS-6B's (one at Fire Island, F-1, and one at Murphy Dome, F-2) with AN/FPS-7's in FY-1958. This program was changed, however, when USAF advised

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that it would be unable to complete the AN/FPS-7 program until FY-1962. In its place was substituted a program for moving two AN/MPS-7's from the ZI to Alaska and converting them to AN/FPS-20's by adding an AN/GPA-58 to each. These radars were expected to become operational in the second quarter of FY-1959.

On 31 January 1959, the AN/FPS-20 at Fire Island was 95 per cent operational, that at Murphy Dome was 100 per cent operational. Meanwhile, the AN/FPS-7's were removed from further consideration in the improvement program. AAC wrote USAF that the AN/FPS-20's would satisfy the high-altitude detection and control requirements in the Alaskan theater. Any additional operational capability that might be obtained from using the AN/FPS-7's was outweighed by the cost of construction for them. AAC asked that both sets be removed from its radar program. USAF deleted both in November 1958.

Getting two search radars for F-1 and F-2 had been but part of the problem at mid-1958. AAC also wanted two height finder (AN/FPS-6) sets at each site by FY-1960. USAF had told AAC that only one AN/FPS-6 for each site would be available by the desired date and it would be the third quarter of FY-1961 before the second set could be furnished.

AAC asked CINCAL to help, stating that unless dual height-finding facilities were available for the simultaneous control of manned interceptors and ground-to-air missiles, the two Joint Direction Centers could not operate properly. CINCAL appealed to NORAD and proposed that USAF be asked to make the equipment available by the second quarter of FY-1960.

In July 1958, NORAD asked USAF for a second height finder for F-1 and F-2 even if it meant reprogramming equipment allocated for low priority ZI sites. USAF replied that with the proposed cut in fighter deployment in the Alaskan theater, sufficient AC&W equipment was available to AAC to accomplish its mission. However, USAF would consider a proposal from AAC to reprogram the allocated AN/FPS-6's to get two sets each at F-1 and F-2. NORAD agreed with USAF's views and forwarded the comments to CINCAL.

On 31 January 1959, 18 AN/FPS-6's were listed in the AAC radar program. F-1 and F-2 were programmed to receive two sets each. Neither of the two sets at F-1 was operational, but both were being installed; at F-2, one AN/FPS-6 was operating, the second was programmed to become operational in the second quarter of FY-1960.

CANADA

Status. On 31 December 1958, there were a total of 33 operational heavy radar stations and six gap filler radars in Canada (not including the Mid-Canada and DEW Lines). Thirty-two of the heavy radars were those jointly built and financed by the United States and Canada and known as the Pinetree Line. Ten of these heavy radars and the six gap fillers were deployed along the East Coast in the 64th CONAD/NORAD Division area. The other 22 ran in a line from Nova Scotia to Vancouver Island. The remaining operational heavy radar was one of three heavy radars being built on Canadian soil under the USAF ADC Mobile Program. The operational radar was M-119, located at Lowther AS, Ontario. The other two were being constructed at Barrington AS, Nova Scotia (M-102), and Kamloops AS, British Columbia (SM-153).

USAF ADC manned nine of the heavy radars and the six gap fillers in the 64th Division area, and nine of the remaining 23 heavy radars (including the Mobile station); Canada manned the other 15 radars which included one in the 64th's area.

The Radar Improvement Program. On 30 June 1958, the thirty-three stations in Canada had a combination of American and Canadian search and height finder radars. The network was composed of the American AN/CPS-6B and AN/FPS-3 and the Canadian FPS-502 and TPS-501. At all but one site new equipment was programmed.

The AN/FPS-3's at 15 sites were to be converted to AN/FPS-20's by having AN/GPA-27's added. The AN/CPS-6B's at six sites were to be replaced with AN/FPS-20's. Ten sites (including M-119) were to get Frequency Diversity radars. Of the two remaining sites, one, C-30 on Resolution Island, was to convert to an FPS-3, the other, C-35 at Comox, was to be phased out and would not change radar. Also, under this portion of the Canadian improvement program, a total of 52 AN/FPS-6 height finders were to be installed in Canada (some sites were to receive two height finders).

As of 31 December 1958, only one of the sites had an operational FPS-20. The station at Pagwa River, Ontario (C-14), had its AN/FPS-3 modified by a GPA-27 in July. On this same date, six of the AN/FPS-6's scheduled for the system had become operational.

A second program was for additional radars in the Canadian network to extend the combat zone northward. This program was first proposed by USAF ADC in 1955. It became known as the Fourth Phase Radar Program or Operation PILLOW. It had not received the approval of the Canadian or American governments by 1958, however.

In the first six months of 1958, NORAD re-emphasized to USAF the need for an extension program. The best USAF could offer was that seven heavy radars would be approved for funding in FY-1960, with an operational date of FY-1963.

In August, NORAD advised ADC that it had reexamined the extension program and concluded that to provide effective coverage for the northern U. S. and southern Canada, approximately 114 new radars were needed. This total included 26 heavy radars (18 along the Pinetree Line and eight along the Mid-Canada Line) and 88 gap fillers.

Also in August, the RCAF proposed a conference at Headquarters NORAD to examine the air defense programs in Canada. RCAF also asked that USAF be invited so that joint U. S.-Canadian programs could be discussed. NORAD agreed and the conference was scheduled for September.

Prior to the conference, the JCS asked NORAD to comment on a proposal submitted by the Secretary of the Air Force to the Secretary of Defense on Canadian air defense. This proposal was for installation of two BOMARC squadrons, a SAGE DC/CC, and two heavy and 12 gap filler radars in the Ottawa-North Bay area, and installation of five heavy and 33 gap filler radars in the Pinetree system.

On 10 September, members of the RCAF, RCAF ADC, USAF, USAF ADC, and NORAD staffs met to discuss the radar, SAGE, and BOMARC programs for Canada. It was concluded that the U. S. and Canada should go ahead and build seven heavy and 45 gap filler radars as previously planned by RCAF and USAF. The NORAD representatives concurred, but emphasized that the seven heavy radars and the 45 gap fillers represented only the highest priority installations in its larger requirement.

NORAD also told the JCS that it concurred with this proposal, but pointed out that its overall requirements for Canada were 61 heavy radars (the 35 planned and/or existing plus 26 in the extension) and 94 gap fillers (the six in existence plus 88 in the extension). The gap filler requirement was later reduced to 93.

On 5 January 1959, it was learned that the U. S. and Canadian governments had agreed in principle to a cost sharing arrangement for joint air defense programs. Included in this arrangement were the seven heavy and 45 gap filler radars. Two of the heavy radar sites were to be in the southern James Bay area at Lake Mistissini and Moosanee, the other five in western Canada.* The 45 gap filler sites (six to be provided by RCAF and 39 by USAF) were to be built in eastern and western Canada. Canada was to be responsible for all construction and unit (TO&E) equipment; the U. S. for all technical equipment. The breakdown of cost was tentatively set at about two-thirds U. S., one-third Canada. Canada was to man and operate the seven heavy radars.

THE DISTANT EARLY WARNING LINE

On 31 December 1958, the Distant Early Warning (DEW) Line (Cape Dyer, Baffin Island, to Cape Lisburne, Alaska) had been "fully" operational for a little over a year's time. This line was not, however, operating as well as desired. There were several reasons for this which will be discussed below.

Employment and Suitability Test (ES&T) Part II. When the DEW Line was built, USAF had provided that a two-phase test would be made to determine how effectively the line operated. It was to be made by the Air Proving Ground Center (APGC) of the Air Research and Development Command. Part I of the test had been held in 1957.

Part II of the ES&T, nicknamed Project RED SEA, was conducted between 1 May and 2 September 1958. The purpose of the test was to determine the operational capability of the DEW Line to effectively detect, identify, and report surveillance information to the Combat Operations Centers at NORAD, RCAF ADC, AAC and the 64th Air Division,

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* The five radars were to be located at: Carberry, Man.; Yorktown, Sask; Alsask, Sask.; Dada, Sask,; and Olds, Alt.

and the adequacy of communications and electronics maintenance.

(U) The test was held in that portion of the DEW Line extending from Hall Lake (FOX) to Cambridge Bay (CAM). This section included 13 DEW Line stations -- the Main stations at FOX and CAM and all auxiliary and intermediate stations between the two. A total of 121 aircraft (KC-97 and B-52) participated in the penetration tests in 73 flights of single and multiple formations.

(C) Test Director

(U) The test report issued by APGC concluded that: "The present operational capability of the DEW Line is acceptable; however, it meets effectively only the detection requirements of the early warning mission." APGC said that all of the penetrations had been detected by the search radars. But it was felt that this detection capability resulted from the amount of overlapping search coverage on the line rather than from operator efficiency. Rearward communications were "satisfactory." The surveillance reports from the line arrived at the various COC's in a matter of 14-17 minutes after detection. However, the information in the messages was incorrect about one-third of the time. This was attributed to poor supervision and improper techniques used by the surveillance operators.

(U) Among the important conclusions reached by APGC were the following: (1) the potential of the DEW Line equipment for detecting and reporting penetrating aircraft was excellent and the current capability of the line was acceptable; (2) equipment performance was excellent (excepting the AN/FPS-23) but low personnel efficiency reduced system capability; (3) the major factors contributing to reduced DEW system efficiency were -- lack of supervision at all operating levels, inadequate formal and on-the-job training programs, inadequate and/or lack of standing operating and management procedures, use of the AN/FPS-19 Radalarm system as a means of detection, and restrictive identification procedures; and (4) the design and operation of the AN/FPS-23 equipment was unsatisfactory.

Test & (C) Training

(U) USAF ADC was aware of many of the problem areas and had started corrective action before the APGC report was published. In other problem areas, actions to correct the deficiencies noted in the report were underway by the end of 1958.

(U) USAF ADC had already been working on the AN/FPS-23 problem. One fault was that the graphic presentation gave so many false alarms that it was difficult to tell whether the alarm was caused by an aircraft or by the equipment itself. Bell Laboratories had

discovered that a reason for the false alarms was that the sensitive receivers of the set picked up too much of the signal from adjacent transmitters. By May 1958, Western Electric personnel were on the line and offsetting the antennae of the sets to reduce the signal received.

A second deficiency of the AN/FPS-23 equipment was the graphic presentation display. The equipment presented pen recordings on electrographic paper. The presentation was almost impossible to read, however. To correct this, Bell Laboratories developed a new device called a Doppler Spectrum Analyser (DSA) to fit on the console. The presentation of the DSA was in the form of a continuous track which could be used to follow the aircraft through the doppler beams. The DSA had been accepted for use on the line by USAF ADC and a target date for installation set for 1 April 1959. However, on 10 December 1958, Rome Air Materiel Depot told USAF ADC that it did not know just when the DSA could be installed and operating in the system.

The APGC report had also recommended against use of the AN/FPS-19 radalarm equipment for detection purposes. The radalarm had been installed on the AN/FPS-19 to operate as a warning to the console operator that a detection had been made. Then the console operator could monitor the scope more closely. But because of the sensitivity of the radalarm and the numerous false alarms (of 9,750 alarms evaluated, some 86 per cent were false), the console operators were ignoring the alarm, or taping down the alarm control so it could not ring. In November 1958, USAF ADC asked FECO to change its contract to provide for 24-hour scope surveillance. A reply in January 1959 informed ADC that the scopes were being monitored around-the-clock.

Installation of a message composer which APGC recommended for the data centers was still under study. By December, however, a FECO radician had developed a composer for rearward reports which appeared satisfactory in every respect. And USAF ADC was reviewing the equipment to see if it could be installed in all sector data centers.

With respect to personnel problems, USAF ADC had to depend more or less on FECO. As contractor for the line, it was FECO's responsibility to see that adequate supervisory and managerial techniques were used. ADC did direct the 4601st Support Group (DEW) to monitor these functions more closely. As to training, it

was recognized by both FECO and ADC that the operations personnel on the line were not adequately schooled in air defense operations. However, FECO told USAF ADC in January 1959 that it was revising its radician training program to include air defense concepts.

Proposed DEW Operations Plan. By 31 December 1958, NORAD was writing a new operations plan for the DEW Line. It felt that the existing plan of 1 June 1956 had been made obsolete by the passage of time and changing command relationships. NORAD also wanted to assign operational control of the line to Northern and Alaskan Regions since they were closer to operations and could better supervise. A new plan would help standardize operations, clarify nebulous command relationships for the Components, Regions and Divisions, and allow NORAD to delegate its responsibilities to the regions if so desired.

On 29 January 1959, NORAD submitted to the JCS its proposed operations plan. The NORAD plan delegated to the Commanders, Northern and Alaskan NORAD Regions, operational control of those portions of the DEW Line within their areas of responsibilities. The plan would not, NORAD wrote, affect USAF ADC's responsibilities for contract administration, logistic support, and operation of the Cape Lisburne-Cape Dyer system. The region commanders responsibilities would include insuring, by inspection and monitoring actions, that DEW Line operations were carried out in accordance with the NORAD plan; coordinating directly with USAF ADC in resolving problem areas which did not require action by NORAD; and acting as coordinating agencies between the DEW sectors and other commands which might need the support of the DEW system for special air operations.

Manning the DEW Line. In October 1958, NORAD learned informally that Canada's Minister of National Defense, Mr. George Pearkes, had visited the DEW Line and had returned with the proposal that his country assume a major share of military manning responsibility for the line. This was followed in December by an official request from the Canadian government through the Canadian Joint Staff in Washington, D. C. The Canadian Joint Staff pointed out that the government agreement of May 1955 provided that Canada would have the right to assume operation and manning of any DEW station located in Canada after notifying the U. S. And it asked for USAF's agreement in principle to changing the manning concept.

The DEW Line was manned by personnel of USAF, RCAF, and Federal Electric Corporation. The latter was responsible for manning

with civilian personnel all operating positions on the line except the data centers at the DEW Main stations. At each of the six data centers, there were six military positions. USAF manned five, the RCAF one.

USAF had approached NORAD and USAF ADC on an informal basis even before the formal Canadian request arrived. NORAD had approved the change; USAF ADC opposed any change at that time. The proposal was studied by the Air Staff at USAF and they decided in favor of the Canadian proposal. On 31 December 1958, USAF wrote the Canadian Joint Staff that it agreed in principle with the Canadian proposal.

Manning details were to be worked out by RCAF ADC and USAF ADC. The broad policy outline laid down by USAF was that additional RCAF officers would be assigned to the line to the extent that they would be predominate among the military personnel at each Canadian Main station (i.e., PIN, CAM, FOX, and DYE). The senior RCAF officer would be designated "Officer-in-Charge." The latter would be responsible for all non-contractual functions to be performed in accordance with the guidelines established by NORAD. USAF would continue to administer the contract with FECO and would assign officers to accomplish these duties. Additional cost to the RCAF would be limited to that necessary for supporting the RCAF personnel.

On 19 January 1959, representatives of RCAF, USAF, RCAF ADC, USAF ADC, and NORAD met to work out the details for the new manning concept. It was agreed that there would be seven officers at each Canadian Main station -- five from the RCAF and two from USAF. The RCAF contingent was to be headed by a Squadron Leader who would be designated DEW Sector Commander. USAF would provide two officers, one to serve as liaison officer between FECO and the 4601st Support Group (DEW), and the other, an officer qualified in air defense operations, to serve as a director. The concept had not received official approval as of 24 February 1959.

DEW System Radar Improvement Program. In addition to the actions taken by USAF ADC to improve the existing radar system on the DEW Line to combat the current threat, it was also looking forward to the post-1960 threat. In June 1958, ADC proposed to USAF that it replace alternate AN/FPS-19 radars on the line with AN/FPS-30 radars. USAF replied that it was taking programming action to replace all DEW Line radars with AN/FPS-30's.

TABLE 5 STATUS OF RADAR: ALASKA-CANADA-GREENLAND

	SITES (SEE COMMENTS)	UNDER CONSTRUCTION	OPERATIONAL	COMMENTS
Pinetree (USAF Funded)				
30 June 1958	23		23	Includes G-32, Thule
31 December 1958	23		23	Includes G-32, Thule
Pinetree (RCAF Funded)				
30 June 1958	10		10	Does not incl 3 USAF
31 December 1958	10		10	ADC Mobile sites
Pinetree Gap Fillers(64th ADiv)				
30 June 1958	6		6	
31 December 1958	6		6	
4th Phase Heavies(Canada)				
30 June 1958	23			Program awaiting approval
31 December 1958	7			7 sites approved
4th Phase Gap Fillers(Canada)				
30 June 1958	51			Program awaiting approval
31 December 1958	45			45 sites approved
DEW Line				
30 June 1958	57		57	
31 December 1958	57		57	
Alaska				
30 June 1958	19	1	17	
31 December 1958	20	0	18	
Aleutian DEW Extension				
30 June 1958	6	6	0	
31 December 1958	6	6	0	
Eastern DEW Extension				
30 June 1958	4			
31 December 1958	4	2		
Pacific Barrier (31 December 1958) 4 DER's and 4 AEW aircraft operating between Kodiak and Midway Island				
Atlantic Barrier (31 December 1958) 4 DER's and 4 AEW aircraft operating between Argentia and the Azores				

On 24 October 1958, ADC followed up its initial request with a CEIP for the DEW Radar Improvement Program. The CEIP noted that the Aleutian Segment and the Main DEW Line needed radars capable of providing coverage from 200 feet over land (from surface over water) to 100,000 feet, with a detection range of 250 nautical miles against a cruise missile target. To attain this capability, ADC proposed to replace 14 existing AN/FPS-19's on the Main DEW Line and three FPS-19's on the Aleutian Segment with AN/FPS-30's.* In addition to the FPS-30's, USAF ADC also wanted 17 modified AN/FPS-26 FD radars installed, one set at each FPS-30 location to act as ECCM "burn-through" radars.

USAF approved part of the CEIP on 3 December 1958. The AN/FPS-26's were deleted from the plan. USAF stated that these radars were not suitable for raid assessment. ADC protested on 16 December. But USAF replied that it would program AN/FPS-58's for the line since they were better raid assessment radars.

The program for the DEW Improvement with AN/FPS-30's as of 31 December 1958 was as follows (the AN/FPS-58's had not been programmed by this time):

TABLE 6

DEW IMPROVEMENT PROGRAM - AN/FPS-30's
31 December 1958

SITE DESIGNATION	LOCATION	OPERATIONS DATE FY
COC-1	Nikolski, Aleutian Chain, Alaska	1/63
COB	Cold Bay, Aleutian Chain, Alaska	1/63
COB-5	Port Heiden, Aleutian Chain, Alaska	1/63
LIZ-2	Point Lay, Alaska	2/62

* There were a total of 29 FPS-19's on the Main DEW Segment. USAF ADC was proposing replacement of 14 of them. Six FPS-19's were on the Aleutian Segment, ADC proposed replacing three of them.

Declassified per 21 Sep 06 memo

SITE DESIGNATION	LOCATION	OPERATIONS DATE FY
POW	Point Barrow, Alaska	3/62
POW-2	Oliktok, Alaska	3/62
BAR	Barter Island, Alaska	3/62
BAR-3	Tuktuk, NWT, Canada	3/62
PIN	Cape Parry, NWT, Canada	3/62
PIN-2	Young Point, NWT, Canada	4/62
CAM	Cambridge Bay, Victoria Island, Canada	4/62
CAM-2	King William Island, Canada	4/62
CAM-4	Parke Peak, NWT, Canada	4/62
FOX	Hall Lake, NWT, Canada	4/62
FOX-2	Piling Lake, Baffin Island, Canada	4/62
FOX-4	Cape Hooper, Baffin Island, Canada	1/63
DYE	Cape Dyer, Baffin Island, Canada	1/63

THE MID-CANADA LINE

On 1 January 1958, the Mid-Canada Line (MCL) had been declared fully operational. Identification became a problem, however. The number of "Unknowns" reported was so numerous that MCL information was being disregarded at the NORAD COC.

