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CONTINENTAL AIR DEFENSE COMMAND and  
NORTH AMERICAN AIR DEFENSE COMMAND

HISTORICAL  
SUMMARY

*July - December 1957*

Directorate of Command History  
Office of Information Services  
Headquarters North American Air Defense Command

## OTHER PUBLICATIONS OF THE DIRECTORATE OF COMMAND HISTORY

### SEMI-ANNUAL HISTORIES

- History of the Continental Air Defense Command, Jul- Dec 1954\**  
*History of the Continental Air Defense Command, Jan-Jun 1955\**  
*History of the Continental Air Defense Command, Jul-Dec 1955\**  
*History of the Continental Air Defense Command, Jan- Jun 1956\**  
*History of the Continental Air Defense Command, Jul 1956- Jun 1957*

### HISTORICAL STUDIES

- The Identification Problem in the Air Defense of the United States, 1946-1954\*\**  
by Denys Volan
- Army Antiaircraft in Air Defense, 1946-1954 \** by Robert L. Kelley
- Emergency Air Defense Forces, 1946-1954 \*\** by Lydus H. Buss.
- Electronic Countermeasures in the Air Defense of the United States, 1948-1955\*\**  
by George L. Montagna
- Organization and Responsibility for Air Defense, 1946-1955 \*\** by Thomas A. Sturm
- Seaward Extension of Radar, 1946-1956 \*\** by Lydus H. Buss
- A Decade of Continental Air Defense, 1946-1956 \*\** by Staff

### HISTORICAL REFERENCE PAPERS

- U.S. Air Defense in the Northeast, 1940-1957* by Lydus H. Buss
- Air Defense of Alaska, 1940-1957* by Thomas A. Sturm

\* Combined with the History of the Air Defense Command for the periods.  
\*\* Product of the Combined CONAD / ADC Historical Staffs (1954-1956).

## PREFACE

The material for this historical summary was taken from a wide collection of documents. Readers desiring more detailed information than is given in the text are invited to use any of the documents cited in the reference notes.

This summary is one of a number of publications issued by the Directorate of Command History. Included are brief historical papers on subjects of relatively small scope and comprehensive historical studies of subjects of broad scope. Together these publications make up the over-all command history.

In addition, the historical office maintains an archive of important documents on air defense dating back to World War II. By means of this archive, this office can answer queries for information on a wide variety of subjects. Members of the staff are invited to make use of this information service.

This history was prepared by Mr. Lloyd H. Cornett, Jr., Miss Elsie L. Joerling, Edwin A. Cranston, JO2, Staff Sergeant Derril E. Howell and the undersigned.

Colorado Springs, Colorado  
1 April 1958

L. H. Fuss  
Director of  
Command History

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## Chapter 1

# *Establishment of NORAD*

### BACKGROUND

Since shortly after the end of World War II, Canada and the United States had coordinated their air defense plans. Each year this coordination had grown and the two air defense systems had become more closely integrated. Beginning in 1950, the two countries prepared yearly emergency air defense plans that prescribed operational procedures to be used jointly in an emergency. The RCAF placed a Liaison Planning Group at Ent Air Force Base. And over the years the USAF and RCAF had exchanged an increasing number of officers.

But this coordination of the separate plans and procedures insured only that the two systems would be compatible. Military planners of both countries saw that North American air defense was a single problem. The most effective air defense required common operating procedures, deployment of weapons according to a single plan, means for split-second decisions, and authoritative control of all available weapons. To achieve this, integration of operational control of the two air defense systems was required.

In the spring of 1954, the RCAF Chief of Staff, Air Marshal C. Roy Slemon, and the USAF ADC Commander, General Benjamin W. Chidlaw, discussed the means for providing the best air defense of North America. Early that fall, General Chidlaw also met with the RCAF ADC Commander, Air Vice Marshal James. Following the latter talks, the two ADC commanders directed their commands to prepare a plan for the best single air defense of the two countries. The plan that resulted was for a combined air defense organization using the forces of the two countries under the operational control of a single commander responsible to both governments.

This plan, completed in December 1954, was presented to CONAD (established in September 1954), RCAF ADC, RCAF Headquarters, and the Chiefs of Staff Committee (CSC) of Canada. Early in 1955, it was presented to the Canadian-United States Military Study Group (MSG) and copies were sent to USAF Headquarters and to the other services.

Nothing concrete developed, however.

In December 1955, the Air Force Chief of Staff proposed to the other members of the U. S. Joint Chiefs that they approve in principle a statement of the desirability of establishing a combined Canada-United States air defense command. The following January, the JCS approved in principle the need for peacetime integration of the operational control of the continental elements of the two air defense forces. And on 15 February 1956, they asked the Canadian CSC for their views on the subject.

The latter replied that it would be desirable to study methods of integrating the operational control of the air defense forces. They suggested that an ad hoc group of representatives of both countries be formed to make the study.