The principal means of identifying air traffic at the MCL was by flight plan correlation. This required filing a flight plan by each aircraft prior to take-off from a base and the transmission of this plan to an ARTC unit or a MIDIZ station. Radio contact was established with the MIDIZ by the plane prior to penetration.

Traffic over the MCL was normally divided into three types -- bush aircraft, commercial aircraft, and military aircraft. The bush aircraft were small planes operating from improvised bases remote from ordinary means of communications. This type plane crossed the MCL in the greatest numbers. The commercial and military aircraft operated from permanent bases with excellent communications facilities. These types could comply with the regulations governing identification. The bush aircraft could not. As a result, almost every crossing by bush aircraft resulted in an "Unknown" classification. The MCL was able to identify only 48 per cent of the southbound traffic in Canada, and approximately 90 per cent of the "Unknowns" were bush aircraft.

Some provision had been made in planning the line to handle the bush traffic problem. Land clearance airdromes were set up where the aircraft could land and file flight plans. Arrangements were made also for some visual identification at the MCL stations (this was made obsolete when the RCAF ADC began unattended operations at the doppler stations). These measures were not nearly enough, however. Some other means of identifying the traffic had to be found.

The Operations Research Branch of the RCAF ADC set out to find this means. The research personnel figured that if they could find some way of determining which planes were small, slow, and low-flying, they could be classified "Friendly" without flight plan correlation. A means was found right in the Doppler equipment.

The Doppler Detection equipment displayed a crossing of an aircraft in the form of a pen tracing known as a "signature." The original purpose of this pen tracing was to discriminate between aircraft crossings and other signals and for counting aircraft crossing the MCL. It was found that by carefully studying the signatures, the approximate size and speed of crossing traffic could be determined. The analysts then made charts from the tracings, showing how each aircraft type would look as it crossed the doppler equipment. The charts would allow the MCL operators to separate flights into two categories -- "small and slow" and "large and fast."

The new system was tested from 28 July to 3 August 1958. So successful were the tests that on 18 August the new procedure was adopted for use all along the line. Then on 5 September, RCAF ADC

forwarded to NORAD the new procedures that it wished to adopt for operations in the MIDIZ. It asked that NORAD concur in the new procedures so that the MIDIZ Air Navigation Orders could be amended. The regulations governing the movement of large aircraft (i. e., aircraft with a fuselage length or wingspan of 65 feet or more) were not changed. Small aircraft (i.e., fuselage length or wingspan of less than 65 feet) could now "airfile" flight plans. NORAD concurred in the proposed amendment on 23 September 1958.

The improvement was tremendous. As noted above, the MCL had been identifying less than half of the southbound traffic. By December, the MCL was identifying 90.5 per cent of all flights.

Other features added to the MCL system to aid identification were new HF transmission frequencies at each Section Control Station (SCS) which provided an additional air/ground facility. Newer techniques were under study to enable the operators to determine the approximate speed and track data on penetrating traffic. Tests were being set up to see if the Doppler Spectrum Analyser (DSA) might be used on the MCL. More sensitive receivers were being programmed for installation in the James Bay area of the line and an automatic alarm adjuster was being considered for installation throughout the system.

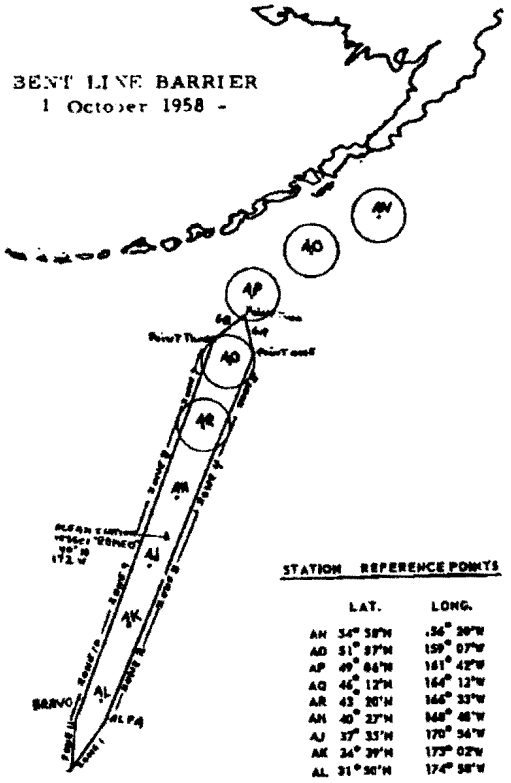
WESTERN EXTENSION AND THE PACIFIC BARRIER

As originally planned, early warning coverage in the Pacific was to be extended with land-based radars along the Aleutian Chain from Naknek to Umnak and with a sea barrier of WV-2 aircraft and DER's from Umnak to Midway Island.

On 1 July 1958, the sea barrier had begun operating with four DER's and four AEW aircraft. The force was not, however, operating between Midway and Umnak. The Aleutian land-based radars would not become operational before March 1959. CINCNORAD had asked the CNO to adjust the sea barrier to cover the exposed area until the Aleutian segment became operational. After the land-based segment became operational, the sea barrier could then be shifted to the Midway-Umnak line.

The temporary line set up on 1 July ran between Kodiak Island and Midway. The four DER stations were on a line running SSW toward Midway Island from a point some 200 nautical miles off Kodiak

Island, with approximately 200 nautical miles between each station. The WV-2's were operating out of Midway, flying out some 1250 nautical miles and then back in a racetrack pattern. The WV-2 pattern overlapped the DER line some 400 miles.



The sea barrier had been in operation but a short time when the NORAD and BARPAC staffs met to discuss a new deployment plan which they called the "Bent Line Barrier." Instead of operating directly between Midway and Kodiak, AEW aircraft would operate from Midway to a point just south of Umnak and picket ships would operate southeast of and generally parallel to the Aleutian Chain from Kodiak over to the AEW line. The BARPAC staff felt that this line would provide better coverage of the Aleutian Chain and allow better AEW operations.

The reasoning behind this proposal was as follows. As the barrier forces were then operating, the picket ships were located some distance from the Aleutians. An enemy could, BARPAC felt, fly over the Aleutians, then drop to a low level and fly undetected between the picket ships. The Aleutian mountain peaks kept aircraft from flying at low level while crossing the Aleutians. Only after crossing could they drop to low level. Thus if the ships were moved closer to the Aleutian Chain, they could sweep the top of the mountains with their radar and catch an enemy aircraft before it had time to drop to low level. Also the operational radars in Alaska at Cape Newenham and King Salmon could cover part of the chain and increase the low level radar coverage.

[redacted]

Declassified per 21 Sep 06 memo

NORAD and CINCPAC approved the idea. After a brief delay caused by the necessity of BARPAC providing ships for submarine patrol temporarily, the bent line barrier was placed in operation on 1 October 1958.

By January 1959, the COB sector, as the Aleutian segment was known, had begun limited operations. CINCNORAD told the Alaskan NORAD Region commander that there was some question as to the need for retaining the Bent Line Barrier. He stated that there were two courses open: (1) have CINCPACFLT abandon the Bent Line barrier and implement the permanent Umnak-Midway barrier, or (2) maintain the barrier until the COB sector was fully operational on 31 March 1959. CINCAL recommended leaving the Bent Line barrier until the Air Force personnel, who were then in a training status, could become familiar with the segment equipment and facilities.

NORAD informed CINCPACFLT of CINCAL's decision and requested that the barrier be left in operation until 31 March 1959 when the Aleutian Segment would become fully operational.

The Aleutian land-based extension of the DEW Line provided for a total of six AN/FPS-19 radar stations between Nikolski on the west and King Salmon on the east. This project, codenamed STRETCHOUT, called for the construction on one Main station at Cold Bay and five lateral auxiliary stations (Driftwood Bay, Sarichef, Nikolski, Port Moller, and Port Heiden).

Western Electric Corporation, prime contractor for the work, planned to test and align the communications and electronic equipment through December 1958.* Then from 1 January until 31 March 1959, the contractor planned to man and operate the six stations around-the-clock for further testing and evaluation. During this period, Air Force personnel would be phased into the stations from the joint Air Training Command/Alaskan Air Command training program. The first station to receive personnel was to be the main station at Cold Bay. Enough personnel to man the remaining stations

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* Support facilities were accepted by the Air Force between 23 July and 30 October 1958. C&E equipment was installed and tested at all stations except Driftwood Bay before 31 December 1958. The latter facility was to be tested by 6 January 1959.

were not expected to become available before the third quarter of FY-1959.

By January 1959, the Aleutian segment was in a limited operational status, but was still under contract control. The Air Force personnel were in a training status, familiarizing themselves with equipment and facilities on the line.

EASTERN EXTENSION AND ATLANTIC BARRIER

In the Atlantic, the Navy ran a sea barrier between Argentia, Newfoundland, and the Azores.* This barrier had begun operations in July 1957 with four DER's and four AEW aircraft. The AEW force was temporarily reduced in August 1957 to two aircraft due to a shortage of operating funds. It was increased to three planes on 17 January 1958 and to four aircraft on 30 April 1958. The picket force remained at four ships throughout 1958 except for very brief periods in November and December.** On 31 December 1958, the barrier was at full strength -- four ships and four aircraft.

To improve operations on the Atlantic sea barrier, Admiral Jerauld Wright, CINCLANT, wanted a heavy radar installed on Flores Island in the Azores. He felt that such an installation would offer numerous benefits, such as reducing the AEW flights from Newfoundland by two hours; allowing the AEW planes to decrease their take-off loads to within "safety" limits; allowing closer spacing of the DER's; and increasing surveillance for submarine air search (SAR) purposes and for defense of the Azores. On 15 August,

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* Except for a period between 19 July and 20 August when the line was shifted to provide coverage of the Denmark Straits, the line was as stated.

** On 19 November, the line was temporarily reduced to two ships because of material breakdowns; on the 21st it was back up to three ships, and on the 22nd of November it was at full strength. The force was lowered to three ships on 8 December when one ship was used to deliver a patient with appendicitis; it was back at full strength on 10 December.

CINCLANT sent a letter to the JCS through CINCNORAD asking for installation of the radar. NORAD forwarded the letter on 17 September with its concurrence. By October, NORAD had heard informally that the JCS felt that it would be 1963 before the radar could be in operation and that this was considered too late, for the Atlantic extension (G-I-UK) would be operating by then.

The Second Atlantic DEW Extension was a jointly sponsored one that was to run from Cape Dyer, Baffin Island, across Greenland, to Iceland, then by water to the Faeroes, and then once again by water to Scotland. USAF was building the land-based portion of the line from Cape Dyer across Greenland to Iceland. The Navy was to extend the line from Iceland to the U. K. This line was often referred to as the G-I-UK extension.

Construction had begun in July 1958 on two stations of the four radar station complex known as the DEW Greenland Extension (DEW East) being built by USAF.* The two stations being built were DYE 1 and 4 located on the east and west coasts of Greenland. Work on the remaining stations (DYE 2 and 3) was to begin during the summer of 1959. All four sites were to receive the AN/FPS-30 radar and were to operate as eastern auxiliary stations of the DEW Cape Dyer sector. The locations and designations of the Greenland sites were as follows.

TABLE 7

STATION	GEOGRAPHICAL NAME	LOCATION
DYE 1	Qaqatoqaq	66°37'N, 52°45'W
DYE 2	Ice Cape Site #1	66°30'N, 46°30'W
DYE 3	Ice Cape Site #2	65°45'N, 43°25'W
DYE 4	Kulusuk Island	65°31'N, 37°10'W

A draft operations plan for DEW East was completed by USAF ADC during November 1958. The plan was submitted to the EWOWG in this

* Construction on DYE 1 had begun on 19 July, on DYE 4 on 3 August 1958.

same month for review and approval. The latter agreed that the communications system should provide a minimum of 36 voice channels between the DYE Main station and DYE 1; a minimum of 12 channels between DYE 1 and the support base at Sondrestrom; and a minimum of 24 channels between DYE 1 and 2, DYE 2 and 3, and DYE 3 and 4.

(U) During the EWOWG meeting, the Danish representatives stated that their government would have to make the final decision on the link and type of communications connecting Kulusuk Island (DYE 4) with the Icelandic site at Keflavik (H-1). The plan provided for a 36 voice channel submarine cable. They felt that no problems would arise if the proper coordination was made before the link was installed. All air/ground radio frequencies to be used at the new sites in Greenland and Iceland had to be fully coordinated also. The Danish members wanted authority to operate the sites at DYE 1 and 4 if and when the Danish Government so desired and wanted a draft plan coordinated with their government before final publication.

(U) The EWOWG decided that the plan should be redrafted by USAF ADC incorporating the suggestions made at the meeting and it should be coordinated with the Danish Government and other agencies prior to submission to USAF. They also decided that NORAD should be requested to contact the DOT of Canada to get approval to relay flight plan data to the Greenland Segment from the Goose AMIS.

(U) By 31 December 1958, the plan was being rewritten. The operations date set for the system was 30 June 1961.

(U) Proposal to Abandon the Sea Barriers. In September 1958, the JCS asked CINCONAD to comment on a proposal for abandoning the seaward extensions of the DEW Line and using the resources to build up the contiguous system.

(U) CONAD replied on 26 November that it was in favor of redeploying the barrier forces to augment the contiguous system. It pointed out that distant early warning against the manned bomber became less important when the ballistic missile threat became equal to or greater than that of the manned bomber. When this occurred, the retaliatory and air defense forces would have to be capable of acting within 15 minutes warning provided by BMEWS. At that time the resources of the sea extensions could be best employed in the contiguous system.

(S) Phase Assessment

The contiguous system had to be expanded, CONAD continued, to get better tactical warning and improved weapons control capability. Means to control BOMARC and interceptors off shore to the limit of their effectiveness were essential to prevent the coastal approaches from "becoming unduly attractive to the enemy." CONAD recommended redeploying the Atlantic and Pacific barrier resources and expanding the contiguous cover as the threat changed, expanding the quality and quantity of contiguous cover as proposed in the NORAD Objectives Plan 1959-1963, and studying the feasibility of using a tethered helicopter-YAGR combination in the contiguous system.

The redeployment set forth in the NADOP 59-63 was as follows.

TABLE 8

SYSTEM	FY 59	FY 60	YEARS FY 61	FY 62	FY 63
Atlantic Sea Barrier					
AEW Stations	5	5	5	0	0
Picket Ship Stations	4	4	4	0	0
Pacific Sea Barrier					
AEW Stations	6	6	6	0	0
Picket Ship Stations	4	4	4	0	0
Contiguous System					
Picket Ship Stations	10	10	18	22	22
AEW&C Stations	10	10	10	22	22

[redacted] CHAPTER VII

Status of Combat Weapons

REGULAR FIGHTER INTERCEPTOR FORCES

General Status. As of 31 December 1958, there were a total of 70 fighter-interceptor squadrons and one fighter detachment in the North American air defense system. These squadrons were owned by three commands: USAF Air Defense Command had 59 squadrons and the detachment* (of which three squadrons were in the 64th Air Division area), RCAF Air Defence Command had nine squadrons, and Alaskan Air Command had two squadrons. Two of the USAF ADC squadrons had no aircraft or crews. This left a total of 68 operational squadrons and one detachment in the NORAD system.

On 30 June 1958, there had been 73 regular interceptor squadrons, of which three had no aircraft or crews. This left a total of 70 operational squadrons at mid-1958, or two more than on 31 December.

The 68 operational squadrons and one detachment were equipped with the following aircraft on 29 December 1958.

TABLE 9

TYPE AIRCRAFT	NUMBER SQDNS	OWNING COMMAND
F/TF-102A	27	USAF ADC (includes 2 in 64th ADiv)
	1	AAC
F-86L	13	USAF ADC
F-89J	11	USAF ADC (includes 1 in 64th ADiv)
	1	AAC
F-104A/B	2 & 1 Det	USAF ADC

* USAF ADC actually owned 60 squadrons on 31 December 1958; however, one squadron, less a detachment, had deployed to Formosa temporarily and was under the operational control of PACAF.

TYPE AIRCRAFT	NUMBER SQUADRONS	OWNING COMMAND
F-89H	2	USAF ADC
F-94C	1	USAF ADC
F-86L/F-104A/B	1	USAF ADC
CF-100 Mk 5	9	RCAF ADC
TOTAL	68 & 1 Det	

Total strength of the force on 31 December 1958 is shown below.

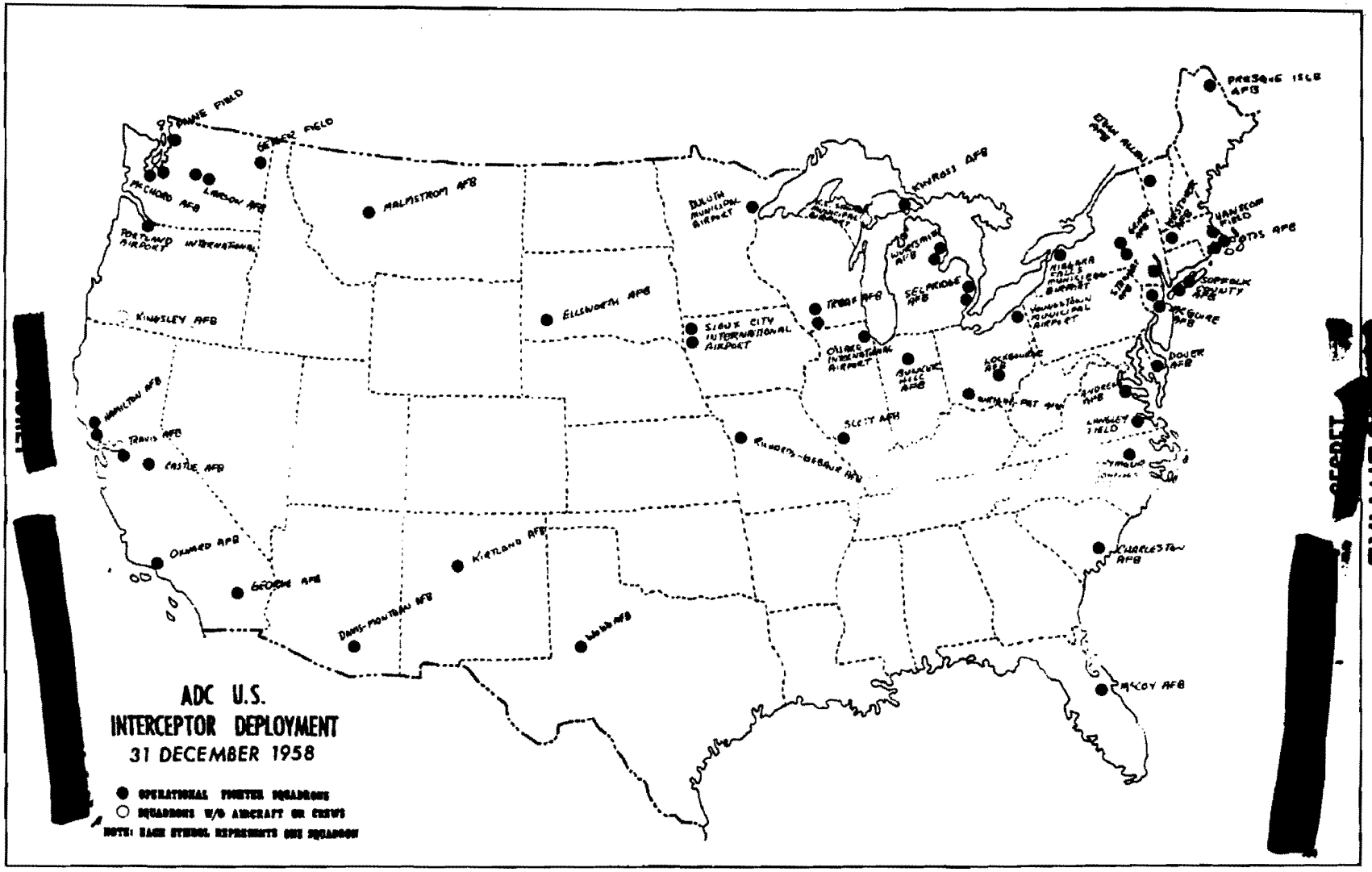
TABLE 10

INTERCEPTORS AND CREWS

COMMAND	DATE	INTERCEPTORS POSS	INTERCEPTORS OPNLY RDY	CREWS ASGD	CREWS OPNLY RDY
USAF ADC	30 June 1958	1,292	812	1,657	757
	31 Dec 1958	1,415	905	1,676	803
64th Air Division	30 June 1958	60	44	64	57
	31 Dec 1958	64	43	78	70
Alaskan Air Command	30 June 1958	80	41	86	81
	31 Dec 1958	62	39	71	71
RCAF ADC	30 June 1958	162	162	225	225
	31 Dec 1958	172	90	242	226
TOTALS	30 June 1958	1,594	1,059	2,032	1,120
	31 Dec 1958	1,713	1,077	2,067	1,170

USAF ADC Interceptor Force. As of 30 June 1958, ADC had 61 squadrons. During the last six months of the year, ADC lost one (the 46th at Dover was inactivated). Thus, it owned 60 squadrons as of 31 December 1958. However, one squadron less a detachment was on temporary duty in Formosa. And two squadrons had no aircraft or crews. This left ADC with 57 squadrons and one detachment operational.

The loss of part of a squadron came about as a result of the crisis on Formosa. USAF directed ADC to deploy 12 F-104's to Formosa


PRESQUE ISLE AFB
DOW AFB
LORING AFB
PLATTSBURGH AFB
GRIFFISS AFB
OTIS AFB
SUFFOLK COUNTY AFB
MCGUIRE AFB
DOVER AFB
ANDREWS AFB
LANGLEY FIELD
CHARLESTON AFB
MACDILL AFB
MCCOY AFB
SELFRIDGE AFB
KINCHELOE AFB
WURTSMITH AFB
KINROSS AFB
DULUTH MUNICIPAL AIRPORT
MALMSTROM AFB
GREAT FALLS INTERNATIONAL AIRPORT
PAINE FIELD
GEIGER FIELD
MCCHORD AFB
LARSON AFB
PORTLAND AIRPORT INTERNATIONAL
KINGSLEY AFB
ELLSWORTH AFB
SIOUX CITY INTERNATIONAL AIRPORT
TRURO AFB
OLMSTED INTERNATIONAL AIRPORT
HAMILTON AFB
TRAVIS AFB
CASTLE AFB
OAKLAND AFB
GEORGE AFB
DAVIS-MONTHAN AFB
KIRTLAND AFB
HOLLOMAN AFB
SCOTT AFB
ADC U.S.
INTERCEPTOR DEPLOYMENT
31 DECEMBER 1958
OPERATIONAL FIGHTER SQUADRONS
SQUADRONS W/O AIRCRAFT OR CREWS
NOTE: EACH SYMBOL REPRESENTS ONE SQUADRON

to operate under PACAF. This was accomplished by sending the 83rd Fighter-Interceptor Squadron less a detachment from Hamilton AFB. The squadron arrived in Formosa in September and remained until December.

Meanwhile, USAF directed ADC to maintain a combat capability on Formosa with the F-104 for an indefinite period. Since personnel had been sent on temporary duty status, their tour had to be less than 180 days. ADC was forced to replace the 83d personnel with crews from another squadron. The only combat ready F-104 aircraft and crews left in the ZI were in the 337th Fighter-Interceptor Squadron at Westover AFB.

As directed by an operations order published on 6 November, crews of the 83d and 337th exchanged places in Formosa in December. The 337th moved 18 of its F-104A aircraft to Hamilton and left ten F-104 aircraft and crews at Westover as a detachment to be used in scheduled SAGE tests in the Boston Air Defense Sector. Personnel of the 83rd Squadron returned to Hamilton.

In the meantime, General Thomas White, USAF Chief of Staff, asked for General Partridge's views on permanently transferring 20 F-104's to the Chinese Nationalists. NORAD replied that the Nationalists should have F-104's, provided that this did not interfere with F-104 programming for ADC. NORAD pointed out that at that time only enough engines were being made available for four hours flying time per month in the ZI. Transfer of 20 aircraft would reduce the flying time available to practically nothing for at least six months.

On 17 February 1959, the JCS informed CINCPAC that operational control of the F-104 unit on Formosa would revert to CINCNORAD on 1 March 1959 and the unit would be returned to the United States.

In other changes in the ADC interceptor force, the 327th Fighter-Interceptor Squadron was moved from George AFB, California, to Thule, Greenland, and the 331st Fighter-Interceptor Squadron was moved from Stewart AFB, New York, to Webb AFB in Texas.

64th Air Division. On 30 June 1958, the 64th Air Division interceptor force was temporarily down to a strength of two squadrons: the 59th at Goose Bay, equipped with F-89J's, and the 323rd at Harmon, equipped with F-102A's. However, in July 1958 the 327th Fighter-Interceptor Squadron arrived from George to take the place of the deactivated 74th Squadron.

On 31 December 1958, the 64th Air Division fighter forces included: two squadrons of F-102A's (323rd and 327th) located at Harmon and Thule, and one squadron of F-89J's at Goose Bay. The latter was scheduled to receive F-101B's in the first quarter of FY-1961.

RCAF Air Defence Command. On 31 December 1958, as at mid-1958, interceptor operations in Canada (excluding the 64th Air Division area) were carried out by nine all-weather interceptor squadrons, each equipped with 20 aircraft, from five bases. Two of the aircraft at each unit were CF-100 Mk3D's, used for training. The other 18 were CF-100 Mk 5 aircraft, used for air defense operations. Four of the RCAF stations -- Uplands, St. Hubert, Bagotville, and North Bay -- had two squadrons each, while Comox had a single squadron.

Until late 1958, the RCAF had been planning to replace the CF-100's with an aircraft then in development -- the CF-105 "Arrow." Canada had started development of this aircraft in 1953. It was programmed to enter the active aircraft inventory in the 1960's. On 23 September 1958, Canada's Prime Minister, John Diefenbaker, announced that Canada would not put the CF-105 into production. It would continue the development program until March 1959, at which time the program would be reviewed again. He stated that a thorough study had been made and it was found that the manned interceptor would not be as effective to meet the post-1960 threat as had been previously thought. Canada would plan on introducing the BOMARC guided missile instead. The nine squadrons then in existence would continue using the CF-100 pending replacement by the BOMARC or newer type aircraft.

Alaskan Air Command. As of 31 December 1958, AAC had two squadrons (one less than at mid-1958). One squadron, the 31st (equipped with F-102A's), had been inactivated in October 1958. Of the remaining two squadrons, one -- the 449th -- was equipped with the normal complement of F-89J's and operated from Ladd AFB; the other, the 317th, was an "augmented" F-102A squadron located at Elmendorf.

The UE complement for the 317th was set by USAF, effective 1 October 1958, at 30 F-102A's and three TF-102's. Except for one TF-102, the 317th had this strength at that time. The additional TF-102 was to be assigned about the first quarter of FY-1960. The 317th's extra aircraft came from the inactivated 31st.

AAC had wanted more. AAC had proposed augmenting the 449th and the 317th with 18 F-102A's from the 31st. CINCAL and NORAD approved this proposal (the latter on 15 August). But USAF would agree to no more than the UE set on 1 October.

The reason for augmenting the 317th was that ALCOM and AAC did not feel that the F-89J in the 449th was capable of performing adequately the identification function. They wanted more F-102A's for the job and also to keep up on training.

Alaskan Program. In the first six months of 1958, USAF's fighter program for the Alaskan theater provided for the following. One F-102A squadron (31st) was to be inactivated and one F-102A squadron was to be left. The F-89J squadron (449th) was to get F-101B's in FY-1962. This would leave the theater with two squadrons -- one equipped with F-102A's and one with F-101B's.

CINCAL did not care for the program. He proposed to USAF through NORAD that both squadrons in Alaska be re-equipped with F-106A aircraft in calendar year 1960. By having one type of aircraft, support and training would be simplified. NORAD supported CINCAL's proposal and in April informed USAF that it concurred.

USAF did not agree, however. It stated that its original program was sound. On 11 June 1958, NORAD again wrote to USAF asking it to reconsider. USAF replied that it would keep CINCAL's proposal under consideration and would advise NORAD of any future changes.

By July 1958, AAC had received the latest USAF programming document (PX-60-1B-1, June 1958) and noted that the F-106A program had been reduced Air Force-wide from 26 squadrons to nine. The program also advanced the phasing in of the F-101B's to replace the F-89J's in Alaska from the first quarter of FY-1962 to the fourth quarter of FY-1961.

On the basis of the revised program, CINCAL sent USAF, through NORAD, a new proposal. He pointed out that his main concern was obtaining two squadrons of the same type aircraft (each with a UE strength of 33 aircraft) having an atomic capability at the earliest possible date. This requirement could not be met by the current interceptors. The F-89J had neither the speed nor the altitude capability to adequately perform the identification function against the type threat facing Alaska, and the F-102A had no atomic

capability. The fact that both squadrons had different type aircraft complicated Alaska's air defense mission since it would not permit mutual air division support, standard control and intercept training and techniques, and recovery and turn-around of the aircraft at other than the home base.

His original choice of the F-106A over the F-101B, CINCAL continued, had been based on what he considered superior performance and the comparative availability of both types of aircraft. However, the availability date of the F-101B had been improved and the F-106A program reduced. Because of these changes, he now asked USAF to consider replacing the F-89J squadron with an F-101B squadron during the fourth quarter of FY-1959, or as soon thereafter as possible, and converting the F-102A squadron to F-101B's the following quarter. "In the event that F-101B aircraft cannot be made available to Alaska prior to...the F-106A..., then the preference for the F-106A aircraft is restated," he concluded.

NORAD forwarded the new proposal to USAF on 5 November with its concurrence. The Air Force answer was not encouraging. It stated that a squadron of F-101B's would not arrive until the first quarter of FY-1961 and that the UE strength would be only 18 aircraft. This was all that could be spared. A second squadron of F-101B's to replace the F-102A squadron could not be provided. However, USAF said it was planning to provide the F-102A squadron with a GAR-11 atomic capability by the fourth quarter of FY-1961.

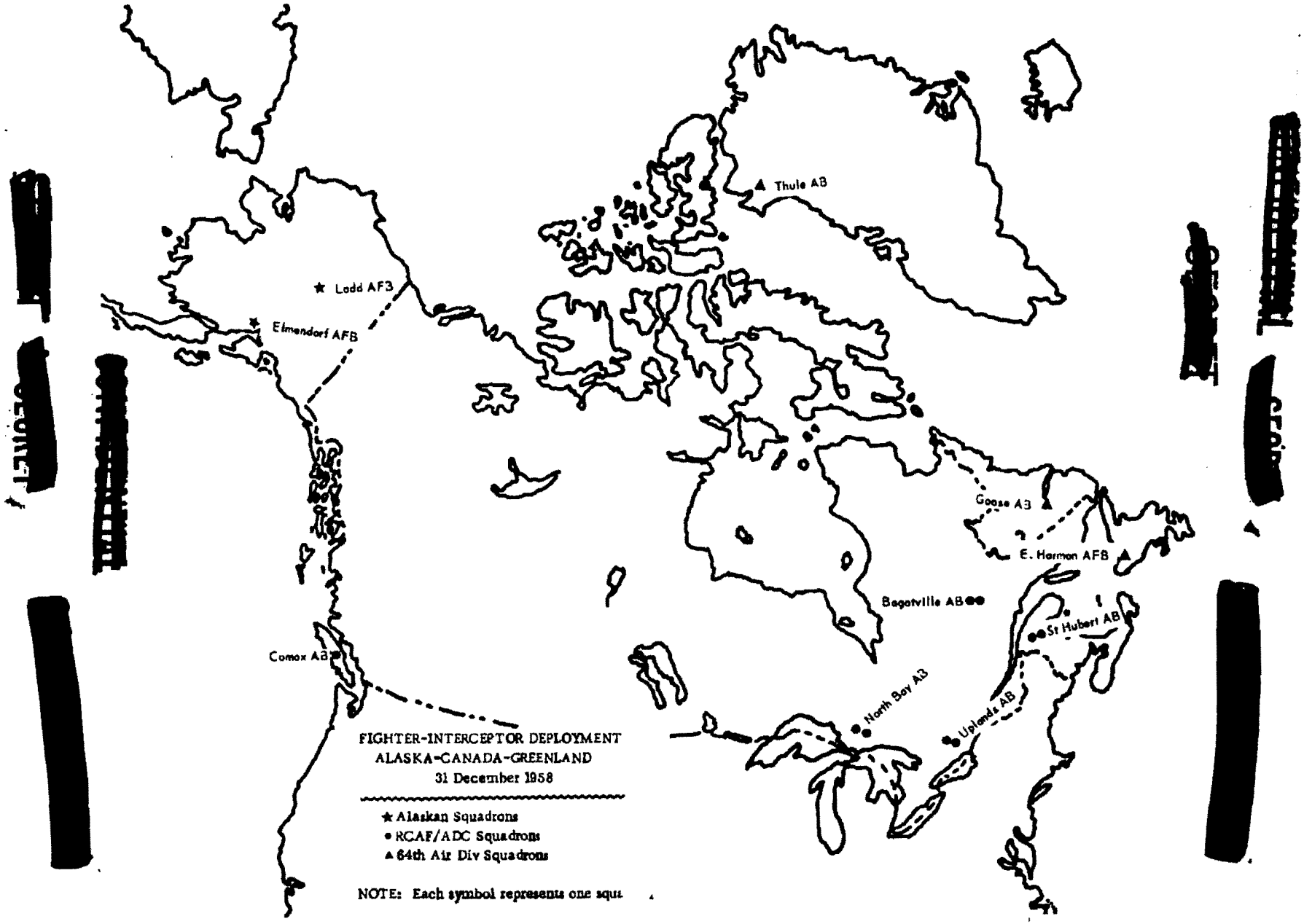
AUGMENTATION FORCES

TABLE 11 AUGMENTATION AIRCRAFT TOTALS REPORTED

	USAF	U.S. Navy	ANG	RCAF ADC	RCN
30 June 1958	1,530	965	1,091	Equiv of two sqdns UE of 101 acft	Acft as avail
31 December 1958	1,900*	933	930*		

* Approximate strength

USAF Augmentation Forces. The USAF augmentation force was provided by Tactical Air Command (TAC) and Air Training Command


Thule AB
Ladd AFB
Elmendorf AFB
Goose AB
E. Harmon AFB
Bagotville AB
St Hubert AB
Comox AB
North Bay AB
Uplands AB
FIGHTER-INTERCEPTOR DEPLOYMENT
ALASKA-CANADA-GREENLAND
31 December 1958
★ Alaskan Squadrons
● RCAF/ADC Squadrons
▲ 64th Air Div Squadrons
NOTE: Each symbol represents one squa

(ATC). TAC's force was composed of tactical fighter wings and tactical combat crew training wings; ATC's force was composed of all-weather combat crew training wings.

The tactical fighter force had nine F-100C/D/F fighter wings, or a total of 36 squadrons with a UE of 18 aircraft each. Theoretically, some 648 aircraft from this force could possibly augment the regular interceptor force. However, many of the squadrons were scheduled to deploy overseas during an emergency and would not be available for air defense operations. The tactical combat crew training wings were located at the three bases that TAC had acquired from ATC on 1 July 1958 -- Nellis, Luke, and Williams. From these bases some 400-500 F-84F, F-86F, and F-100A/D/F aircraft could be used in an emergency.

As noted above, ATC lost much of its augmentation force when TAC assumed control of three ATC training bases and their personnel. On 31 December, ATC's all-weather combat crew training wings were operating from two bases -- Perrin and Moody. These two bases were reporting between 250 and 300 aircraft assigned. An increase in strength was expected on 1 January 1959 when F-89D's would become operational at a third base, Connally Air Force Base.

Air National Guard. On 30 June 1958, 55 Air National Guard squadrons had a mobilization assignment to ADC as augmentation forces. This total was divided into 42 all-weather and 13 day-fighter squadrons. Another 12 day-fighter squadrons had a mobilization assignment to TAC. USAF had proposed assigning all 25 day-fighter squadrons to TAC. NORAD, USAF ADC, and TAC had agreed.

On 1 October the transfer was made. ADC was left with a mobilization force of 42 all-weather squadrons. These squadrons each had a UE of 25 aircraft, or a total of 1,050 aircraft, that could possibly have been used in air defense.*

U. S. Navy. On 31 December 1958, the Navy reported a total of 933 Marine and Navy fighter aircraft available for use as augmentation forces. These 933 aircraft were grouped into the following categories: 500 Fleet aircraft, 217 Training aircraft, and 216 Reserve Training aircraft.

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* One squadron was located in Puerto Rico.

[redacted]

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* One squadron was located in Puerto Rico.

[redacted]

Canadian Augmentation Forces. The forces available to augment the RCAF ADC regular fighter force in December 1958 included the ADC training stations at Chatham and Cold Lake and the Royal Canadian Navy. The Operational Training Unit at Chatham had a Unit Establishment strength of 56 Mk 5 Sabre aircraft and an average of 36 experienced crews. The Cold Lake Training station had 45 CF-100 Mk 4A aircraft and an average of 20 experienced crews. Both base commanders were to bring the maximum number of aircraft to a combat ready state, man them with experienced staff crews or the most experienced crews available, and await orders from the AOC ADC when an emergency arose. The aircraft at Chatham were to operate from their home base, those at Cold Lake were to deploy upon orders from the AOC ADC.

The RCN forces consisted of Banshee aircraft from the Atlantic Coast. These aircraft were to be provided on a "when available" basis for combat operations in the 2nd Sector under the operational control of the sector commander.

ARMY AIR DEFENSE WEAPONS

General Status. As of 31 December 1958, the number of Army air defense missile and gun battalions totalled 64. ARADCOM had 62 (60 in the U. S. and two in Thule) and U. S. Army, Alaska, had two. Of the battalions in the U. S., 58 were Nike (equivalent in fire power to 61) and two were Skysweeper. At Thule there was one Hercules battalion (of which one battery was operational) and one gun battalion.