#### STUDIES OF CANADIAN-U. S. AIR DEFENSE INTEGRATION

Prior to this suggestion by the Canadian Chiefs, in January 1956, the JCS directed the USAF Chief of Staff to make studies of the subject. As a part of this task, he asked the CONAD Commander-in-Chief, General Earle E. Partridge, to prepare a study, together with appropriate U. S. commanders, on operational integration in peacetime. The CONAD study was completed by 1 April 1956.

The CONAD study recognized that the objective of integrating operational control of Canadian and U. S. air defense was to achieve as nearly as possible an ideal air defense arrangement, using to the maximum the air defense forces of the two systems. It included the air defense of Alaska and of the Northeast Command area as part of the integrated system.

The U. S. and Canadian Chiefs of Staff decided to give the job of preparing a combined study to the Canada-United States Military Study Group (MSG). The latter was to create an ad hoc group to actually make the study. On 31 May 1956, the USAF Chief of Staff forwarded the CONAD study to the JCS. He recommended that it be reviewed for use in preparing general guidance to the U. S. Section of the MSG. This review was made and the JCS decided that the CONAD study was adequate as initial guidance for the U. S. Section.

Meanwhile, on 4 June 1956, the JCS sent to the Secretary of Defense a proposed revision of the Unified Command Plan. The JCS

proposed to disestablish the U. S. Northeast Command on 1 September 1956 and to assign the air defense mission of this area and of Alaska to CINCONAD. The Secretary approved the Revised Unified Command Plan on 21 June 1956. He also approved JCS recommendations on reorganizing CONAD and revising the CONAD Terms of Reference.\* Included in this reorganization was separation of USAF ADC and CONAD Headquarters.

New Terms were sent to CONAD on 4 September 1956. They provided for the enlargement of the CONAD mission directed by the Revised Unified Command Plan and for the change in organization recommended by the JCS. As noted above, among the changes was separation of ADC and CONAD Headquarters.

On 17 September 1956, a new staff structure for the separate CONAD Headquarters was established. The CONAD Commander-in-Chief, General Partridge, was relieved of command of ADC on this date and Lieutenant General Joseph H. Atkinson (who had been Commander-in-Chief Alaskan Command) was appointed Commander of ADC. But it was not until 1 October 1956 that the CONAD staff actually separated physically, insofar as space permitted, and began functioning separately.

Near the end of 1956, the Ad Hoc Group set up by the MSG completed its study of integration of operational control of the U. S. and Canadian air defenses. The MSG approved it. In its so-called Eighth Report (presented on 19 December 1956), the MSG recommended that the Ad Hoc Group's Report be approved and that the JCS and CSC get approval of their governments for integration.

The basic conclusions of the Ad Hoc Group Report were as follows:<sup>1</sup>

- (1) Air defense of the two countries is a single problem and should be carried out on a combined basis.
- (2) Integration should be of operational control only.
- (3) There should be centralized authority for exercising operational control.
- (4) The system set up should be adaptable to general war.

\* See CONAD Historical Summary, July 1956-June 1957, pp 1-10, for background.



[REDACTED]

(5) The system must be in being and continuously developed and exercised so that no transitional period will be required to go from peacetime to general war.

(6) The exercise of operational control should be through joint subordinate commanders.

(7) The commanders of the air defense system should report to the Chiefs of Staff of both countries.

(8) Command of forces of one nationality regarding such matters as logistics, administration, discipline, international organization and training should be carried out by national commanders responsible to their own national authorities.

(9) The organization for operational control should be founded on geography and geared to the targets to be defended with relation to the routes of approach and other factors. While this meant that national boundaries were to be disregarded in the main, there was a provision that the international line should be used whenever operationally and technically feasible.

(10) The commander and his deputy were not to be from the same country.

(11) The commander should be responsible for plans, including requirements, for policy, for standardization of techniques and procedures, and for operational control. The latter was to be defined in accordance with the definition in Joint Action Armed Forces which was used for the CONAD Terms.

#### CANADIAN-U.S. APPROVAL OF INTEGRATION

The JCS approved the MSG Eighth Report on 6 February 1957 with the understanding that integration of operational control would be limited to the continental elements of air defense of both countries.

[REDACTED]

This included the continental portions of the warning systems and the contiguous radar coverage. The Secretary of Defense approved the MSG Report on the 16th of March. And on the first of May, the CSC of Canada advised that they had completed action on the MSG Report and that the matter awaited governmental approval.

On 1 August 1957, an announcement was made jointly by the Canadian Minister of National Defense and the U. S. Secretary of Defense that the two governments had agreed to an integrated command:<sup>2</sup>

The two governments have agreed to the setting up of a system of integrated operational control of air defense forces in the continental United States, Alaska, and Canada under an integrated command responsible to the Chiefs of Staff of both countries. An integrated headquarters will be set up in Colorado Springs and joint plans and procedures will be worked out in peacetime, ready for immediate use in case of emergency. Other aspects of command and administration will remain the national responsibility. This system of integrated operational control and the setting up of a joint headquarters will become effective at an early date. This bilateral arrangement extends the mutual security objectives of the North Atlantic Treaty Organization to the air defenses of the Canada-U. S. Region.