TABLE 12

MISSILE-GUN STATUS

UNITED STATES

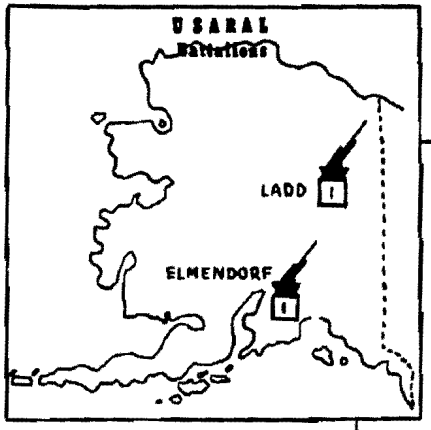
	JUNE 1958			DECEMBER 1958		
	NIKE BTRYS		SKY BTRYS	NIKE BTRYS		SKY BTRYS
AVG NO ASGD	Ajax	242	6	Ajax	236	6
	Hercules	2		Hercules	8	
AVG NO ON SITE	Ajax	242	6	Ajax	236	6
	Hercules	2		Hercules	8	

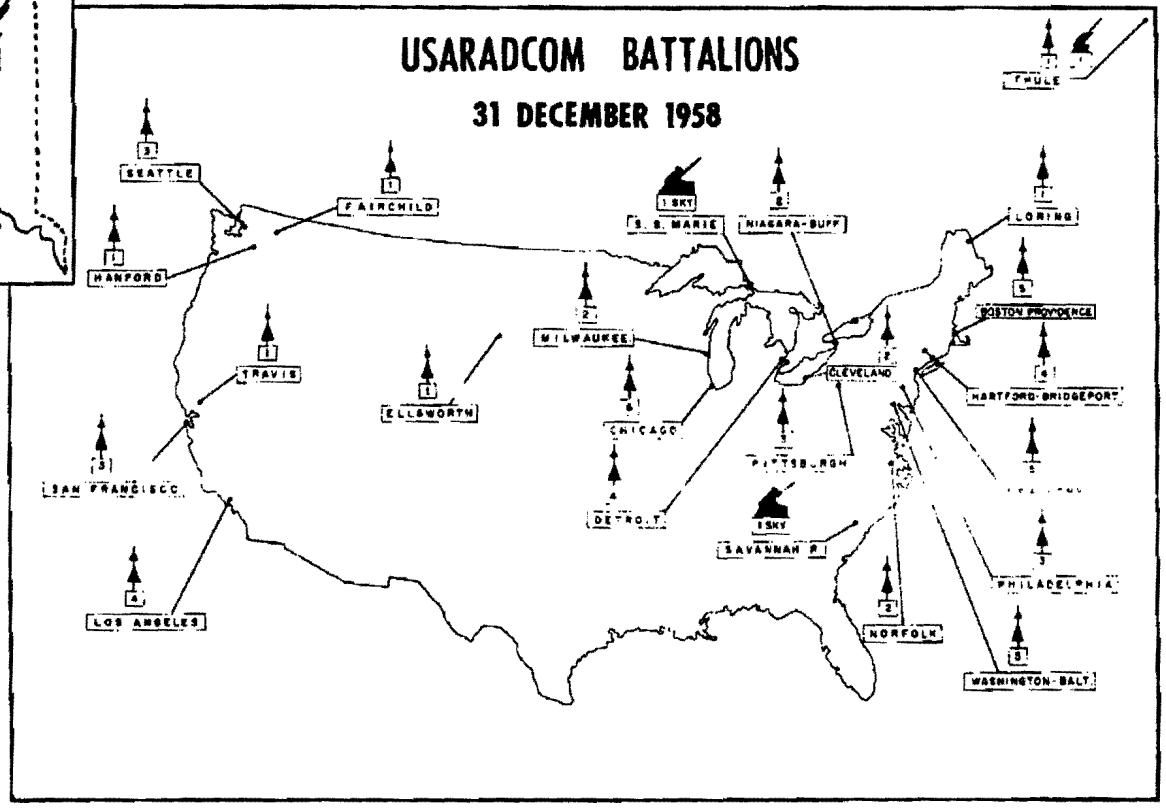
ALASKA AND THULE				
AREA	JUNE 1958		DECEMBER 1958	
	UNIT	WEAPON	UNIT	WEAPON
Thule	549th Bn	90mm	4th Missile Bn (Nike-Hercules) 55th Arty	90mm & 1 Btry Hercules (opnl)
Alaska	96th Bn Ft. Richardson	120mm	96th Bn*	120mm*
	502nd Bn	120mm	502nd Bn	120mm
* less one battery				

USARADCOM. At mid-1958, ARADCOM's Nike program called for 70 battalions by the end of FY-1959. The 70 battalions would include 43 Nike Ajax and 27 Nike Hercules. Of the 27 Hercules battalions, 18 battalion equivalents (72 fire units) were to be formed by converting existing Ajax sites, the remaining nine were to be activated in new defense areas (including one battalion in Greenland).

This program was changed on 15 December 1958. A shortage of construction funds, construction problems encountered at various sites, and a stretchout in equipment procurement caused a revision. The new program provided for 67 on-site battalions at the end of FY-1959 (three battalions formerly scheduled for operations at six SAC bases had been deferred). This program included 43 Ajax battalions (36 to be manned and operated by Regular Army units, seven to be manned and operated by National Guard units) and 24 Hercules battalions. Of the 24 Hercules battalions, it was still planned to form 18 battalion equivalents (72 fire units) by converting existing Ajax sites. The remaining six would be activated in new defense areas (including the Greenland battalion). Only one of the six Hercules battalions for the new defense areas was expected to become operational by the end of FY-1959, however.

On 1 July 1958, ARADCOM had 58 Nike battalions on-site (244 fire units), which in fire power was considered by ARADCOM the equivalent of 61 battalions. By 31 December 1958, ARADCOM had 59 battalions on site (in fire power the equivalent of 62 battalions), 58 in the U. S., one at Thule. The equivalent of 56 battalions (236 fire units) were Nike Ajax, the remaining three (12 batteries)


USARAL
Batteries
LADD
1
ELMENDORF
1


USARADCOM BATTALIONS
31 DECEMBER 1958
THULE
SEATTLE
FAIRCHILD
1 SKY
S. S. MARIE
NIAGARA-BUFF
LORING
HANFORD
BOSTON-PROVIDENCE
MILWAUKEE
TRAVIS
CLEVELAND
ELLSWORTH
HARTFORD-BRIDGEPORT
CHICAGO
SAN FRANCISCO
PITTSBURGH
DETROIT
1 SKY
SAVANNAH
PHILADELPHIA
LOS ANGELES
NORFOLK
WASHINGTON-BALT.

were Nike Hercules. Eight of the 12 batteries were converted Nike Ajax batteries. These eight were located in the U. S. as follows: one each in the Detroit, Philadelphia, Chicago, and Los Angeles areas; two each in the New York and Washington-Baltimore defense. The remaining four batteries were newly activated at Thule, Greenland. Only one of the four had become operational by 31 December 1958.

On 31 December 1958, ARADCOM's active U. S. gun program consisted of two operational Skysweeper units, the same level as at mid-1958. These two units were the 4th Gun Battalion (Skysweeper), 71st Artillery, located at Savannah River, and the 2nd Gun Battalion (Skysweeper), 68th Artillery, at Sault Ste. Marie. ARADCOM was also operating the four 90mm gun batteries in Thule which were augmenting the new 4th Missile Battalion (Nike Hercules), 55th Artillery, during the transition from guns to missiles.

Nike Hercules Improvement Program. In 1956, Bell Telephone Laboratories (BTL) proposed to DA that it proceed on an advanced design Nike Hercules. On 18 April 1956, DA asked the BTL to initiate studies to determine the feasibility of improving the Hercules capability against small, high-speed targets in an ECM environment. The study was completed in 1957 and several improvements were presented to the Army staff for consideration.

By 1958, the Army had agreed to certain improvements to the basic Hercules system rather than to an entirely new system. These improvements were: (1) a new, long-range, high-powered, L-band acquisition radar (HIPAR); (2) a new Ku-band, range only radar; (3) an improved target tracking radar to give increased range against small targets; and (4) minor changes in the operating consoles.

The improvements were expected to provide the Hercules system with a capability against small, high-speed targets of the Rascal and Hound Dog type and to enable the Hercules to work in a "heavy" ECM environment. The improvements were to be provided in so-called "retrofit improvement kits."

In September 1958, DA asked ARADCOM for its recommendations as to the minimum number of improvement kits needed for the current Hercules program. ARADCOM replied that it wanted 79 complete retrofit kits, 17 kits less the HIPAR, and sufficient communications equipment for the latter 17 so that they could receive HIPAR data.

ARADCOM told DA that it had been unable to obtain NORAD's approval of its stated requirements. NORAD would not concur in the requirements because it felt that the cost of the improvement program would affect the overall air defense budget and, in particular, the Frequency Diversity radar program. NORAD also felt that there was no need for the new target ranging radars (Ku) at every Hercules fire unit and the use of the new HIPAR in the defenses was unnecessary when an existing or programmed radar could furnish comparable data at the time and in the form required by the Hercules system.

Shortly thereafter, USAF asked ADC and CINCNORAD if the Army program had been presented for coordination. USAF said that DOD and the Bureau of the Budget had reviewed the proposed Army and Air Force budgets and that DOD recommended cutting the USAF FD program if the Army HIPAR improvement program were funded. This would eliminate any duplication in funding for the U. S. surveillance system. DA felt that the performance characteristics of the HIPAR plus the technical compatibility of the improvements to the Hercules system made it essential to procure Army retrofit kits. Air Force further stated that the Army program would, in many cases, duplicate the USAF FD program.

CONAD then outlined its stand to the JCS. ARADCOM had contacted it, CONAD said, to obtain coordination, but the program had not been presented in sufficient detail to permit evaluation of the impact on the overall surveillance program. So the improvement program had not been approved. CONAD stated further that if DA proposed to program the improved Hercules equipments, the proposal had to have CONAD's approval.

On 5 December, DA wrote ARADCOM that the JCS had sent CINCONAD's message to it for action. It stated that two CONAD staff members had visited DOD and had agreed that CINCONAD considered early improvement of the Hercules a definite requirement. The problem to be solved, DA concluded, was the number and type of radars required. DA directed ARADCOM to expedite coordination with CINCONAD and upon receipt of NORAD's approved requirements send the information so that the budget could be completed.

Almost immediately CONAD restated its position to the Army. It stated that CINCONAD was in favor of improving the Hercules, but that he was convinced that much of the improvement could be met within the approved FD program. In examining the Army and the USAF

FD programs, it was found that there was considerable duplication of heavy radars. CONAD stated that where possible the Hercules requirements should be met by the FD program. Any requirement for Army HIPAR radars should be determined only after a site-by-site survey. This would show just where the FD program could not meet the Hercules surveillance requirements. Before CONAD supported procurement of the HIPAR radars, "...CINCONAD must be assured that it will not cause interference to the planned surveillance system and that it will not duplicate that system in each individual Hercules area."

DA replied on 31 December. It stated that it felt that the duplication and interference problems were over-emphasized and that, in general, Army radars in the Hercules improvement program were essential. Army agreed to the need for a detailed site survey, however. And it stated that ARADCOM had been told that a team would visit Colorado Springs to discuss the program further.

Army National Guard. In the first half of 1958, DA approved reorganization by the National Guard Bureau of 28 ARNG 90mm gun battalions as Nike Ajax units. These units were to be placed in a training status from which DA expected that 22 battalion equivalents (88 batteries) would emerge by FY-1960 as Nike Ajax units. Upon completion of their training, the units would take their place in the ARADCOM force structure manning the Ajax sites. Initially, ARADCOM's FY-1959-60 Nike Ajax program called for a total of 43 battalions, seven of which would be ARNG units in FY-1959. In FY-1960, another 15 ARNG units were to be added, making a total of 22.

The ARADCOM Nike Ajax program was changed in the last six months of 1958. DA decided to slow down the transition from Regular Army to National Guard operation of the Ajax. The revised program did not affect the FY-1959 schedule and seven National Guard units were expected to become Ajax units by 30 June 1959. One unit -- the 720th -- assumed its role in the active defense program on 12 September 1958 in the Los Angeles defense. The FY-1960 program was reduced from 15 battalions to seven and one-half. This meant that the end FY-1960 force structure would provide for 14 and one-half battalion equivalents (58 batteries), rather than the 22 battalion equivalents formerly programmed.

Back in November 1957, ARADCOM had recommended to DA the elimination of the M-Day program (a total of 84 battalions at that time). ARADCOM felt that since its own gun program had been cut

out, there would be very little reason to keep a force whose mission was to augment or replace active Army gun units. Retention of the National Guard gun program would not, ARADCOM stated, contribute sufficiently to the air defense effort to warrant the money and manpower needed to support it. ARADCOM concluded that unless the ARNG forces could be used in the on-site missile program they should be dropped.

DA approved the ARADCOM recommendation and so notified the National Guard Bureau. On 19 December 1958, the National Guard Bureau told ARADCOM that effective 1 January 1959, 52 of the M-Day battalions would be eliminated. The remaining 32 would be reorganized as missile units and would enter the ARNG on-site missile program. This meant that four more gun units would be reorganized as missile units. Twenty-eight of these 32 were discussed above.

The trend toward using National Guard units rather than Regular units to man the first line air defense weapons was a matter of some concern to CINCNORAD. In December 1958, CINCNORAD pointed this out to the Chairman of the JCS. DA was already starting to man the Nike Ajax with National Guard personnel. Also, in parts of the NORAD system, the only available fighter-interceptor capability was provided by the Air National Guard. And it had been learned informally that Army and Air Force were considering using National Guard personnel to man BOMARC, Hercules, and Hawk units.

CINCNORAD stated that both the ADC and the ARADCOM commanders were opposed to any plan that would turn first line, untried weapons over to National Guard units. Both commanders had written their departments objecting to these plans. CINCNORAD indorsed those objections, "To my way of thinking, our current and historical concept of maintaining the Regular military establishment as a front line, ready force, equipped with the newest weapons, was designed to be responsive to the needs, control, and direction of National, not State, defense." Only by retaining Federal control could the full capability, mobility, and flexibility of the military forces be maintained for defending North America. He urged that immediate action be taken to establish a policy that the equipping, manning, and operation of North American air defense units needed on a full-time basis be made a responsibility of the Regular military establishment, and that National Guard units be used as augmentation forces only.

Alaskan Program. At mid-1958, Department of the Army plans for the Alaskan theater provided for the conversion of both of its gun battalions to Nike Hercules in FY-1959. The first Nike units

were to arrive in September 1958, the second in October 1958. Nine batteries were programmed -- five for Eielson and four for Elmendorf. The units, with the exception of the fifth battery for Eielson, were expected to become operational by February 1959. The remaining battery at Eielson was expected to become operational early in FY-1961.

In August, the plans were changed, however. In this month, DA informed USARAL that the unit scheduled to arrive in Alaska in September had been diverted and was to be used in Formosa. A new unit would be programmed as soon as possible. CINCAL protested to CINCNORAD. He stated that the reduction in fighter strength had, in part, been based on the fact that an operational Nike Hercules unit would be in place at Eielson. Further, there would be serious logistical and personnel problems if this unit were not quickly replaced. He recommended that NORAD request DA to replace the diverted unit no later than January 1959. CONAD, in turn, asked the Executive Agent when a new unit for Alaska could be expected.

By September 1958, DA announced that it had revised its overseas Nike plans and that Alaska would receive a replacement in February 1959. To prepare for the arrival of the Nike unit, USARAL (with the concurrence of CINCAL) relieved one battery of the 96th Gun Battalion (120mm) from its active air defense mission on 30 September 1958. The battery was to be used in preparing the Nike sites in the Elmendorf area.

In October 1958, the Nike plans were changed again. In this month, DA told CINCAL that the two Nike packages would arrive in Alaska in January and April 1959. On the basis of these revised dates, CINCAL told USARAL that the first battery for the Elmendorf defense should be operational on 1 March 1959, the first battery for Eielson on 10 May 1959, and the remaining batteries as soon as practicable. By 31 December 1958, it was anticipated that all but one battery in the theater would be in operation by June 1959. The fifth battery planned for Eielson would not be ready before November 1959.

[redacted]

CHAPTER VIII [redacted]

Operational Requirements and Procedures

NORAD REGULATION 55-3

General. Since establishment in September 1957, NORAD had been operating with a multitude of directives covering conditions of readiness, states of alert, and alert requirements. These directives included RCAF ADC Air Staff Instruction (ASI) 2/13, "Air Defence Readiness"; ASI 2/14, "Air Defence Warnings"; CONAD Regulation 55-3, "Increased Intelligence Watch, States of Preparedness, Air Defense Emergency, and Air Defense Warnings"; CONAD Regulation 55-8, "Alert Requirements for Air Defense Units During Normal Preparedness"; and CONAD Regulation 55-14, "Definitions of States of Alert for Air Defense Weapons."* In addition to the above, there were a number of operations plans in the 64th CONAD Division, Alaska, and the RCAF ADC covering these subjects.

The NORAD staff worked for over a year to standardize and consolidate procedures in these important fields. Finally, on 3 November 1958, NORAD Regulation 55-3, "Conditions of Readiness, States of Alert, and Alert Requirements" was issued. This regulation provided all echelons of command under the operational control of CINCNORAD** with instructions and procedures to place the air defense units in a condition of preparedness to meet any emergency and prescribed the states of alert and minimum alert requirements to be maintained under each condition of readiness.

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* Not included in the above are amendments 55-3A, 55-3B, 55-8A and 55-14A.

** Although CINCNORAD's Terms of Reference did not include responsibility for Greenland, the 64th CONAD/NORAD Division was to be governed by the regulation so that separate instructions would not be required for this one area.

[redacted]

[redacted]

It also provided guidance to other commands and agencies having an air defense responsibility to CINCNORAD.

The regulation stated that all air defense forces assigned, attached, or otherwise made available to CINCNORAD would at all times be maintained at a state of preparedness compatible with the real or apparent imminence of attack. During normal peacetime conditions, the emphasis was to be placed on training. The minimum number of weapons necessary to perform an identification function and to defend against a small sneak attack were to be maintained at the prescribed degree of operational readiness. During periods of international tension or war, the NORAD system would maintain higher levels of preparedness as set forth in the regulation.

Conditions of Readiness. Three conditions of readiness were established by the regulation -- Normal Readiness, Increased Readiness, and Maximum Readiness. Normal Readiness was defined as "a state of preparedness related to peacetime operations and training wherein the minimum number of air defense weapons systems required for identification and/or immediate reaction to a small scale surprise attack are maintained at a high state of alert." This condition would be declared and terminated by CINCNORAD, Deputy CINCNORAD, or his designated NORAD representative.

Increased Readiness was that condition requiring ". . . a progressive build-up of preparedness established by specifically prescribed conditions whereby the air defense system . . . [was] readied for situations above 'Normal' but not demanding 'Maximum' readiness." Under this condition, four different degrees (Conditions 1, 2, 3, and 4) of readiness were set up with the minimum alert requirements necessary to carry out actions for a progressive build-up of "Increased Readiness."

These steps would obviate the necessity of sending messages to each commander telling him exactly what alert level was needed to improve the air defense capability. Increased Readiness was to be declared and/or terminated by CINCNORAD, Deputy CINCNORAD, or his appointed representative. Provision was made for a region or division commander to declare Increased Readiness for his own forces under unusual circumstances peculiar to his area. However, when such condition was established by NORAD subordinate commanders, it was subject to confirmation by CINCNORAD, Deputy CINCNORAD, or a designated NORAD representative.

[redacted]

TABLE 13

STATES OF ALERT AND MINIMUM ALERT REQUIREMENTS
FOR
NORMAL READINESS

	5 MINUTE ALERT	15 MIN	30 MIN	1 HOUR	3 HOUR	REMARKS
Interceptor (non-nuclear)	2 a/c per base (this status is considered synonymous with RCAF 10 min capability)			2 a/c for an 18 a/c sqdn 4 a/c for a 25 a/c sqdn	Remaining a/c that can be operationally ready in 3 hours	Aircraft maintained on a "1-hour" alert status may be flown, subject to diversion to air defense operations or recall.
Interceptor (nuclear capable)	2 a/c per base (not armed with nuclear weapons)		2 a/c per base (equipped with nuclear weapons)			Alert a/c will not be scrambled with nuclear weapons during "Normal Readiness. Maximum number of nuclear weapons will be maintained in an operational ready status at all times.
Surface-to-air Weapons Fire Unit		25%			75%	
Picket Ships						When on station, operation in accordance with current NORAD Operation Plan for Seaward Extension Elements, or as specifically approved by CINCNORAD.
Sentinel Aircraft (AEW&C)						As for Picket Ships
ACW Squadrons						24-hour day operation to provide continuous surveillance and control capability, except for periods of authorized, scheduled maintenance.
DEW Line-Mid Canada Line						24-hour day operation to provide continuous surveillance
ACW Squadrons (Limited Operational Status)						Surveillance for a 4-hour period beginning 2 hours before sunrise, and a 4-hour period beginning 2 hours before sunset, for early warning raid recognition purposes.

TABLE 14 STATES OF ALERT AND MINIMUM ALERT REQUIREMENTS FOR INCREASED READINESS*

	5 Minute Alert				15 Minute				30 Minute				1 Hour				REMARKS
	Conditions				Conditions				Conditions				Conditions				
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
Interceptor (non-nuclear)	4 a/c per base	4 a/c per base	4 a/c per base	4 a/c per base							2 a/c per sq	4 a/c per sq	*30%	40%	50%	60%	*Percentage figures represent the % of remaining operationally ready aircraft (a/c)
Interceptor (nuclear equipped)	2 a/c	2 a/c	2 a/c	2 a/c	2 a/c	2 a/c	2 a/c	2 a/c			2 a/c	4 a/c	*30%	40%	50%	60%	Nuclear equipped aircraft will not be scrambled during Increased Readiness, except in Alaska. Nuclear capable a/c will not be armed with nuclear weapons, except in Alaska. (Other All-weather aircraft may be substituted for the 5-min alert rqmt).
Surface-to-air Weapons fire unit					25%	25%	25%	50%	25%	25%	50%	25%				25%	Remaining operational fire units in a 3-hour status. Percentage figures represent % of operationally ready fire units.
Picket Ships																	Continue normal station manning & operation on both Atlantic & Pacific coasts.
Sentinel Aircraft (AEW&C)																X	Continue normal manning & operation. (Minimum of an additional 3 a/c & 3 crews).
ACW Squadrons																	24-hour day operation to provide continuous surveillance & control capability.
DEW Line-Mid Canada Line																	24-hour day operations to provide continuous surveillance.
ACW Squadrons (Limited Operational Status																	As directed by NORAD Division commander.

* With these requirements went special instructions to the NORAD Region Commanders -- see NORADR 55-3, 3 November 1958

As noted elsewhere, the regulation was dated 3 November 1958. However, it was 12 December before the RCAF ADC notified its units that the ASI's were to be superseded* and the NORAD regulation promulgated. On this same date, RCAF ADC told the Canadian units that effective 13 December 1958 they would begin standing alert, except for the five-minute requirement, in accordance with NORADR 55-3. Instead of the five-minute alert, the Canadian squadrons were to maintain a ten-minute alert at each base. The requirements for the 64th CONAD/NORAD Division were to be those in 55-3.

Alaskan Requirements. In the case of Alaska, CINCAL modified the regulation and tailored it to fit the needs of the Alaskan theater. The requirements established by CINCAL, issued in AlCOM Regulation 55-11, dated 17 December 1958, were as shown on Table 15.

Change in 75mm Alert Requirements. NORADR 55-3 had been in effect but a short time when ARADCOM asked NORAD to revise the Normal Readiness alert requirements for Skysweeper (75mm) units. ARADCOM pointed out that these units were to maintain 25 per cent of their weapons on 15-minute status and 75 per cent on three-hour alert. It stated that the 15-minute alert requirement was unrealistic. Settling rounds had to be fired from the guns and a subsequant recheck of orientation and synchronization made in order to deliver accurate fire. Further, the maximum engagement range of the 75mm guns was limited to 7,200 yards. The limited range of the weapons, ARADCOM continued, afforded the unit more time to get ready for engagement after detection of a hostile than was available to longer range weapons. Thus, it recommended that the requirement be changed to have the 75mm units maintain 33 per cent of their fire units on 30-minute status and the remainder on a three-hour alert.

NORAD approved the ARADCOM recommendation on 31 December and notified ENR, the region responsible for the guns. On 7 January

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* RCAF ADC advised its units that ASI 2/13 with the exception of paragraph 11 (declaring Simulated Air Defence Readiness) and ASI 2/14 excepting paragraphs 15-16 (pertaining to simulated Air Defence Warnings) were superseded.

TABLE 15

ALASKAN ALERT REQUIREMENTS

WEAPON/UNIT	CONDITION	MINUTES			HOURS	
		5	15	30	1	3
Interceptors	Normal Readiness	2 a/c per base of operations	2 a/c per main base		Sufficient no. of a/c to bring alert total of 6 a/c	Remaining operationally ready a/c
	Increased Readiness (all conditions)	4 a/c	4 a/c		Remaining operationally ready	
	Maximum Readiness (all conditions)	Maintain interceptors on such states of alert as will permit maximum availability of operationally ready a/c and crews in the event of an attack.				
ACW Squadrons	Normal Readiness	24-hour operation to provide continuous surveillance and control capability, except for periods of authorized, scheduled maintenance.				
	Any condition higher than normal	24-hour operation to provide continuous surveillance and control capability.				
Surface-to-air fire units	Normal Readiness		25%		25%	50%
	Increased Readiness (all conditions)		50%	25%	25%	
	Maximum Readiness (all conditions)	Maintain the highest number of fire units on the highest state of alert that the units can sustain.				

1959, ENR notified the ARADCOM regions of the new requirements and made them effective upon receipt of its message.

AUGMENTATION ALERT FORCE

General. The CONAD regulation governing alert requirements had made no provision for establishing alert requirements for augmentation units. And for the most part, such schedules as were set up in the U.S were arranged by USAF ADC, those in Canada by the RCAF ADC. The schedules established were concurred in by NORAD Headquarters and the region commanders, however. The new NORAD regulation provided that alert requirements for all augmentation units coming under CINCNORAD's operational control would be prescribed by the region commanders.

U.S. Augmentation Aircraft. On 30 June 1958, there were a total of 17 Air National Guard (ANG) fighter-interceptor squadrons standing alert in the U.S. Sixteen of the squadrons were maintaining two planes on five-minute alert 14 hours a day. The normal schedule was one hour before sunrise to one hour after sunset. If this schedule went over 14 hours, an alternate was to be followed which stipulated that the aircraft were to begin one hour before sunrise and continue to 14 hours later.

The other squadron was standing a 24-hour alert. This requirement had been started to increase the ADC identification capability and augment the regular interceptors. Selected units of the ANG were to provide two aircraft and aircrews for five minute-readiness, 24-hours per day, 7 days a week. In addition, two aircraft and aircrews were to be designated for one-hour back-up.

On 31 December 1958, the total number of ANG units on alert was 19 — six were standing 24-hour alert, the remaining thirteen, 14-hour alert.

Two additional units standing alert on 31 December, as at mid-1958, were a Navy unit at San Diego and an ATC unit at Perrin AFB, Texas. Both kept two aircraft on five-minute alert around-the-clock.

Canadian Augmentation Aircraft. The Canadian augmentation aircraft came from two sources: RCAF ADC training stations and

the RCN. NNR required the training base at Chatham to keep four Sabre aircraft on one-hour readiness from dawn to dusk. A second training station -- Cold Lake -- was to maintain six CF-100 aircraft at three-hour readiness. The RCN was to maintain a daylight alert with Navy Banshee aircraft as available at Shearwater, a station located just outside of Halifax.

On 31 December 1958, the NORAD weapons alert force was as shown below.

TABLE 16

FORCE	ALERT REQUIREMENTS					TOTAL
	5-Minute	15-Minute	30-Minute	1-Hour AI/NAI	3-Hour AI/NAI	
Interceptors	133	9 (MB-1)	20	186/4	649/55	977/59
Missiles		59		3	159	221
Guns*	1	33	10	27	109	180

* Includes Navy

RULES OF ENGAGEMENT

Until 3 November 1958, there were no NORAD regulations on rules of engagement. The engagement rules were contained in four separate directives: (1) CONAD Regulation 55-6, issued on 13 May 1957; (2) AlCOM Supplement No. 1 to CONADR 55-6, issued on 27 February 1958; (3) RCAF ADC ASI 2/5, dated 15 June 1957; and (4) Provisional Thule Rules of Engagement, dated 22 March 1957.

NORAD considered this situation unsatisfactory. And the same reasons that prompted it to issue 55-3 were instrumental in getting a new engagement directive. A new regulation -- NORADR 55-6, dated 3 November 1958 -- replaced the four other directives.*

* RCAF ADC informed its forces on 12 December that ASI 2/5 was superseded except for paragraphs 10-11 pertaining to identification by interceptors.

NORADR 55-6 provided instructions for determining when an object was hostile and for engaging such objects. The directive was applicable to all U.S. and Canadian military forces assigned, attached, or otherwise made available to CINCNORAD for the performance of his mission. The Commander, 64th CONAD/NORAD Division was also to be governed by the regulation in exercising operational control of the air defense forces in Greenland. And other commands and agencies having an air defense responsibility to CINCNORAD were to use the regulation for guidance.

Surface-to-Air Weapons Employment. One change in the NORAD regulation from the CONAD regulation was that all reference to engagement procedures for surface-to-air weapons was removed. NORAD felt that these procedures were sufficiently covered by other directives from NORAD/CONAD headquarters. The CONAD regulation had provided for four states of fire as follows: "Weapons Tight," only targets identified or declared hostile, or those targets committing hostile acts could be fired at; "Weapons Free," any target not identified as friendly could be fired upon; "Hold Fire-Do Not Open Fire-Cease Fire,"; and "Discreet Fire."

In July 1958, CONAD told the regions that ARADCOM had recently issued an operations plan for the Nike Hercules which contained policies for employment of surface-to-air atomic weapons. CONAD stated that it considered the document to be in consonance with the plans, concept, and atomic employment policy of CONAD and that planning and training should proceed in accordance with this document. It went on to point out that a CONAD atomic employment plan was being considered by the U.S. JCS. And until approval was received, no engagements were to be undertaken with atomic surface-to-air weapons unless Air Defense Emergency had been declared by CINCNORAD. After such declaration, the weapons were to be employed using the ARADCOM procedures. CONAD emphasized that the ARADCOM plan was an "interim" measure and would only be used until the CONAD plan received JCS approval.

CANADA'S PLANS FOR CONELRAD AND SCATER

On 17 June 1958, the Chairman of the Canadian Chiefs of Staff Committee (COSC), General Charles Foulkes, forwarded to NORAD for information and review, a revised 1957 study on control of radio transmissions in war. He pointed out that the COSC had been

studying the CONEIRAD problem and wanted to revise the CONEIRAD policy in MCC 300/9 to bring it up to date. The COSC had already contacted Washington, he stated, and they had replied that this appeared to be a good project for the MCC. Washington also suggested that NORAD's comments and views be obtained before the MCC was asked to revise the policy. General Foulkes stated further that it might be appropriate if representatives from NORAD and the Canadian military staff met and discussed the problem before any recommendation was made to the MCC.

Again in October, the COSC chairman wrote NORAD. He stated that a special Canadian government inter-departmental committee had been established to prepare an interim Canadian CONEIRAD (CANCONEIRAD) plan.

NORAD replied that it seemed appropriate that exploratory talks be held on such subjects as SCATER, CONEIRAD, and CONILLUM. NORAD pointed out that the need for coordinating Canadian-U.S. plans on these subjects had been apparent for some time.

Meanwhile, in August 1958, while attempting to revise the U.S. SCATER plan to reflect air movement priorities for air traffic, NORAD had written to Air Marshal Hugh Campbell, RCAF Chief of the Air Staff, about its negotiations and asked him to consider establishing similar priorities for essential air traffic in Canada. Air Marshal Campbell replied that a new Emergency Security Control of Air Traffic Plan (ESCAT) had been prepared and that DOT/RCAF agencies were developing implementing actions. General Partridge stated that he would appreciate receiving copies of the ESCAT plan. He pointed out that it seemed that control of air traffic throughout the North American air defense system was a single, indivisible problem that could not be solved on a unilateral, national basis, nor should it be coordinated by persons other than the air defense commanders concerned with conducting the air battle. General Partridge also stated that he felt that this was true also of CONEIRAD and CONILLUM plans. He then brought up the subject of an exploratory conference as he had with General Foulkes, and forwarded a copy of the letter written to General Foulkes.

In January 1959, a copy of the ESCAT plan was forwarded to NORAD. The following month, Air Marshal Campbell wrote that he shared General Partridge's views that unilateral development of plans was inappropriate because of the formation of NORAD. "In

this respect I favour an early meeting at the planning level of the agencies concerned to determine the confines of the task, and to recommend a procedure which will effect the prompt, harmonious, integration of the Canadian and American plans for ESCAT, Conelrad and Conillum."

POSITIVE CONTROL/NOAH'S ARK PROCEDURES

The latest directive concerning the NORAD-SAC procedures to pass information to the SAC strike force was issued as NORAD Regulation 55-21, dated 23 December 1958. This directive superseded NORADR 55-21, dated 30 April 1958, and NORAD 55-21A, dated 10 October 1958. The procedures set up were as follows. In case of an emergency and SAC decided to launch the alert force before receiving an execution order from the JCS, Headquarters SAC was to provide the SAC aircraft with instructions to take off but to check for further instructions at designated check points on the way to the targets. At the control points, if the aircraft did not receive so-called Positive Control/Noah's Ark instructions they were to abort the mission. If instructions were received, they were to continue on to their targets.

SAC was responsible for providing the Noah's Ark code messages to the NORAD COC. The NORAD COC would, in turn, transmit the information to AAC, RCAF ADC, 64th NORAD/CONAD Division, and the 5th Air Division (RCAF). The AAC and 64th COC controllers would send the information to the DEW Line Main stations and to those stations within their areas having a VHF/UHF ground-to-air communications capability. The DEW Main stations would relay the messages to the auxiliary stations within their sectors. RCAF ADC COC controller would relay the messages to the Mid-Canada Line stations and the 5th Air Division COC controller would send the messages to Canadian stations C-21, C-20, and C-19.

All stations would then await contact from the SAC aircraft (under no circumstances were the stations to call the aircraft first). When the aircraft checked in, the stations would transmit the Noah's Ark messages and authenticate, or reply that they had nothing for the force.

NORAD made it clear that it was not responsible for the successful receipt of the messages, but only to insure that broadcasts

were made within a unit's capability and without jeopardizing the NORAD air defense mission.

NORAD/FCC MEMORANDUM OF UNDERSTANDING

FCC/NORAD Agreement was issued as NORAD Regulation 55-7 on 29 September 1958, setting forth the responsibilities, functions, and working relations between NORAD and the FCC. The regulation superseded CONADR 55-7, dated 11 September 1957.

NORAD was responsible for coordinating with appropriate U.S. and Canadian agencies in the development of policy and broad plans for the security control of air traffic, the control of electromagnetic radiations and the control of illuminations and, when appropriate, for initiating implementing actions for the above; coordinating with appropriate National civil defense agencies on matters directly related to air defense; manning CONELRAD operating positions at ADCC's; and initiating and disseminating the CONELRAD radio alert and, subsequently, the CONELRAD all clear.

The FCC was responsible for preparing and implementing CONELRAD plans for radio stations (except those belonging to and operated by any department or agency of the U.S. Government) and the preparation of CONELRAD plans for the Department of Defense for radio stations belonging to and operated by departments and agencies of the U.S. Government. It provided liaison personnel at NORAD Regions and Divisions to advise on non-government radio services with respect to participation in air defense and on FCC policies and procedures on non-government CONELRAD plans.

NORAD/CAA MEMORANDUM OF UNDERSTANDING

On 29 September 1958, NORAD also issued a NORAD/CAA "Memorandum of Understanding" as a NORAD regulation. The new directive -- NORADR 55-18 -- superseded CONADR 55-18, dated 8 August 1957. It outlined mutually agreed arrangements on responsibility, functions, and working relationships of CAA and NORAD to insure that the air defense mission was accomplished within existing laws and directives. The regulation applied to all NORAD echelons and military agencies under the operational control of CINCNORAD except the 64th NORAD Division and the air defense elements of ALCOM, and was for the

guidance of other commands having collateral responsibilities in the conduct of air defense.

AIR DEFENSE ALERTING SYSTEM FOR THE NORTH AMERICAN CONTINENT

Procedures for announcing alert conditions in the North American Continent were issued in NORAD Regulation 55-12, dated 29 December 1958. The procedures were to be used by all NORAD commands, by the Commander of the 64th CONAD/NORAD Division in exercising operational control of the air defense forces in Greenland, and were for the guidance of other commands and agencies having an air defense responsibility to CINCNORAD. The responsibility for determining and announcing conditions of air defense readiness and air defense warnings had been assigned CINCNORAD by the U.S. JCS and the Canadian COSC in the 10 June 1958 "Terms of Reference." NORAD's responsibility for alerting fell within two broad categories: (1) notifying the NORAD operational forces and (2) notifying other civil and military agencies in the continent.

The alert system established and maintained by NORAD was designed to carry out these two functions. To prevent the alerting responsibility from obstructing operational duties, the regulation stated that warnings and readiness conditions were to be passed initially to a limited number of key points and they, in turn, would be responsible for further dissemination of the information.

The alerting system had four components. These were: Alert #1 -- a full-period, multi-point teletypewriter network that connected Headquarters NORAD with the NORAD Regions, Divisions, Sectors, and key points of other U.S. and Canadian agencies; the NORAD Division Warning Network -- a combination of full-period, multi-point teletypewriters, and long-distance or tactical telephone circuits used by the NORAD Divisions to pass warnings to other military agencies; the OCDM National Warning System (NAWAS) which was established and operated by the Office of Civil and Defense Mobilization; and the Alaskan and Northern NORAD Regions. The commanders of these regions were responsible for passing warnings and readiness conditions throughout the Alaskan Command and Canada.

The network was to be controlled from Headquarters NORAD and/or the ALCOP and would pass the initial readiness and warning conditions

to its subscribers.* The NORAD Division Warning Network would pick up the information and pass it to such key points as military flight service centers, Army Headquarters, and Navy and Coast Guard Districts.** The Key points were responsible for passing the warnings to personnel of their own areas (NORAD forces under division control were to receive warnings and readiness conditions in accordance with NORAD operational procedures and were not considered Division Warning network subscribers). The division commanders were responsible for establishing primary and alternate communications for the division network and for establishing procedures for operating the network. The OCDM Attack Warning Officers located at each NORAD region would pass the warnings to the civilian population in accordance with OCDM procedures.

Subscribers to either the Alert #1 or Division Warning networks had to receive the approval of CINCNORAD. In the case of the division network, the criteria to be used in determining which organizations would be on the network were: subscribers had to provide continuous monitoring of the division network stations; they had to have a justifiable need for priority warning; and subscribers were to be kept to a minimum. Upon transition to SAGE, SAGE Sector Warning Networks were to be established in lieu of the Division network. SAGE CC's and DC's, when operational, were to be subscribers to Alert #1.

INTERCEPTOR COMMITMENT POLICY

On 30 July 1958, NORAD directed ENR and NNR to prepare a joint policy for tactically employing the RCAF-USAF interceptor forces against southbound raids penetrating through Eastern Canada. NORAD stressed the fact that the employment policy developed by ENR and NNR should consider the MB-1 equipped F-89J's as the primary weapon to meet the threat whenever possible. Upon receipt of the recommendations, NORAD stated it planned to develop and issue its own policy for all region commanders.

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* Alert #1 SOP and subscribers may be found in Annexes A & C to NORADR 55-12.

** For a list of subscribers to the division network on 29 December, see Annex B to NORADR 55-12.

Representatives from NNR and ENR met on 22 September to discuss methods to be used in employing the interceptor forces. By late October, the regions forwarded their joint policy to NORAD. The conferees had agreed their interceptor policy had to be based on the type of warning that might be received before an attack. The regions stated that if warning were received before the raid reached the Mid-Canada Line (MCL), the F-89J should be the first weapon used. It would be followed by successive attacks with the F-102's, CF-100's, and other rocket bearing aircraft. If the raid reached the MCL before warning was received, it was decided that F-102's either based at, staged from, or recovered at RCAF bases and CF-100's should be committed first. The F-89J's would be committed to the air battle as soon as they arrived.

To make the commitment policy work, the regions recommended that: authority be obtained to base, stage and/or turn-around MB-1 equipped aircraft at designated Canadian air bases before declaration of Air Defense Warnings Yellow or Red; facilities of the Canadian bases at Armstrong, Kapuskasing, Casey, Val D'Or, and Seven Islands be improved for fighter recovery or turn-around; the Pinetree sites control capability at Ramore and Moisie be increased to five control scopes, those at Senneterre and Parent to eight; and top priority be established for acquiring the newest radar equipment for the northernmost Pinetree sites to enable them to furnish control for the maximum use of the weapons.

On 18 December, NORAD told RCAF ADC of the recommendations and of its approval. NORAD pointed out that negotiations were already in progress to get a long-term agreement to permit overflight of all of Canada with atomic weapons during Maximum Readiness (Air Defense Readiness) and that the U.S. State Department and the Canadian Department of External Affairs were negotiating for storing and using nuclear weapons at Goose Bay. NORAD said further that USAF ADC had initiated action with USAF for construction at Armstrong and Kapuskasing and had begun a program to increase the control scopes at Ramore to six and at Moisie to five.