#### ESTABLISHMENT OF NORAD

The Chiefs of Staff of both countries agreed that the Commander and the Deputy Commander of the new command should prepare plans and terms of reference for it in accordance with the MSG Eighth Report.

On the 13th of August, General Partridge proposed that the Canadian Chiefs issue an order stating that effective 12 September 1957 operational control of the Canadian Air Defence Command would be assumed by the integrated headquarters at Colorado Springs.<sup>3</sup> CONAD would issue orders stating that effective the same date, Air Vice Marshal L. E. Wray (Commander of the RCAF ADC) would become responsible to the commander-in-chief of the new command for operational control of all Canadian and U. S. air defense forces in Canada. General Partridge pointed out that as of 12 September there could be a Canada-U. S. command in name as well as fact, for the Canadian officer who was to become Deputy Commander-in-Chief, Air Marshal C. Roy Slemon,

was to arrive on 2 September and there were already several Canadian officers at CONAD Headquarters.

General Partridge also recommended the name North American Air Defense Command, abbreviated NORAD, rather than the first suggested (and publicized) title, Air Defense Command Canada-United States, abbreviated ADCANUS.

The Canadian Chiefs agreed to these recommendations on 3 September; the JCS on 6 September.<sup>4</sup> On 11 September, RCAF Headquarters issued an order placing RCAF ADC air defense forces under operational control of the integrated headquarters as of 12 September.<sup>5</sup>

After receiving JCS and CSC approval, CONAD started action to launch the new command. On 6 September, CONAD advised its component commands, the Canadian ADC, USAF and RCAF Headquarters, and CONAD subordinate commands that:<sup>6</sup>

...operational control over the Canadian Air Defence Command and the air defense forces assigned, attached or otherwise made available to that command will be assumed by the Commander-in-Chief, North American Air Defense Command (short title CINCNORAD) with headquarters at Ent AFB, Colorado, U.S.A., effective 0001 Zulu 12 September 1957. The Commander-in-Chief NORAD hereby designates the Air Officer Commanding, Canadian Air Defence Command as the commander responsible to him for exercising operational control over all Canadian air defense forces and United States air defense forces in Canada, effective 0001 Zulu, 12 September 1957.

On the same date, all interested commands were advised by CONAD that NORAD was to be established at Ent AFB effective 0001 Zulu 12 September.<sup>7</sup> CINCNORAD would exercise operational control over Canadian and U. S. air defense forces in Canada through the Commander RCAF ADC and over all other U. S. air defense forces in the United States, Alaska, and Greenland in accordance with the CONAD Terms of Reference.

The Department of the Air Force assigned General Partridge as CINCNORAD with no change in duty as CINCONAD effective 12 September 1957.<sup>8</sup>

Thus, as of 12 September 1957, mainly by CONAD proclamation, the



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North American Air Defense Command was established. As stated above, establishment of NORAD had the approval of the JCS and the CSC. But NORAD had no unit manning document and no terms of reference. It still had neither of these at the end of December 1957; but NORAD proposals for both were in the hands of the JCS and the CSC.

#### PROPOSED TERMS OF REFERENCE

The service chiefs of both countries had directed General Partridge and Air Marshal Slemon to propose terms of reference for NORAD in accordance with the MEG Eighth Report. The proposed NORAD Terms, as approved by General Partridge and Air Marshal Slemon, were sent to the JCS and CSC on 11 October 1957.<sup>9</sup>

Their terms provided that the mission of CINCNORAD would be to (1) defend the continental United States, Canada, and Alaska against air attack and (2) support other United States, Canada and NATO commands. CINCNORAD was to be responsible to the United States JCS and the CSC. CINCNORAD and his Deputy were not to be of the same nationality and during the absence of CINCNORAD, command would pass to the Deputy Commander, or in his absence, to the next senior officer regardless of nationality or service affiliation assigned to NORAD or to one of the component headquarters. The proposed terms did not designate an executive agency for NORAD. This was left to the JCS and CSC.

General Partridge asked in his cover letter that CONAD be disestablished by the JCS concurrent with the approval and publication of the NORAD Terms.