NORAD asked RCAF ADC to replace the existing radars in Sectors 1 and 3 with higher performance radars and to increase the control capability at Senneterre and Parent to eight scopes. Also ADC was to improve turn-around and recovery facilities at Canadian bases in the following order of priority: (1) Val D'Or, (2) Seven Islands, and (3) Casey. Then on 28 December, NORAD informed ENR and

NNR that their recommendations and commitment policy had been approved and outlined the actions taken on each recommendation.

In January 1959, NORAD told CNR and WNR of the interceptor policy developed by ENR and NNR. NORAD stated that since the air battle would involve many USAF-RCAF interceptor squadrons and since coordination was needed among region commanders, similar recommendations were needed from CNR and WNR. NORAD directed the regions to coordinate with NNR and submit their recommendations for committing the interceptor forces against southbound raids penetrating through Canada.

AIR DEFENSE AND AIR TRAFFIC CONTROL INTEGRATION

An agreement was reached between the Secretary of Commerce and the Secretary of Defense in January 1958 on joint use of certain facilities in the performance of common functions in air traffic control and air defense. This agreement was formalized in a White House document dated 9 January 1958.

The stated objective of the agreement was avoidance of duplicating facilities, equipment, and overlapping functions; increased capability of each function; and an air traffic control system functionally compatible with the nation's defense facilities in peace and war. It was mutually agreed that each department would make its respective surveillance, data processing, situation display, communications, and identification processes and facilities mutually and fully available for the early attainment of this objective.

The agreement provided that the Airways Modernization Board would conduct a program to determine how integration could be accomplished. On 22 July 1958, the Air Defense Systems Integration Division was designated as the Air Force agency to work with AMB. On 29 July, the ADSID was further designated as the Department of Defense agency on this program.

On 15 August 1958, the ADSID advised NORAD of the foregoing and stated that an extensive research and development program would be carried out to explore regions of potential air traffic control/air defense functional integration.

NORAD said that these studies should stress the vital requirement for CINCNORAD to have positive control of the air traffic within his area of responsibility during active hostilities after an Air Defense Emergency had been implemented. ADSID support and acceptance of this concept was asked. ADSID replied on 7 October that it would fully support this requirement. Said ADSID, "Integration of the Air Defense and Air Traffic Control systems will have as a primary objective the development of this capability. We will insure that the requirements expressed in your letter are completely fulfilled."

On 16 December 1958, an interim report was issued by the Air Defense - Air Traffic Control Boundary Alignment Working Group. The report included an AD/ATC coincident boundary proposal for air defense divisions and high altitude control areas. Each of the areas proposed would have a solid state computer to accomplish air defense functions and high altitude air traffic control functions.

NORAD felt that a number of considerations had yet to be taken into account. Among these were the affect of the solid state computer, AN/FSQ-7A, and the inclusion of air traffic control in Canada. On 16 January 1959, NORAD told ADSID that CINCNORAD wholeheartedly supported the concept of coincident air traffic control and air defense boundaries and collocation of facilities, provided this did not degrade CINCNORAD's capability. But, said NORAD, because of these other matters, agreement, at that time, could not be given to the proposal or any firm guidance provided as to what the boundaries should be.

NORAD had proposed to the JCS on 16 October 1958 that the studies on integration of functional activities common to air traffic control and air defense be expanded to include Canadian considerations and participation. The JCS agreed in January 1959 and recommended to the Secretary of Defense that an invitation be extended to the Government of Canada to participate in these studies.

CHAPTER IX

Exercises

EXERCISE TOP HAND

In September 1958, NORAD and SAC conducted a large-scale air defense exercise named TOP HAND. This was the first joint, large-scale exercise since December 1955 when CRACKER JACK (a joint minimum warning exercise) had been run. TOP HAND also was the second in a series of annual exercises programmed by USAF back in 1954.

In July 1954, the air defense forces had participated in a continent-wide air defense exercise with SAC. This exercise, named CHECK POINT, had been designed to provide maximum training for the air defense and SAC forces. Following this exercise, ADC had proposed to USAF (with CONAD concurrence) that an exercise be conducted with SAC annually. ADC stated that CONAD wanted two types of joint exercises, minimum warning (no-notice) and maximum training. The former was to be designed to evaluate and analyze the effectiveness of the air defense system defending against realistic attacks by SAC forces. CONAD also wanted the exercise schedule arranged so that the two types of exercises would be alternated -- minimum warning, one fiscal year, maximum training, the next. ADC stated further that the exercises should be run on a scale comparable to CHECK POINT to allow maximum participation of all defense elements (approximately 400 strike aircraft per exercise).

USAF approved the policy. A tentative exercise schedule was set up by USAF through FY-1960 as follows:

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* CONAD wanted the exercises to start in FY-1956. It also asked for one small-scale exercise per division (defense) per year.

	EXERCISE NAME	DATE TO BE CONDUCTED	TYPE EXERCISE
1.	CHECK POINT	July 1954	Maximum Training
2.	CRACKER JACK	December 1955	Minimum Warning
3.	NO NAME ASGD	May 1957	Maximum Training
4.	NO NAME ASGD	Oct-Dec 1957	Minimum Warning
5.	NO NAME ASGD	Jul-Sep 1958	Maximum Training
6.	NO NAME ASGD	Oct-Dec 1959	Minimum Warning

After CRACKER JACK had been run, dissatisfaction with the large-scale missions arose at various command levels. The commanders complained that the exercise objectives were not being achieved and the exercise schedule, in so far as time phasing was concerned, was poorly suited for their purposes. They differed in opinion as to the value of each type of exercise.

In September 1956, CONAD asked the component and regional commanders for their recommendations on the type exercises desired. The answers received from the commanders varied greatly. However, without exception, they stated that they had not liked CRACKER JACK with respect to conduct, scale, analysis systems, and delays in the critiques and submission of the final report.

The question of what type exercise to hold in FY-1957 and FY-1958 needed no answer as it turned out because SAC later cancelled both. One exercise was cancelled because of the Suez crisis, the second because of the Middle East crisis.

The issue of a joint, large-scale exercise was raised again in May 1957. CONAD informed SAC that it wanted an exercise on the order of CHECK POINT as had been scheduled by USAF for the first quarter of FY-1959. The period 12-18 September had tentatively been selected for the exercise. SAC approved planning for the exercise. Then in November 1957, NORAD informed the region and component commanders of the pending exercise and directed them to submit recommendations.

On 12 March 1958, a conference was held at Headquarters NORAD with the component and regional commanders. The conference was

called to determine requirements for all air defense elements for the annual large scale exercise. The conferees were informed that SAC could provide approximately 360 bombers for the strike force. And SAC favored a "no-notice" type exercise to test its EWP penetration tactics.* It wanted the exercise conducted in two major strike efforts, one containing approximately two-thirds of the strike force, the other, the remaining aircraft. SAC felt that the exercise should last approximately 30 hours.

The commanders still differed in their opinions as to what the goal of the exercise should be. Eastern and Central Regions favored training as the primary aim, the other regions and the components considered the exercise as a test of air defense effectiveness. Finally, however, a concept and design for the exercise was reached that satisfied both requirements.

The exercise would be conducted in two phases. The principal phase would be a no-notice type mission using the main SAC force as the strike force. This would satisfy SAC's desire to test its EWP penetration tactics and NORAD's wish to test the overall system. The second phase would be a maximum training type mission using the remaining SAC aircraft.

It was further agreed that the broad aims of the two phases would be as follows. The minimum warning phase would have as its objectives (1) testing the detection and reporting capability of the DEW Line, MCL, and Ocean barriers, (2) testing SAC's EWP tactics, and (3) determining and evaluating the overall air defense effectiveness against SAC forces. It was felt that training of the forces would be a by-product of this phase. The maximum training phase would be used for providing training to all regularly assigned and augmentation units.

The name chosen for the exercise -- TOP HAND.

The NORAD position was discussed with SAC on 18 March at a planning conference held at Headquarters SAC. Both commands were in general agreement that the exercise as envisioned by NORAD was suitable. The two command staffs and representatives from the CONAD Regions and RCAF ADC met again on 25 March for detailed

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* CINCNORAD also favored a no-notice type of exercise.

planning. Few changes were made in the concept as had been agreed upon in the NORAD conference of 12 March. The strike forces were to make maximum use of ECM, communications jamming, and evasive tactics during both phases.

NORAD's Operation Order (OPS ORDER 5-58) was sent to the forces on 9 September. At that time, NORAD told the defense units that participation was expected by all forces made available for air defense, excepting active air defense alert forces. The forces were directed to defend the North American Continent against the SAC penetrations and to expect the strike force between 15 September and 15 October 1958.

The exercise began at 0700Z on 20 September. The first phase strike force, consisting of 183 SAC aircraft, simultaneously penetrated the ocean barriers and the DEW line and then swept southward through the continent hitting critical target areas.

Following the first strike, there was a lull of some four and one-half hours before the second phase began. The strike force for the second phase was composed of 76 planes hitting the interior of the continent. The entire exercise lasted from 0700Z to 2240Z, a little over 15 and one-half hours.

As a whole, the exercise met its stated objectives. SAC provided sufficient forces to adequately test and train the defense forces (262 aircraft were scheduled, 259 flew the mission). NORAD was able to place nearly all operational procedures and plans into effect and to study the weaknesses and strong points of each. The no-notice aspect of the exercise had been compromised in many instances, but this apparently did not detract from the overall results and the training received was considered excellent.

As noted above, the primary NORAD objective of the exercise was to test the capability of the warning lines and the MCL to detect, identify, and report the strike forces to the NORAD COC. NORAD's Operations Analysts were responsible for the analysis of this portion of the exercise.

Two questions were posed and answered by the analysts. Did the early warning lines have the capability to recognize a raid and transmit the reports of such raids to the NORAD COC in time to provide warning before the strike penetrated the land-based contiguous radar coverage? Could the early warning lines do a good enough job

of counting aircraft and of estimating their speeds and altitudes to permit decisions to commit interceptors before the bombers reached contiguous cover? The first question was answered in the affirmative, the second had a qualified answer.

The analysis pointed out that 25 of 26 aircraft cells (102 planes) penetrating the DEW, MCL, and Ocean barriers were detected and that 19 (76%) were reported to and plotted at the NORAD COC. The average delay from detection to plotting of the tracks at the COC was about 17 minutes. The following table shows the cells detected and plotted.

TABLE 17

	EW LINE				
	ATLANTIC BARRIER	PACIFIC BARRIER	DEW	MCL	ALL LINES
No. of cells	3	3	6	14*	26
No. detected	3	2	6	14	25
No. plotted in NORAD COC	3	1	5	10	19

* Actually, there were only 11 SAC cells penetrating the MCL, but because of the way two cells split, 14 groups of aircraft were formed that the MCL would be expected to detect as distinct groups.

The report stated that the overall capability of the early warning lines to detect was high, but the aircraft were in groups of from three to six aircraft and were at favorable altitudes for detection (between 26 and 48 thousand feet). The analysts concluded that the EW lines were capable of providing early warning of the type attack conducted in TOP HAND.

The raid assessment by the individual lines was considered less adequate. It was felt doubtful by the Operations Analysts that raid assessment by the individual lines was good enough to justify committing the interceptor forces on the basis of their information. Estimates of numbers of aircraft by the Atlantic Barrier were 78 per cent high, by the Pacific Barrier 50 per cent low; by the DEW Line 19 per cent low, and by the MCL 45 per cent low.

The analysts stated that as a whole, the assessment of numbers of aircraft was not too bad, but that assessment by individual portions of the EW system was rather poor. They pointed out that in attempting to plan interceptor commitment prior to penetration of the land-based contiguous cover, the ability to estimate correctly what was coming in terms of numbers, speeds and altitudes, and from various directions was important and that the early warning lines did not provide such estimates accurately.

NORAD felt that it learned much from TOP HAND. Many weaknesses were shown, but there were also many improvements noted since CRACKER JACK. For one thing, the mere fact that the DEW Line, MCL and Ocean barriers were operating provided a major improvement. The EW system initially detected the strike forces over 1,000 miles further out than could be done in 1955. Also, by using the EW lines data, NORAD felt that it had proven that positioning interceptors at the forward bases to meet the attack was a sound tactic. This tactic allowed the interceptor force to meet an attack well outside critical target areas.

NORAD also felt that the air defense operational capability had been improved since CRACKER JACK by the establishment of NORAD. This allowed much better coordination of defense efforts than when air defense was dependent upon disjointed efforts by ALCOM, RCAF ADC, NEAC, and CONAD.

There were certain areas needing improvement, however. The fact that atomic weapons were in the weapons inventory and could not be prepositioned in or used over Canada before the declaration of an Air Defense Emergency (Warning Yellow or Red) was one such area. This automatically restricted early prepositioning and use of these weapons at Canadian bases. The fact that an operational atomic capability existed also emphasized the need for mature judgement in declaring an Air Defense Emergency. Steps were being taken to change the rules for employing atomic weapons (see Chapter VIII).

Another weak area was the use of non-standard alert procedures for the Canadian-U. S. forces. This was expected to be corrected by NORADR 55-3 (see Chapter VIII).

The fact that NORAD delegated the responsibility for local tactical actions and decisions during the air battle to subordinate joint NORAD headquarters pointed up the need for jointly manned and staffed NORAD subordinate headquarters.

It was found that fighter-interceptor and missile deployments had not kept pace with SAC base construction and dispersal in the midwestern U. S. and at SAC refueling bases in Canada. The TOP HAND attacks demonstrated the vulnerability of these areas.

SAC ECM activity highlighted the ECCM weaknesses of the air defense system (in some cases, divisions lost 95 per cent of their effectiveness) and emphasized the need for providing the radar system with ECCM fixes, training of NORAD personnel to combat ECM, and getting the FD radar program completed. Proof of these needs was shown by the fact that in the 37th Air Division area where radar and ECCM improvements had been made for the WEX-VAL tests, the radars were not seriously affected by ECM.

Other features of the air defense system that were found deficient during TOP HAND were: communications, forward and lateral telling procedures, provision of DEW Line and Barrier data to Alaskan and Northern NORAD regions, tactical employment of the augmentation forces, a flexible all-weather augmentation force, coordination between NORAD Headquarters and the regions, non-standard procedures in the NORAD system, and operations in the COC. Some of these deficiencies were already known, other were new. Almost all had received attention before the end of 1958.

EXERCISE DESK TOP

Less than a month after TOP HAND, NORAD held a simulated large scale exercise. This was a realistic Command Post Exercise (CPX), named DESK TOP. The exercise simulated actual conditions of an attack against the North American Continent, yet it involved no actual offensive or defensive missiles or aircraft. Tracks of attacking and friendly aircraft and missiles were artificially injected into the air defense system. This was accomplished by using prepared scripts at some defense units, and at those units where proper facilities were available, filmed simulated radar targets (the System Training Program (STP) technique).

Representatives of ADC and the Systems Development Corporation (SDC) had approached the NORAD staff in 1957 with an informal proposal for holding an ADC-wide STP exercise. ADC pointed out that the ADC-SDC training program had been developed to a point where it was considered both possible and desirable to conduct such an exercise. It was not practical to do so, however, unless NORAD Headquarters participated. NORAD, in the meantime, had been searching

for a method to use in conducting a NORAD-wide CPX. The ADC STP program appeared to be the answer. After several meetings, it was decided that an STP problem would satisfy both needs.

The responsibility for planning and executing DESK TOP was assigned to a special committee created specifically for the task in January 1958. This committee was composed of members of the major staffs of NORAD Headquarters and the component commands. The NORAD CPX Committee worked closely with personnel of SDC and prepared a problem design and the specifications for the participation of all the NORAD defense elements. It was decided that the primary objective of the STP problem would be to exercise NORAD/CONAD operational control procedures at each echelon of control. A secondary aim was to develop a problem large enough for the NORAD-wide exercise and one that could be adapted for later use in region exercises.

By May 1958, the exercise concept had been developed to a point where it could be disseminated to the field for planning purposes. The concept was as follows. At an unannounced time and date (but probably between October and December 1958), an exercise simulating actual conditions of an attack against the North American Continent would be held. The exercise would last approximately 15 hours. It would consist of a surprise attack of three to four hours duration, a lull of a few hours, and then a mass attack.

Problem inputs were to come from the following: (1) the surprise and mass attack phases would be on STP film; (2) battle damage would be injected into the problem at the DC and AADCP levels from scripts; (3) early warning for the mass raid would come by prepared messages from the DEW Line, the ocean barriers, the picket ships, the MCL, and the Pinetree Line; and (4) communications from parallel and higher echelons to NORAD were to be introduced by teams in the NORAD COC.

The exercise would begin with the sneak attack when filmed enemy tracks were suddenly introduced. From that point, the various defensive elements were to play their roles as if an actual attack were underway.

By late September, everything was in readiness. The NORAD Commanders were alerted and a liability period of 1-10 October was set for the execution of the mission.

The system was triggered shortly after 0700 on 8 October when an attack force of 70 manned jet bombers and four air-breathing sub-launched missiles began a penetration of the NORAD system. The attack, aimed at 35 SAC bases and 4 Naval bases, achieved complete surprise. No strategic or tactical warning had reached NORAD Headquarters. Air traffic over the continent was normal and the system was on normal readiness. This phase continued until 1000Z. By this time, the surviving bombers had either withdrawn or were withdrawing.

The sneak attack was followed by a lull of seven hours (1000-1700). During this period, the defense reorganized its forces and prepared for a large-scale attack that was building up in the northern reaches of the continent. Reports from the DEW Line, the barriers, the MCL, Alaskan Region, and Iceland told of numerous enemy penetrations and warned of an approaching mass attack. The interim phase ended when a relatively large force of hostile aircraft penetrated the radar network.

At 1700Z, the mass attack began with 193 jet bombers and 16 missiles. The attackers entered the system in fairly large flights that later split into small segments to strike various targets within the continent. The third phase of the problem lasted until 2000Z when the filmed inputs ended. Shortly after 2000Z, CINCNORAD declared "Fade-Out," ending the exercise.

DESK TOP actually went far beyond the scope of what was normally considered a CPX. In one respect it was an experiment in training battle staffs through the medium of synthetic air defense problems. It provided even more, however, by giving battle staffs at all command levels, as well as many other personnel, a realistic air defense problem.

Six basic objectives had guided the planning and execution of DESK TOP. These were:

(1) to train the NORAD operational control elements;

(2) to test procedures for alerting the NORAD staff;

(3) to test procedures for alerting subordinate NORAD headquarters;

(4) to test NORAD communications facilities (to include activation of Engineered Military Circuits);

(5) to provide a controlled problem for subsequent review of procedures, tactical decisions and actions at NORAD region, division, and direction center levels; and

(6) to determine the training value of this type exercise.

NORAD's Directorate of Operational Evaluation and NORAD's operations analysts evaluated the exercise. In their final report, the major conclusions made of the air defense system as it operated during DESK TOP were as follows.

The NORAD policy of delegating responsibilities for tactical actions and decisions to lower echelons of command was found sound. Tracking and weapons control capability of the NORAD system became excessively burdened as a result of the tendency to classify all doubtful tracks either Invader (Hostile) or Unknown. Discrepancies in radar tracking caused an additional burden by duplicating radar tracks. Times to activate engineered circuits were so great that many of these would not become available in the event of a surprise attack. Valid tests of alerting procedures could not be provided in a situation where operating personnel knew that an exercise was in progress even before the decisions to declare warnings or states of preparedness were made. Battle summary reports were excessively delayed in reaching the COC.

Based on these conclusions, a series of recommendations were made. It was recommended that a study be made of surveillance and tactical information required by the battle staff personnel to eliminate the reporting of excessive data. Procedures for submitting special reports should be exercised more frequently. Further testing of battle staff call-up procedures should be conducted. Study should be made of tactical voice communications systems between NORAD and region headquarters to reduce or redistribute the traffic load and determine the number of circuits for the maximum expected loads. System-wide exercises, such as DESK TOP, should be conducted periodically. Participation of elements outside of USAF ADC should be expanded and made more realistic. Efforts should be made to increase the realism of simulated air defense functions and

analysis objectives of future exercises provide detailed knowledge of specific air defense functions rather than a general knowledge of a large number of functions.

To improve tactical reporting and the operation of a display in the NORAD COC, a number of steps had been taken. The NORAD staff had studied a new display system, the Iconorama, developed by Fenske, Federick and Miller Company, and found it suitable for COC needs. ADC was asked to procure the equipment. In addition, a new manual summary reporting method, an interim measure until new display equipment was installed, was being tested. Also a system for creating a display from information already forwarded through the surveillance network was being studied.

A method to improve late and incomplete reporting of weapons status was also being reviewed. A test of reporting weapons status by means of voice had been conducted between 1 November and 15 December and the recommendations and comments of the regions were being analyzed. A second reporting procedure was being tested between WNR and the NORAD COC. This test began in October and consisted of reporting weapons status via the surveillance net using pre-arranged coding. Equipment difficulties in the NORAD COC left NORAD with inconclusive evidence with which to evaluate the test results. WNR, however, liked the new method and recommended adopting it on a NORAD-wide basis.

NORAD/SAC ECM-ECCM EXERCISES

NORAD's ECM-ECCM training program was largely dependent upon daily and monthly training missions provided by SAC, and by USAF ADC radar evaluation flights. The missions did not completely meet NORAD's requirements in quality or quantity, however. SAC missions did not meet NORAD's requirements because they were able to test only portions of the system. Another reason that SAC could not provide needed training was that it had to keep many of its aircraft in their EWO ECM configuration and they could not be used in testing. The ADC radar evaluation flights could not provide adequate training because they were using outdated aircraft.

NORAD had appealed to USAF to correct the latter situation by providing modern multi-engine aircraft with the newest ECM equipment. NORAD pointed out that the training provided by SAC could never reach the point where it would fully satisfy NORAD's training

requirements. Unless newer aircraft and equipment were provided ADC, the radar evaluation flights would become less and less useful in providing ECM training. Little progress was made in obtaining the new aircraft, however.

In February 1958, a severe blow was dealt the SAC-NORAD ECM training program. In this month, the monthly ECM exercises were stopped completely following a collision between a SAC B-47 and an ADC F-86. SAC refused to allow further fighter attacks against its aircraft. This made it impossible to continue further ECM exercise activity of a realistic nature which included fighter-bomber affiliation. NORAD had tried to lift the restriction but had not succeeded. USAF asked SAC, ADC, and NORAD to mutually resolve the problem by 30 June 1958. SAC redrafted its training regulation (51-6) and asked for an extension of the USAF deadline so that it could test the new procedures. USAF then extended the deadline to 31 July.

NORAD, however, would not accept the SAC regulation as a solution to the exercise training problem. The revised regulation contained too many restrictive provisions. NORAD felt that exercises and training carried out accordingly would be of negligible value.

Then in June 1958, USAF dealt a second blow to ECM training when it informed ADC that it did not plan to build up the ECM force. USAF stated that it felt the ADC-SAC ECM training program was beneficial to both commands. SAC had the capability to provide realistic training, USAF said. And it could not afford to duplicate this capability in ADC. USAF directed ADC to join SAC to find a way by which the requirements of both commands could be satisfied. A deadline for submission of this study was set for 1 August.

After receiving USAF's letter, ADC approached NORAD with a proposal to set up a central coordinating agency in ADC for SAC-air defense training. NORAD turned down ADC's proposal. NORAD said that it had already told SAC that NORAD would handle coordinating activities and that it had designated the Exercise Branch in NORAD to be the central coordinating agency. It stated further that a FY-1959 exercise planning schedule had been set up with the exception of ADC's requirements. Upon receipt of the latter, it would have a complete exercise schedule to forward to SAC.

ADC then submitted its exercise and training requirements. ADC stated that its primary requirement was for SAC to provide realistic

penetrations similiar to those that could be expected from an enemy. This meant, ADC continued, that selection of strike routes, altitudes, speeds, and ECM procedures would have to be approved by NORAD or itself since SAC's concept for conducting USCM's and rotation missions to provide training was not compatible with ADC's requirements.

Shortly thereafter, ADC furnished NORAD copies of the USAF correspondence directing it to coordinate directly with SAC. ADC stated that since NORAD was acting as coordinating agency, NORAD should take appropriate action. It went on to point out that a joint conference with SAC had been held on 8 and 9 July where it had been agreed that each air division would be assigned specific SAC wings for flying support. The SAC aircraft were to fly special multiple aircraft missions and would be equipped with the proper ECM equipment to exercise all components of the divisions. In addition, SAC had agreed to continue the BIG PHOTO missions. This would, ADC continued, satisfy USAF's request to work out mutual ECM-ECCM training requirements with SAC, but it still left unanswered the problem of providing the necessary support for Tactical Evaluations and ORI's, monthly division exercises, and radar evaluation.

ADC said that it had hoped to use the SAC USCM's for supporting TAC EVAL-ORI requirements. However, SAC informed ADC that it could not provide sufficient sorties to support this program. This fact plus the lack of "L" band equipment on the EWO-configured aircraft made such missions incompatible with the TAC EVAL-ORI needs. SAC further felt that it should not be required to support ADC's radar evaluation requirements because such training would not benefit SAC crews.

On 23 and 24 July, NORAD met with SAC to discuss the flying training restrictions. And on 30 July, it met with ADC, SAC, and USAF at Headquarters USAF to discuss the ECM-ECCM training problems. During this conference, it was found that SAC would compromise a little. It agreed that training would be provided, if intercept missions were properly scheduled and coordinated by NORAD-SAC agencies; if NORAD provided a permanent liaison officer at SAC Headquarters; if attacks against SAC aircraft were not conducted within 30 nautical miles of any RBS site; and if fighters would delay lock-on in radar attacks to six-eight nautical miles from the target.

SAC also said it would not allow fighter attacks against SAC aircraft carrying atomic weapons. NORAD felt that accepting this

restriction would negate the use of any large scale SAC missions for exercises, evaluations, or training since SAC's policy was to schedule atomic weapons on these missions. In order for NORAD to resume the use of large scale SAC missions, as enjoyed prior to 4 February, two alternatives were open. Either SAC had to unload their weapons on selected USCM's, or the restriction against fighter attacks on weapons carrying aircraft had to be lifted. SAC remained adamant.

However, some progress was made in the July meetings. On 14 August, NORAD told the regions and components that it had reached an agreement with SAC to set up a mutual ECM-ECCM training facilities program between individual NORAD divisions, RCAF sectors and SAC bomb wings. The program was to work as follows. The SAC bomb wings would be paired with the air defense divisions/sectors. A team composed of Army, Navy, USAF and RCAF elements of a NORAD division/sector and the attached SAC wings would draw up the training routes to be flown by SAC so that maximum training would be provided every element in the system. The training missions, codenamed BIG BLAST, were to be designed to complete one penetration leg of at least one and one-half hours duration employing maximum ECM. All missions were to be planned primarily as NORAD component ECCM training missions and were to receive maximum support from all SAC and NORAD units.

The minimum missions that would be run each month were:

TACTICAL WINGS	MISSIONS	"L" Band Transmitters to be installed in each aircraft	No. of A/C per mission
B-47	1	2	5
B-52			
(3 sqdns)	2	2	3
(2 sqdns)	2	2	3
(1 sqdn)	1	2	3

The program was scheduled to begin on 1 September with the first mission flown in October 1958.

On 23 August, USAF wrote NORAD that the program set up would satisfy day-to-day needs of air defense units and both SAC and ADC

had been directed to implement the program as soon as possible. USAF stated that it realized no provision had been made for ORI's and monthly air defense division exercises, but it believed that the arrangements agreed upon would later prove to be a basis for accomplishing significant portions of even these requirements. USAF questioned the fact that NORAD should be coordinating agent and said that ADC had been instructed to include NORAD requirements for ECCM training in negotiations with SAC.

NORAD replied that no provision had been made for SAC to support the 64th Air Division training requirements, nor were there any set up for satisfying ORI's and exercise requirements. As to ADC being the coordinating agency with SAC, NORAD stated: "we are convinced that it is to the best interests of SAC and to the NORAD components that Headquarters NORAD continue as the coordinator... rather than [have the SAC] headquarters negotiating with the several components on a competitive unilateral basis for the limited SAC mission capabilities." At this time, NORAD also told USAF that if the SAC forces could not provide sufficient training support for all of NORAD's needs that it would become necessary to again recommend that the obsolete TB-29's in ADC be replaced with modern multi-jet aircraft so that NORAD could support it own program.

An answer from USAF was not long in coming. It stated that the ECCM training that would be received from the new program would far surpass the quantity and quality of that experienced before. The new program would not solve all problems, USAF continued, but additional ways of providing ECCM training were being examined. USAF pointed out that ADC and SAC had already established a well integrated ECCM training program at command, force, and wing/air division level (BIG BLAST).

Meanwhile, NORAD and SAC had continued meeting in an effort to get their regulations (SACR 51-6 and NORADR 51-1) in agreement. These efforts finally met success. In September 1958, SAC reversed its policy of carrying weapons on all USCM's and the monthly ECM exercises could begin once again.* On 9 September 1958, NORAD

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* This is not to infer that the restriction against attacking SAC aircraft carrying weapons had been rescinded. It was still applicable.

issued its flying training regulation 51-1. It outlined the procedures to be used by the NORAD forces when conducting joint training with SAC.

NORAD listed as objectives:

(1) air defense systems training;

(2) fighter-interceptor training to include attacking airborne targets, ECCM for AI radar equipped interceptors, and training in operational procedures;

(3) AC&W and AEW&C (including aircraft and airships), Texas Tower, and Picket Ship training to include training in air surveillance, development of tactics and techniques for controlling fighter-interceptors against airborne targets, ECCM training, and training in operational procedures;

(4) Air Defense Artillery Unit training in detection, acquisition, and tracking of airborne targets, and training in operational procedures and ECCM.

The first joint exercise with SAC was TOP HAND discussed above. This mission was followed by BIG JUMP (a region exercise in October), GRAND SLAM (a NORAD directed exercise in November), and FULL FORCE (an ENR and NNR coordinated exercise run in December 1958).

Meanwhile, the BIG BLAST daily systems training missions had begun in October 1958 as scheduled. By the end of 1958, the main weakness of the BIG BLAST program appeared to be the fact that the missions did not provide training for the 64th Air Division or Alaska. Also there were certain technical training problems that had to be resolved. The SAC-NORAD Big Blast Sub-Committee, of the Joint Exercise Planning Committee, had been formed to iron these problems out.

CHAPTER X

NADO, NADOP, and Ballistic Missile Defense

NADO AND NADOP

In December 1958, NORAD submitted to the Canadian CSC and the U. S. JCS a two-volume objectives plan: North American Air Defense Objectives 1959-1969 (NADO 59-69) and North American Air Defense Objectives Plan 1959-1963 (NADOP 59-63). This two-volume plan was a successor to CONAD's 1956-1966 Objectives Plan (CADOP 56-66). The latter, the first over-all U. S. air defense plan ever prepared, was, according to NORAD planners, basically a compilation of existing and projected service programs supplemented by CONAD inputs to fill out the ten year period. The CONAD plan, the Commander's foreword to NADOP stated, demonstrated "conclusively that uncoordinated uni-service programs in the field of air defense had become too duplicatory and too expensive to merit Joint Chiefs of Staff sanction in their entirety."

CADOP was returned in May 1958. The JCS approved the concepts and philosophies, but not the force structures. They estimated that implementation of this plan would cost over ten billion dollars annually, according to NADOP. The JCS said that an average expenditure of around five and one-half billions yearly should be used as the basis for planning for U. S. forces.

Another problem was long-term projection. CADOP attempted projections farther into the future than there were agreed intelligence estimates against which to measure the proposed forces. NORAD, therefore, divided its objectives plan into two volumes. NADO 59-69 stated the concepts, philosophies, and qualitative objectives for a ten-year period. NADOP 59-63 set forth the qualitative and quantitative force structures for a five-year period (half that of CADOP).

Besides the matter of cost and length of projections, these plans differed from CADOP in another important respect. CADOP had stated only a very general requirement for a ballistic missile defense system, covering no specific equipment, deployment, cost,

etc. Now a detailed, firm requirement was set forth for a BMDS. ICBM defense, in fact, was the heart of the NADO and NADOP.

In the preface to NADO (the plan covering concepts and philosophies), NORAD stated that a ballistic missile defense was a requirement of the highest priority. The ballistic missile threat would build up throughout the period under consideration, becoming serious by 1961 and reaching alarming proportions by 1963. However, there also had to continue to be a defense against the manned bomber threat, for there was no assurance that the enemy would inactivate his bomber force. And he would surely use this force if there were no defense against it.

NORAD stressed these two points in NADO:

> a. Regardless of cost, if we are to prevent war, we must acquire an effective AICBM as a matter of the highest priority.
>
> b. We must maintain a strong defense against the air-supported threat despite the serious and imminent introduction of Soviet ICBM's.

The cost of providing an ICBM defense made it impossible, NORAD said in NADOP (the quantitative plan), to stay under the six billion dollar ceiling set by the JCS. Sufficient forces could not be provided to insure an air defense system capable of achieving the military objectives of Canada and the United States. The average annual cost of forces recommended by NADOP, to be provided by Canada and the U.S., was under eight billion dollars. But, NORAD said, within this total there was set aside, for 1961, 1962, and 1963, contingency funds of around one billion dollars yearly over the cost of the accelerated Nike Zeus program.

The reason for the latter: NORAD felt that even though the highest priority was given to Zeus, the level of protection provided to targets in Canada and the U.S. would be too low in the 1963 time period. Therefore, contingency funds were provided in the hope that the Zeus program could be accelerated or another anti-missile defense system adopted to augment Zeus.

How should funds be applied against the various service programs related to air defense? In NADOP, NORAD laid down these priorities:

a. It is felt that first priority should be given to the establishment of a system to provide early warning of an attack by either air-breathing vehicles or ballistic missiles.

b. In second priority, all the funds which can be profitably employed in the development and installation of an active defense against the ICBM and IRBM should be provided.

c. Thirdly, the development of an integrated control system for the effective employment of all weapons should be funded.

d. Lastly, to the extent appropriations are available, there should be a qualitative improvement of weapons systems designed to counteract the air-breathing threat.

NORAD stressed that its priorities did not mean that funds should be applied to those categories high on the list to the exclusion of those further down. Continuation and improvement of defenses against the air-breathing threat was mandatory as was the need for bringing into being a BMDS. Systems to meet both threats, NORAD said, had to remain in operation for the foreseeable future "and certainly far past 1969."

TABLE 18

SUMMARY OF

NADOP RECOMMENDED FORCE STRUCTURES*

TYPE UNIT	FY 59	FY 60	FY 61	FY 62	FY 63
Ftr-Intcptor Sqs.	71	61	59	54	50
BOMARC Sites/ Launchers					
IM-99A	0	4/168	6/224	6/224	0
IM-99B	0	0	4/112	27/1176	36/2772

* Totals unless otherwise indicated.

TYPE UNIT	FY 59	FY 60	FY 61	FY 62	FY 63
NIKE Fire Units					
Hercules New Construction	12	77	109	109	109
Hercules Conversions	60	72	97	97	97
Ajax	184	172	148	28	0
HAWK Batteries	0	8	70	70	70
ZEUS					
Locations*					
United States	0	0	0	15	40
Canada	0	0	0	1	4
Basic Units (3TTR, 10MTR, 50 missiles)	0	0	0	29	120
Prime Radars	189	191	204	237	237
Gap Fillers	133	171	289	410	416
Texas Towers	3	3	3	3	3
Off-Shore Picket Ship Stations	10	10	18	22	22
Off-Shore AEW&C Stations	10	10	10	22	22

* The proposed ZEUS deployment was for SAC bases and population centers or, where possible, at a combination of both. The deployment represented that desired for the so-called accelerated ZEUS program. The accelerated program provided defense for 44 locations in 1963. NADOP stated that this was an inadequate defense and that the limitations were assumed to be technical, not monetary. According to NADOP, if technical difficulties were overcome and additional weapons were produced within the time period of the plan, one billion dollars in 1961, 1962, and 1963 were set aside to accomplish this requirement.

TYPE UNIT	FY 59	FY 60	FY 61	FY 62	FY 63
Land Based DEW Line					
Northern	57	57	57	57	57
Aleutian	6	6	6	6	6
Greenland	0	0	4	4	4
Iceland	4	4	4	4	4
Sea Barrier DEW Line					
Atlantic					
AEW&C Stations	5	5	5	0	0
Picket Ship Stns	4	4	4	0	0
Pacific					
AEW&C Stations	6	6	6	0	0
Picket Ship Stns	4	4	4	0	0
Mid-Canada Line Stns	98	98	98	98	98
SAGE					
Direction Centers	5	12	19	25	30
Combat Centers	1	3	4	6	10
NORAD Control Centers - U.S.	3	3	10	10	10
BADGE II (GPA-73)					
Alaska NORAD Control Centers	0	0	2	2	2
Alaska GPA-73	0	0	1	1	1
Goose Bay NORAD Control Centers	0	0	0	1	1
Harmon NORAD Control Centers	0	0	0	1	1
Goose & Harmon GPA-73	0	0	0	2	2
BMEWS					
Greenland (Thule)	0	1	1	1	1
Alaska (Clear)	0	0	1	1	1
British Isles	0	0	0	1	1
BMEWS Computer Central	0	1	1	1	1

TYPE UNIT	FY 59	FY 60	FY 61	FY 62	FY 63
NIKE ZEUS Local Defense Centers/Local Acquisition Radars					
United States	0	0	0	12	33
Canada	0	0	0	1	2
NIKE ZEUS Forward Acquisition Radars					
United States	0	0	0	2	4
Canada	0	0	0	3	5

BALLISTIC MISSILE DEFENSE AS COVERED IN NADO 59-69

The concept for defense against ballistic missiles, the plan stated, was essentially the same as for defense against the air-supported threat. The active defense should (1) be composed of a variety of weapons so as to give the enemy many tactical and technical problems and (2) place the major portion of the air battle in regions remote from principal targets.

According to the plan, the initial early warning system (i.e., the three-station BMEWS) would provide for detection and reporting of only the first generation ICBM attack from the north. This system would detect and identify ICBM's with elevation angles of 15 to 65 degrees approaching from the north. It would detect missiles 15 to 25 minutes prior to impact.

As for the initial active defense system, NORAD said that apparently the only weapons system to defend against the ballistic missile that could be made available in reasonable numbers by 1964 was the Nike Zeus. This system involved the use of forward and local acquisition radars and anti-missile missiles with atomic warheads. The radars would, where practicable, be integrated into the basic NORAD surveillance system to provide data to SAGE and the AICBM control centers. The effective intercept capability of each fire unit in the initial system was expected to be 75 nautical miles slant range and up to 300,000 feet altitude. As currently planned, initial fire units would have three target tracking radars, ten missile tracking radars, and fifty missiles (this would give a unit the capability of engaging three targets simultaneously with up to three missiles each).

NORAD declared that, using the numbers of target tracking and missile tracking radars provided initial fire units, the tracking rate and rate of engagement per battery were too low for defense of important areas, considering the enemy's ability to saturate defense by simultaneous salvos or hard decoys. The intercept rate could be increased somewhat by adding target tracking and missile tracking radars and missiles. Great effort had to be made to solve the decoy discrimination problem.

In conclusion, NORAD said that to keep an adequate defense, improved weapons had to be introduced to start the air battle at much greater distance than was possible with Zeus and to reduce vulnerability resulting from dependence on one type of weapon. BMEWS would also have to be improved with additional stations to provide coverage to the east, west, and south. Ultimately, equipment would be required to provide continuous surveillance of all objects within or without the sensible atmosphere.