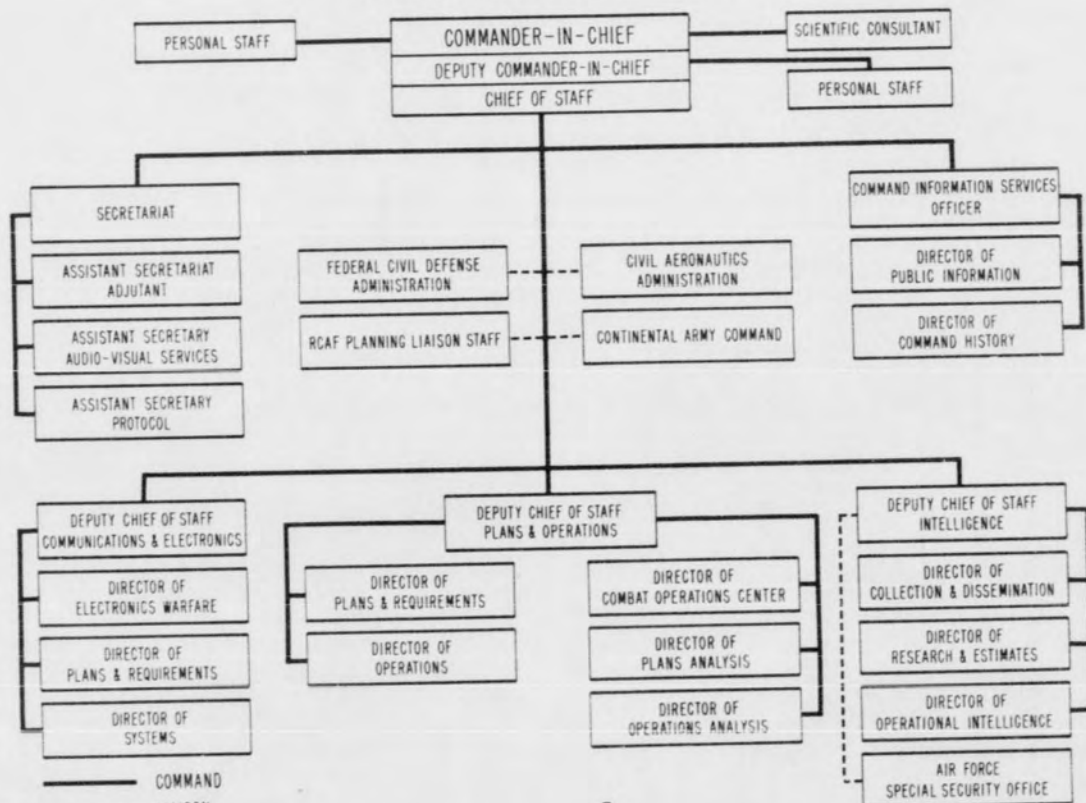
In the JCS, the proposed terms went to the air defense or Black Team (of the Plans Section of the Joint Strategic Plans Group). They were to be submitted to the JCS for approval when all service comments were in. But they were not to go to the MEG for review as had once been planned. NORAD heard informally at the end of the year that the Canadian Chiefs were ready to approve the terms with minor modifications.

#### PROPOSED NORAD MANNING

In the meantime, on 22 October 1957, NORAD submitted to the JCS and CSC its proposed headquarters unit manning document.<sup>10</sup> It included all races -- Canadian and United States, military and civilian --

[REDACTED]

## NORAD ORGANIZATIONAL CHART



31 DECEMBER 1957

considered necessary for the operation of Headquarters NORAD. A total of 562 spaces (over 150 more than in the June 1957 UMD) were requested, broken down as shown below.

	TOTAL	U.S.	U.S. SERVICE	CANADIAN
(1) Officers	195	167	104 A.F. 42 Army 20 Navy 1 M.C.	28 RCAF
(2) Enlisted Men	253	250	174 A.F. 51 Army 25 Navy	3 RCAF
(3) Civilians	<u>114</u>	<u>110</u>		<u>4</u>
TOTALS	562	527		35

Of interest, so far as Canadian participation was concerned, was the fact that in addition to the Deputy Commander position, held by Air Marshal Slemon, the position of Deputy Chief of Staff for Operations was proposed for an RCAF Air Vice Marshal. This would mean separation of Operations and Plans into two sections. On the CONAD staff, Operations and Plans were combined under one Deputy. There were to be Canadian officers in other staff positions also, of course.

The Chief of Staff, USAF, advised NORAD that the proposed UMD had been referred to the appropriate committee of the JCS for comment and recommendation on 4 November. As with the terms of reference, NORAD heard unofficially that the UMD was generally acceptable to Canada.

#### PROPOSED GEOGRAPHICAL BOUNDARIES

A third matter worked on was the geographical boundaries of areas within the NORAD territory of responsibility. These too were to be drawn by NORAD in accordance with the principles of the MGG Eighth Report. No decision on NORAD's boundary proposal had been reached by the end of December 1957. A proposal was being considered by the component commands. NORAD wanted component command agreement on a plan before it was submitted to the JCS and CSC.



## Chapter II

### *CONAD Regions and Divisions*

#### BACKGROUND

The original terms of reference for CONAD, dated 1 September 1956, provided that each USAF ADC Headquarters down to air division level would be additionally designated as a joint headquarters. Accordingly, joint defense forces and joint divisions were established at (or superimposed upon) every ADC air defense force and air division.

One of the important parts of the 1956 reorganization was separation of the CONAD and ADC structures.\* The 1956 terms gave CINCONAD authority to establish a separate headquarters and such subordinate joint organizations as he deemed necessary to accomplish his mission, including those necessary to permit centralized control and employment of the air defense forces.