RESTUDY OF NADOP

The requirements in the CONAD Objectives Plan 1956-1966 (CADOP 56-66) had been too high to get approval. The JCS, as noted earlier, had estimated a cost of ten billions annually to implement the plan. On returning the plan unapproved, the JCS had stated that an average annual expenditure of 5.5 to six billion dollars was to be used as the basis for planning for U. S. forces.

NADOP was scaled down from what CADOP asked. But the cost of recommended forces to be provided by Canada and the U. S. would total something under eight billions yearly, NORAD estimated. However, this total included, for the years 1961, 1962, and 1963, contingency funds of around one billion dollars annually over and above the cost of the accelerated Nike Zeus program.

In January 1959, NORAD told ADC, ARADCOM, and NAVFORCONAD that considerations in Washington indicated that the forces, manpower, and fissionable material required by NADOP might not be approved and that a lesser program would be directed. If so, a complete review of the NORAD force structure would be required to prevent imbalances in the system through lack of a coordinated plan. NORAD did not have enough people for this and, therefore, the components were asked to provide personnel to an ad hoc planning committee.

The terms of reference for this group stated that they were to determine a five to six billion dollar yearly Canadian-U. S. air defense system beginning FY 1960. Among the planning factors listed for accomplishing this objective were the following:

(1) NADOP should be analyzed to ascertain its compatibility with service programs existing or planned.

(2) A procedure should be developed for costing the service elements that make up the NORAD force structure.

(3) Determine priority steps to accomplish the objectives of NADO.

(4) Determine the priority of areas to be defended and means of providing defense on an adjustable basis.

(5) Evaluate and establish the role of the national guard and augmentation forces.

(6) Reduce by forty per cent fissionable material requirement for warheads.

PROPOSED UNIFIED AIR DEFENSE ENGINEERING AGENCY

A primary requirement upon NORAD was to assure the integration of many, complicated current and future air defense systems and equipment into a smoothly-working machine, fully responsive to NORAD's needs. NORAD's efforts in this respect were shown in nearly every undertaking, but can be seen and were expressed especially in such activities as the collocation and testing of SAGE-Missile Master, attempts to assure BMEWS-Zeus and Zeus-SAGE compatibility, and NORAD's COC single contractor idea (see this chapter).

In September 1958, NORAD wrote to the JCS that it did not have the technical staff to insure this integration and responsiveness. NORAD had been forced in the past to amalgamate service implemented programs after the fact. What was needed was a unified technical organization to assist NORAD.

Both the Air Force and the Army had organizations engaged in air defense systems evaluation, research and integration, and program

management and coordination. The U. S. Army Signal Air Defense Engineering Agency (USASADEA) was an activity of the Chief Signal Officer. The Air Force had established in March 1958 at Hanscom AFB, Massachusetts, the Air Defense Systems Integration Division. It represented three commands: ARDC, AMC, and ADC.

NORAD recommended to the JCS that the unilateral efforts of the services be consolidated in the air defense field into a unified, centrally-directed, organization. The USASADEA and ADSID and appropriate Canadian and Navy representatives should be consolidated, NORAD recommended, into a Unified Air Defense Engineering Agency. This agency should be subordinate to either CINCNORAD, the Secretary of Defense, or the JCS, in that order of desirability.

The JCS replied in February 1959 that they agreed with CINCNORAD's need for more technical assistance. They were studying the responsibilities of the services and the unified commands in regard to weapon systems integration in the light of the Defense Reorganization Act and implementing instructions. In the meantime, NORAD could provide additional technical capability on its staff (in the course of its reorganization) and provide NORAD technical liaison to the USASADEA and ADSID. When the JCS study was completed, further consideration was to be given to the recommendation for a Unified Air Defense Engineering Agency.

INTEGRATION OF ZEUS LOCAL ACQUISITION RADARS WITH SAGE

Investigation by NORAD of the effect of Zeus on the air defense system revealed that there would be great duplication of high altitude coverage by the Zeus local acquisition radars and the USAF ADC frequency diversity radars. If optimum coverage were achieved, NORAD discovered, exactly the same geographical locations would be involved in many cases.

Because of this situation, NORAD recommended to the Air Force Chief of Staff, as Executive Agent, on 5 June 1958, that the Defense Department initiate a study to determine the feasibility and desirability of integrating the local acquisition radars with the SAGE system. NORAD explained that:

> Based on tentative Zeus deployment plans, it appears that approximately 75 per cent of the Zeus Local

> Acquisition Radars could be located at the sites of existing USAF ADC prime radars and serve the requirements of air defense against both the air-supported and ballistic missile threat. If the marriage of the LAR program of the Zeus anti-missile system to the SAGE surveillance network is technically feasible, so doing will prove most beneficial to the electronics ground environment through the air defense system.

NORAD sent a copy of this letter to the Army Chief of Staff. And NORAD asked that DA (1) support integration of the Zeus LAR's with SAGE and (2) insure that the LAR's were compatible with the data input system of SAGE insofar as surveillance against the air breathing threat was concerned.

The Army replied on 11 August 1958. DA said that action had been started to assure the feasibility of data transfer from the Zeus system to SAGE and other elements of the NORAD control system. The proposed method for doing this would be sent when completed. DA also said that it had recommended to the Air Force that the problem be referred to the JCS with a view toward initiating the Department of Defense study NORAD had recommended.

In the meantime, the Air Force advised that an executive agency reply to NORAD's letter would be forthcoming as soon as the Army coordinated on it. Three more similar interim replies were received from the Air Force. In September, NORAD wrote directly to the JCS that the interim replies from the Air Force indicated that no progress was being made on the matter. NORAD pointed out that much work and time would be necessary for any such integration and that a decision should not be delayed.

The JCS replied that (1) they did not consider a special DOD study on integrating the Zeus LAR with SAGE to be required and (2) it was not intended that the LAR supersede the Frequency Diversity program radar. A study was not required because a Zeus production and procurement program had not yet been approved and the Secretary of Defense had directed the services to assure compatibility between the LAR and the data transmission requirements of SAGE. If a production and procurement program was approved and funding provided in FY 1960 and later years, the first LAR's could be provided by the end of FY 1963. Then, these radars, compatible with their deployment for their primary AICBM role, could fulfill the functions

of a limited number of prime radars and thus constitute components of the overall FD posture.

BMEWS-ZEUS COMPATIBILITY

NORAD was concerned that the BMEWS programs were proceeding independently and not being meshed into a total system. In February 1958, NORAD told USAF that, "It is imperative that the BMEWS detection and tracking system be designed and built to be capable of feeding processed data to the Zeus system and that this system be capable of accepting such data for acquisition and launching the anti-ICBM missile."

USAF replied in March that BMEWS had to be compatible with any active system (although designed to go with the active portion of the WIZARD system) to be employed. The Secretary of Defense was expected to make a decision soon that would clearly delineate the responsibilities of the Army and Air Force in the entire program. In the meantime, every action possible would be taken to insure compatibility.

On 7 July 1958, NORAD wrote to both the Army and the Air Force Chiefs of Staff that it had not been kept informed of the coordination being effected between the Zeus and the BMEWS programs. Informal information had indicated, however, that certain technical parameters were already independently at the decision stage without regard to mutual compatibility. NORAD stressed that it had learned from experience that complicated systems that were expected to work together had to be designed to do so right from the start.

General Curtis E. LeMay, Air Force Vice Chief of Staff, signed the Air Force reply, dated 1 August 1958. General LeMay said that there had been no decision on the overall requirements of an operational active system. Army and Air Force coordination, therefore, had been limited to the mutual exchange of technical reports on Zeus and Wizard. However, Air Force Headquarters had maintained close coordination with the BMEWS Project Office, ADC, and interested Army agencies on the BMEWS program. This close coordination would continue, he said, when the parameters of the active system had been clearly defined.

In regard to NORAD's complaint of lack of information, General LeMay said that Air Force Headquarters agreed that development

actions had to be "fully responsive to your operational requirements and that accordingly, you must be kept informed of progress." Air Force would correct any inadequacies found in the flow of information to NORAD.

The Army replied on 5 September that it concurred with NORAD's view that complicated equipment that was to work together had to be designed to do so from the beginning. DA said that it was arranging a meeting of representatives of DOD, Air Force, NORAD, and the contractors to discuss compatibility.

This meeting was held on 22 September at Bell Telephone Laboratories in New Jersey. According to a DA memorandum to the Air Force, the discussions indicated that Zeus and BMEWS could be made technically compatible. Various problems were to be studied and the Air Force advised. NORAD representatives at the meeting felt that in general the meeting produced a better understanding of the need for BMEWS and Zeus representatives to work more closely together.

LOCATION OF NORAD HEADQUARTERS COMPLEX

The requirement for a BMEWS display facility brought consideration early in 1958 on a long-standing need for a new COC. In response to a USAF query on location of the BMEWS display, NORAD said in February 1958 that it preferred integration with an underground COC in the Colorado Springs area. The headquarters of NORAD and component commands had to be nearby, NORAD told the JCS in March, for rapid assembly of the battle staff and for joint planning functions. NORAD reported to the JCS in April that RAND studies had shown that the COC in a granite mountain in the Colorado Springs area offered the best solution at the most reasonable cost.

On 30 June 1958, the JCS asked for formal recommendations and justifications for a new headquarters location. Criteria were provided, which were not intended to be restrictive, the JCS said. These criteria were:

(1) The location of the headquarters should be determined by the optimum location for the hardened COC.

(2) The COC, wherever located, will be a prime target. Consequently, the site should be selected, as

far as practicable, remote from other key facilities so, if attacked, a minimum "bonus effect" to the enemy would result.

(3) The structure should be designed for an overpressure of not more than 200 pounds per square inch.

(4) The conventional administrative headquarters should be located convenient to the COC site.

NORAD replied on 31 July that studies had shown that the NORAD Headquarters complex should be located in the Colorado Springs area with convenient access to its COC located in a self-supporting granite formation nearby. The two most attractive locations were Blodgett's Peak adjacent to the Air Force Academy and Cheyenne Mountain two miles west of Fort Carson (south of Colorado Springs). Detailed site surveys and determination of supporting facilities had to be made before a location could be selected. NORAD recommended these surveys be made without delay.

In September, NORAD learned informally that a working group of the JCS joint staff had recommended that the COC be placed at Ent Air Force Base with only the basement and sub-basement construction for hardening. Because of this, NORAD wired the JCS that construction in a granite mountain near Colorado Springs would permit unlimited hardening and expansion at no greater cost than soft above-ground construction typical of SAGE installations. NORAD again urged that site surveys be made without delay.

The JCS answered that USAF had been directed to make detailed site surveys and develop estimates for the sites under consideration.

In its instructions to the Corps of Engineers, USAF said that the criteria for the COC involved hardening to 200 PSI, that capability for future expansion had to be assured, and that the COC siting should lend itself to locating the administrative headquarters above ground in close vicinity at some future date. USAF asked immediate action on preliminary cost estimates and site selection so that instructions could be issued for design. The Corps of Engineers, USAF said, would be asked to prosecute the design so that all facilities would be completely designed and ready to advertise by 1 August 1959.

In March 1959, NORAD was informed that the Corps of Engineers had recommended a site on Cheyenne Mountain. The JCS approved, on

18 March, the Cheyenne Mountain site as the location for the NORAD COC.

COC SINGLE-AGENCY DEVELOPMENT CONCEPT

NORAD wrote to the JCS in October 1958 that it believed one technically competent agency should assume responsibility for the development and production management of the entire new electronic COC complex. This would result in a properly integrated system.

NORAD said that it was particularly concerned about having a properly integrated ballistic missile defense system. Unless the design criteria for the BMEWS ZI complex was clearly established with the integrated BMDS in mind, NORAD said, "we will once again produce separate defense systems which will not work together and will require expensive modification to properly serve NORAD's needs."

NORAD felt that the best way to get an integrated BMDS was to have the NORAD computation and display complex treated as a separate development and procurement project. This project should be concerned with all facilities required for the central ZI complex. These included the integrated ICBM/IRBM situation display, automatic air-breathing (SAGE) situation display, satellite prediction computers, master computer and data handling facilities, etc.

NORAD suggested two courses of action to achieve this objective. The first was to amend the current BMEWS contract to include the all-inclusive requirements. The second was to initiate an immediate separate all-inclusive contract for the new COC facility.

In this connection, NORAD told ADC that SAGE plans should be amended. They should provide for modification of the AN/FSQ-8 computer program and input and output circuitry to provide automatic processing of data to and from the NORAD automatic SAGE display and for funding of the COC SAGE display, if not provided separately as recommended earlier.

Two agencies considering systems and building design for the

new COC were Dunlap and Associates and the MITRE Corporation.* Dunlap completed a functional requirements study in October which recommended a multi-level construction. MITRE, on the other hand, recommended a single-level construction with a smaller display.

At first, in October, CONAD recommended the Dunlap report to USAF as a point of departure for developing a COC GOR for Air Research and Development Command guidance in equipment design. After further study of the report, however, NORAD decided that the Dunlap recommendations in span size, space, arrangement for display areas and the master display technique could not be considered final. NORAD recommended instead that a complete investigation of these areas was necessary before the design was made final. Another question to be solved was that of one versus multiple level construction.

USAF replied on 19 January 1959 that a GOR was being drafted, but could not be published until joint staff action had been completed and a decision made on the single service manager idea. USAF concurred on the need for a complete study of requirements.

INTERIM BMEWS DISPLAY FACILITY

The Thule BMEWS site would reach limited capability by September 1960, the Clear site a year later. The new COC facility would probably not be ready until late 1961 or early 1962.

In response to a query from ADC on this subject, CONAD said that if a decision was made in FY 1959 on location of the COC and FY 1959 or FY 1960 funds were appropriated for construction, approximately two and one-half to three years should be allowed for

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* The MITRE Corporation was sponsored by Massachusetts Institute of Technology and worked with and assisted the USAF Air Defense Systems Integration Division (ADSID). MITRE was incorporated on 18 July 1958. Its president was Mr. C. W. Halligan who maintained offices at Hanscom AFB, Bedford, Massachusetts, in the ADSID buildings. ADSID was a tri-command unit formed in the spring of 1958 at Hanscom by the Air Force. Major General Kenneth P. Bergquist was commander.

the implementing phases. It appeared, said NORAD, that the earliest a new COC building could be available would be 1 July 1962.

Because of this, NORAD continued, the BMEWS central computer should be planned for installation on an interim basis at a leased facility in the Colorado Springs area or a loaned facility at Fort Carson. Accordingly, ADC should arrange for the required housing, floor space, and such other items as power, air conditioning, and communications.

A conference on the interim display was held with ADC, RCA, and ARDC in October. Among the conclusions reached were the following. The BMEWS equipment, except for satellite prediction computer, would be ready for installation by May 1960. The satellite computer would be ready for installation in May 1961. The most optimistic estimate for completion of a new COC building was 1961. In order to get the earliest value from BMEWS, the tactical display should be located in the present COC for at least a year and probably much longer.

The total space requirement for the ZI BMEWS equipment, less the tactical display and satellite prediction computer, was 6,000 square feet. Several possibilities were examined for locating this equipment. These included putting part of it in a nearby rented building and part on the base, putting it in a prefabricated building next to the COC, and putting it in the basement of a nearby building on the base. The latter was recommended by the conferees.

ALTERNATE ICBM DETECTION PROPOSALS

There were a number of proposals for ICBM detection systems under consideration that would add to the BMEWS capability. One of the most important of these (insofar as progress toward adoption was concerned) was the Lockheed Missiles Systems Division project WS-117L. This would contain an infrared detection system that appeared promising for air defense uses.

NORAD recommended to the executive agent in April 1958 that development of such a system be accelerated and that when it proved practical and effective, it be brought into production. NORAD's view was that the BMEWS was an urgent requirement, but, being based

on radar, it was vulnerable to countermeasures. It had other weaknesses also resulting from developments in protective coatings, reduction of the cross-sectional area of nose cones, the problem of sorting to eliminate decoys and other space objects, surveillance restrictions imposed by site selections, and ground based line of sight equipment.

The WS-117L might, NORAD suggested, be a solution to the problem. The Air Force answered on 21 May that an infrared subsystem of WS-117L was being developed to detect the launching of an ICBM.

In the next few months, a number of discussions were held with ARPA, the Air Force, and other agencies. From these discussions it appeared that development of the WS-117L infrared system was feasible and practical. Because of this, on 16 December 1958, NORAD recommended that development of this system be treated as a matter of the highest urgency.

Another proposal under consideration was for a system that had the name Project David.* The Project David proposal was for equipment that had a passive detection system and an ECM active system. The passive detection system could detect the vertical motion of missiles and the guidance system signals, and decipher the missile guidance codes. The active system could jam the guidance system or it could insert false steering instructions.

In June 1958, NORAD recommended to the executive agent that this system be evaluated. The JCS gave the project to the Weapons Systems Evaluation Group for evaluation.

In the meantime, NORAD had received enough further information to be able to prepare a specific proposal. This was submitted to the JCS on 16 October 1958, also for evaluation by WSEG.

NORAD said that it had been assured that the David system could be produced, deployed and operationally capable of detecting missiles before any other early warning system currently under

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* This term was applied by the agency proposing the system, the Electronic Defense Laboratory, an Army-Sylvania Electric Products Corporation agency.

development. NORAD felt that this system should supplement BMEWS and be of continuing support as a complementary system in the BMEWS era. Its cost was reasonable, which, together with the early employment date, made it an attractive proposition. NORAD said that the David system could provide:

a. Early warning against ICBM's;
b. ECM weapon against ICBM radio-inertial guidance systems;
c. Rough determination of the trajectory path;
d. ELINT (electronic intelligence) on Soviet ICBM development;
e. ELINT on satellite launching and operation.

NORAD proposed six locations for David equipment, which would comprise a weapons complex: St. Lawrence Island; on two ships in waters north of Scandinavia; Samsun, Turkey; Mombetsu, Hokkaido, Japan; Peshawar, Pakistan; and Frankfurt (or Berlin), Germany. The St. Lawrence Island and shipboard installations would be responsive to requirements in support of defense of the North American continent. The other sites would augment defense and ELINT requirements for U. S. and overseas commands.

SATELLITE DETECTION AND TRACKING SYSTEM

In July 1958, NORAD learned that ARPA was trying to determine what organization should manage a soon-to-be established interim satellite detection and tracking system. The Air Force recommended that NORAD be given operational control of the interim, as well as the ultimate, system.

The Air Force position (as expressed in a July memorandum from the Air Force to ARPA) was that the detection and identification of the nature of all satellites was of overriding importance, and that the interim system was an operational consideration. The interim system was just another subsystem of the overall air defense system and, as such, should be integrated from its inception under NORAD. The advantages of NORAD control were as follows.

a. The interim system would be technically compatible with the air defense network;
b. Duplication would be avoided by fully integrating

all existing communications;

c. Other agencies, besides the research and development and the intelligence communities, that needed the information, would receive it on an expedited basis;

d. Research and development agencies of all services would receive timely and necessary information regarding the advanced and future detection and tracking systems.

ADC advised NORAD in October that it had learned that a decision might be made soon in DOD on management of the system. ADC recommended that NORAD back up USAF's position with a letter to the JCS.

NORAD did this on 26 November. NORAD wrote that the ultimate space track system had to be as inherently a part of the NORAD organization as the conventional radar network in the current system. If the ultimate system was to be developed responsive to NORAD's requirements and properly integrated, there appeared to be no alternative to placing the whole project under NORAD control in the immediate future. Its letter was, therefore, "a declaration of strong support for the USAF recommendation for the assignment of the interim, as well as the ultimate, Satellite Detection and Tracking System to NORAD for operational control."

However, NORAD pointed out that while it could establish the military requirements and operate the system, it did not have the scientific and engineering staff to develop the ultimate system or improve the interim system. Another agency would have to handle this in much the same way that the SAGE system had been developed.

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