Effective 15 January 1957, CONAD disestablished the joint defense forces and joint divisions and replaced them with CONAD Regions and CONAD Divisions. A total of three regions and 16 divisions were created at that time; a seventeenth division, the 64th, was established on 1 April 1957. The CONAD Regions (e.g. Central CONAD Region) and CONAD Divisions (e.g. 28th CONAD Division) were made responsible for the same geographical area as the organizations they replaced; their headquarters were at the same location and they carried the same numerical designation.

#### ORGANIZATION

In a new CONAD Regulation 21-1, prescribing organizational policy

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\* For background, see CONAD Historical Summary, July 1956-June 1957, pp 1-10 and 23-25.



and procedures, dated 3 September 1957, CONAD defined three subordinate command levels.<sup>1</sup> These were (1) CONAD Region, a geographical subdivision of the CONAD area of air defense responsibility within the United States; (2) CONAD Division, a geographical subdivision of a CONAD Region, or an area specified by CINCONAD as a division area, and those forces within the division area; and (3) CONAD Control Center (CCC), a specified subordinate joint information, communications, and operations center within a CONAD Division, established for the purposes of coordinating and supervising air surveillance and identification activities within an assigned area, and of exercising operational control of air defense units assigned by the CONAD Division commander for interception and destruction of hostile aircraft and missiles. The CONAD Control Center was to be a joint center at which the USAF ADC Direction Center (ADDC) and the Army Air Defense Command Post (AADCP) were collocated and integrated. There were none of these formed at the end of December 1957 (see Chapter Three).

Each region and division was to be organized as an operating agency, separate from the headquarters of each component command. The commander of each was to have a joint staff that was to be limited to the minimum number of personnel required to perform the command's functions. Because component commanders at each echelon were to insure that personnel, supply, and training supported CONAD requirements, CONAD organizations were not to be staffed to perform these functions.

CONAD Division commanders were to exercise operational control over all air defense systems and CONAD forces and units in air defense activities, except as otherwise provided, within their assigned areas of responsibility. The exercise of this control was to be through the commander of one or more of the following as applicable: (1) ADC Direction Centers, (2) Army Air Defense Command Posts, or (3) CONAD Control Centers.

CONAD noted in its regulation that ADDC's and AADCP's were located at separate sites. As long as these facilities were separated and communications existed between these facilities and the CONAD Division, the commander of the latter was to exercise operational control through the commander at these facilities. If there were no communications between the AADCP and the CONAD Division, operational control of the AADCP was to be exercised through the ADDC. CONAD stated that it did not contemplate placing its commanders at these separate sites.

But collocation and integration of the two to form a CONAD Control Center wherever operationally and economically feasible was CONAD

policy, the regulation declared. The component service forces were to operate their own weapons control systems at the CONAD Control Center, but under the operational control of the commander of the control center (who would be under the division commander).

#### MANNING

At the time the regions and divisions were formed, their size and staff structure were not established. COMAD laid down the basic lines (which were repeated in the September 1957 issue of Regulation 21-1) that the staff would be limited to the minimum number of personnel required for the CONAD commander to perform his functions.

As an interim measure, until COMAD could get its own separate commanders, COMAD asked ADC to designate the commanders of its air defense forces and air divisions as commanders of the CONAD Regions and Divisions at the same locations. This was, of course, a two-hat arrangement for the commanders. They were responsible to their component superior for all uni-service command matters and to CINCOMAD for all CONAD command matters.

These commanders were to have separate staffs, however, and were not to give either staff any responsibility that was in the functional area of the other, unless approved by CONAD Headquarters. CONAD provided that the joint staff of each CONAD organization was to consist of personnel of all services and that all personnel assigned or attached to the CONAD Region or Division were to be supported by the appropriate component.

But there was no approved unit manning document for any subordinate COMAD headquarters by the end of December 1957. The two-hat commanders could appoint provisional staffs only.

On 7 June 1957, proposed unit manning documents for the CONAD Regions and Divisions and the proposed organization of the staffs were sent to the JCS. The size of the staffs varied, but an average of about 128 people were proposed for the region headquarters (45 officers, 66 enlisted men, and 17 civilians) and about 115 for division headquarters (29 officers, 79 enlisted men, and seven civilians).

The JCS replied on 16 July 1957, asking for more information so as to properly assess CONAD's proposals.<sup>2</sup> The executive agency letter explained that more information was needed in order to make an assess-

was because of the great and anticipated manpower and dollar cut-tings which are dictating world-wide headquarters reduction for all three Services.<sup>3</sup>

CONAD's reply was returned on 5 September. The same number of personnel were requested for manning the CONAD Regions and Divisions. The total number requested for each organization would not all have to be added to any base, of course. Some were already at the bases, such as the Combat Operations Center and Combat Center personnel. To meet the some 128 required at each region, an average of about 72 would have to be added; for the some 115 required at each division, about 32 would have to be added. In other words, about 750 more people would be needed to complete the manning of CONAD Regions and Divisions.

In addition to the personnel, a total of \$2,424,300 would be required for construction, facilities, equipment and other needs in order to establish the regions and divisions. The operational benefits of this cost in men and money would be great, CONAD advised the JCS. A primary justification was that it would enable CINCONAD to much more effectively accomplish his air defense mission. A separate, independent CONAD organization down to the lowest operational headquarters was necessary, CONAD said, in order (1) to have effective centralized operational control and employment of all air defense weapons, (2) to have effective planning for the employment of all air defense forces, and (3) to have effective exercise and evaluation of the system. The JCS had recognized, CONAD pointed out, the ineffectiveness of having the Air Force commands additionally designated as CONAD commands and had given authority to separate them.

CONAD concluded its justification of a separate command with the following statement:<sup>5</sup>

Because of the complexity of the job of air defense, resulting from the increased variety, speed, altitude, and destructive power of weapons which can be employed by a potentially hostile country against the United States, it is inconceivable that any single service of the nation's armed forces can be expected to accomplish effectively the job of defending the U. S. by itself, with its own limited resources and through its own limited direction. In this era of rapidly advancing technology, the mission of defending the country against air attack requires not only the combined resources and efforts of the three services, but

also the effort and capacity of the nation's industrial planners, engineers, and scientists. In short, air defense requires the combined, coordinated and integrated effort of the nation's brainpower and available military resources. COMAD Headquarters is a start toward this teamwork; it is expected that CONAD subordinate joint headquarters will further this necessary integrated effort required to permit CINCONAD to exercise overall operational control of the air defense of the continental United States, Canada, Alaska, and the Northeast Area.

However, before any action was taken on the region and division manning proposals, NORAD asked the JCS to postpone its decision. NORAD advised that it was submitting region and division boundaries that differed from the existing boundaries. These changes would affect the manning requirements.<sup>6</sup> By the end of December 1957, the boundary proposal had not yet been submitted, as noted in Chapter One, and the manning of the regions and divisions was still hanging in abeyance.

Meanwhile, back in August, the USAF Air Defense Command recommended to CINCONAD that separate CONAD Headquarters below CINCONAD level not be established.<sup>7</sup> ADC pointed to the extra cost in men and money that would be required in the face of budgetary limitations. Also, ADC contended that separation would not improve operational control, but on the contrary, would cause confusion and overlap of functions. To achieve the highest quality of operational control, ADC said, the commander should be intimately acquainted with the capabilities and limitations of his forces, matters which are vitally influenced by training, logistic, and administrative aspects. "The problems that are created then by splitting these responsibilities are readily evident," ADC concluded.<sup>8</sup>

ADC recommended that its commanders be specified as the CONAD commanders also and given authority to conduct the air battle with operational control of all air defense forces. The commander's staff, ADC suggested, could be augmented with Army and Navy officers for planning and operational jobs.

General Partridge disagreed. He replied that experience had shown that separate CONAD echelons were required to maintain the control necessary to insure accomplishment of the CONAD mission. And he pointed out that ADC's commander had previously agreed and the JCS

had intended that separate organizations be set up. Finally, General Partridge declared that:9

it is my firm conviction that it is unwise to continue any longer than necessary the present arrangement below CONAD Headquarters by which one service, in effect, has operational control of the other two services. Consequently, I must insist that we proceed as quickly as possible with the establishment of a CONAD organization.

## Chapter III

### CONAD Control Centers

#### COLLOCATION OF MISSILE MASTER AND ADDC's AT TEN SITES

On 19 September 1956, CINCONAD proposed to the JCS the collocation and integration at ten locations of the Army's weapons control system, the AN/FSG-1 Antiaircraft Defense System (Missile Master), and the Air Force's Air Defense Direction Centers.\* CONAD proposed the following areas for these: Washington-Baltimore, New York, Detroit, Niagara-Buffalo, Seattle, Boston, Chicago, Philadelphia, Los Angeles, and Pittsburgh.

Both the Army and the Air Force accepted the CONAD proposal and on 30 October concurrence was given by the Office of the Secretary of Defense. Following a CONAD directive to carry out this collocation, the requirements for the ten sites were studied jointly by CONAD, ARADCOM, and ADC. CONAD outlined its preliminary requirements to the JCS on 4 February 1957.

CONAD's plan of 4 February provided that at three sites where ADC radar was suitably located, the Missile Master building was to be built next to the ADC equipment and operations building. The operations room in the Missile Master building was to be enlarged by removing a wall that partitioned off what was to be a maintenance room. The ADC operating positions were to be placed in the operations room together with the Army positions and equipment. The Air Force technical equipment was to remain in the ADC buildings. These sites were:

<u>Defense Area</u>	<u>Site</u>
New York	P-9, Highlands, N. J.
Detroit	P-20, Selfridge AFB, Mich.

\* For background, see CONAD Historical Summary, June 1957, pp 26-30. Part of the equipment at the ADDC's would be the pre-SAGE semi-automatic intercept system, the AN/GPA-37 Radar Course Directing Group.

<u>Defense Area</u>	<u>Site</u>
Niagara-Buffalo	P-21, Lockport AFS, N. Y.

New collocated and integrated facilities were to be built at six sites. The Missile Master building was to be made large enough to hold the Air Force technical equipment and operating positions (the latter in a joint operations room) as well as the Army positions and equipment. These sites were:

<u>Defense Area</u>	<u>Site</u>
Boston	Fort Heath, Mass.
Chicago	Arlington Park, Ill.
Philadelphia	Gibbsboro, N. J.
Los Angeles	San Pedro Hill
Pittsburgh	South Park Mil. Res., Penn.
Seattle	Fort Lawton, Wash.

The final one of the ten sites was to be located at Fort George G. Meade, Maryland, under basically the same plan as for the above six. But this was to be left for a later date and treated independently as it was required for technical testing of the Missile Master initially.

On 15 March 1957, CONAD was advised that the Army would procure land to build a Missile Master operations building next to the ADC buildings at P-9, P-20, and P-21. At the other sites, the Army would build a new facility. To avoid delay on the latter, the specific land requirements and site locations and the space and technical requirements were requested as soon as possible.

On-site surveys were made by ADC and ARADCOM at the first three sites (Highlands, N. J., Selfridge AFB, Mich., and Lockport AFS, N. Y.). The complete equipment and building lay-out plans for these sites were submitted to CONAD on 30 April 1957. There was not time, however, for on-site surveys of the remaining six sites (Fort Meade -- the tenth site -- had already been accepted). Facilities and plans for a typical collocated site only were submitted at that time.

On 2 May, CONAD approved the technical and operational portions of the joint plan. This provided approval for the three specific site locations where on-site surveys had been made and left six sites to be





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approved. CONAD did not pass on the detailed support facilities portions of the plans, stating that it considered this to be a matter for final decision of the services concerned.

CONAD was informed by the executive agent on the 23rd of May that the Army had concurred on the ADC-ARADCOM plan. And on 10 July, CONAD was advised that the Army and Air Force were forming a Joint Policy and Technical Steering Group to support implementation of the plan.<sup>1</sup>

Also on 10 July, CONAD learned that the Army and Air Force had approved in principle the ADC/ARADCOM plan and that service responsibilities had been established by a joint memorandum of agreement.<sup>2</sup> This agreement provided that all technical facilities, equipment, and installation would be the responsibility of the service having the equipment. The Missile Master building would be considered an Army technical facility. The Air Force was to be the host service at four locations: Highlands, N. J.; Selfridge AFB, Mich.; Lockport AFB, N. Y.; and Gibesboro, N. J.; the Army was to be host at the other sites.

The first meeting of the Army-Air Force group, which changed its name to Joint Collocation Technical Steering Group, was on 14-15 July. At this meeting, a subcommittee of the group presented design proposals.<sup>3</sup> It recommended that for the first three sites (Highlands, Selfridge, and Lockport), conventional rather than protective design criteria be used for the joint operations building so as to permit early construction. The structures would house the Air Force consoles, but not the Air Force technical, "back room," equipment which would be left in the existing ADC buildings.

For the other six facilities, the subcommittee recommended new designs based on conventional design criteria. The standard design for these sites would differ from the first three in that all Missile Master and AN/GPA-37 and AN/FST-2 equipment would be installed in the operations building.

On the basis of this design plan and the anticipated construction schedule to meet it, the group estimated the following operations dates:

<u>Site</u>	<u>Ops Date</u>
Highlands	Jul 1960
*Lockport	Aug 1960



<u>Site</u>	<u>Op. Date</u>
Scitowage	Dec. 1960
Boston	Oct. 1961
Philadelphia	Nov. '60
Pittsburgh	Dec. 1960
Chicago	Jan. 1961
Fort Meade	Jan. 1960
Seattle	Mar. 1961
Los Angeles	Apr. 1960

An Air Force representative expressed serious concerns over the late operational dates. He pointed out that action had already been taken by the Air Force to phase out, relocate, or convert seven existing radar stations as part of the deployment plan to support collocation. An Army representative stated that until more definite criteria was furnished to permit better determination of time involved in design, a better schedule could not be developed. The upshot was that the group withheld final decision on the subcommittee recommendations mentioned above.

On 6 September 1957, ARADCOM wrote to CONAD expressing grave concern over the delays in the collocation program.<sup>4</sup> ARADCOM stated that a year had passed since the Missile Master installation program had been suspended in order to reorient it towards the joint CONAD control center. ARADCOM recommended that a solution proposed by the Department of the Army be adopted. DA had proposed that construction be started immediately on the Army approved design for the Missile Master facilities and the Air Force approved AN/GFA-37. These facilities would be built next to each other and retrofitted when funds became available. ARADCOM asked that CONAD approve construction of Missile Master facilities at Boston, Philadelphia, Pittsburgh, Chicago, Seattle, and Los Angeles using the original Army design.

In response to this letter, NORAD recommended to the JCS on 27 September ways by which construction could be speeded up:<sup>5</sup>

(1) Provisions should be made for a joint operations room in the Missile Master building. This should be accomplished in such a manner as to require little, if any, redesign or further delay in construction.

(2) Supporting facilities, such as annexes for ancillary equipment, housing, and administration, should be



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<u>Site</u>	<u>Ops Date</u>
Selfridge	Dec 1960
Boston	Oct 1960
Philadelphia	Nov 1960
Pittsburgh	Dec 1960
Chicago	Jan 1961
Fort Meade	Jan 1961
Seattle	Mar 1961
Los Angeles	Apr 1961

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(2) Supporting facilities, such as annexes for auxiliary equipment, housing, and administration, should be

handled in separate projects. By so doing, delays for these facilities would not reduce Missile Master operational capability.

(3) If construction of the Missile Master building could be expedited by lessening the protection criteria, NORAD would support such changes.

Finally, NORAD urged that action be taken to get construction started at all programmed sites (excluding Fort Meade) within the next six months.

In other words, NORAD's recommendation was to build the last six sites similar to the first three. Rather than to provide one consolidated building to accommodate the Missile Master, AN/GPA-37, AN/FST-2, and associated equipment (as CONAD had proposed on 4 February), the operations building would be the currently designed Army Missile Master building modified to house all Army equipment and the Air Force operating consoles only. The rest of the Air Force equipment would be housed in nearby buildings or annexes.

The Air Force replied on 25 October that it had no objection to putting the Air Force operating consoles in the building with the Missile Master and the Air Force technical equipment in a nearby building.<sup>6</sup> But it turned down the idea of treating supporting facilities as separate projects. These, Air Force said, had to be included in the overall requirement before funds could be approved. Air Force said it gave essential personnel facilities equal priority with operational facilities. The unit could not be manned if the essential personnel facilities were not in place.

In the meantime, surveys were made by ADC and ARADCOM of the remaining six sites (Boston, Chicago, Philadelphia, Los Angeles, Pittsburgh, and Seattle). On 1 November 1957, NORAD forwarded its approval to the executive agent of the site layout plans for these sites (CONAD had approved the plans for the first three sites on 2 May, it will be recalled).<sup>7</sup> Approval of the six sites was returned by the executive agent in an indorsement dated 10 January 1958.<sup>8</sup> NORAD was also advised at that time that the Secretary of the Air Force had informed the Secretary of Defense that site surveys for the first three sites were approved.

NORAD had learned informally by 15 November 1957 that the Army and Air Force had agreed to locate all consoles in the joint



operations room and also to put certain AN/GPA-37 technical equipment in the Missile Master building. Other Air Force ancillary equipment was to be housed in a separate Air Force building. The Corps of Engineers had been requested to proceed with Real Estate Planning Reports for all sites. The District Engineers were to be given a standard layout for all sites by 27 November. This was possible because of an Air Force agreement to build all sites (except Fort Meade) along the same lines as planned for the first three (those at ADC "P" sites). The Department of Defense had forwarded a request to the Budget Bureau for funds for Missile Master construction with a recommendation for approval. The objective as of 15 November 1957 was to consummate contract action for the first three sites in the third quarter of FY-1958 and the remaining six in the fourth quarter.

Because of these decisions, the operational dates would be moved up from those estimated at the July meeting of the Joint Collocation Steering Group (see page 20). But the dates were not firm at the end of December 1957. One estimate moved all dates up about three months, others were more optimistic.

**THE SELECTION OF RADAR FOR THE COLLOCATED SITES**

The Secretary of Defense memorandum of 30 October 1956, mentioned above, and one of 28 January 1957, had charged CINCONAD with responsibility for selecting the radars for the collocated sites. Also, CINCONAD was to recommend disposition of the AN/FPS-33 radars procured by the Army for Missile Masters if not used at these sites.<sup>10</sup>

On 2 May 1957, as has been noted, CONAD forwarded its approval to the JCS of the joint ARADCOM/ADC plan for the ten sites. Included in this plan was a list of specific radars for each site. The joint plan listed three AN/FPS-7's and seven AN/FPS-20's, as follows:

<u>Location</u>	<u>Radars</u>
Highlands (P-1)	AN/FPS-7
Lockport (P-21)	AN/FPS-7
Selfridge (P-20)	AN/FPS-20
Los Angeles	AN/FPS-20
Boston	AN/FPS-7
Pittsburgh	AN/FPS-20
Chicago	AN/FPS-20
Seattle	AN/FPS-20



<u>Location</u>	<u>Radars</u>
Philadelphia Fort Meade	AN/FPS-33 AN/FPS-20

This selection became the subject of much debate, however. First, USARADCOM objected to the use of the AN/FPS-7 radar. The Army command informed USAF ADC in September that the Army's Chief Signal Officer had advised that this radar was not compatible with the Missile Master and that modifications to make it compatible were not feasible. ARADCOM recommended that the radar that was originally to go with the Missile Master, the AN/FPS-33, be used for all ten joint centers. ARADCOM said, however, that the AN/FPS-20 might be suitable, but further tests were necessary to determine this.

On the other hand, the USAF ADC told WORAD in October that it had considered the AN/FPS-33 for use at the joint centers and had rejected it because of its limited range as compared with other radars.<sup>12</sup>

A third matter causing reconsideration of the radars resulted from an effort by the USAF ADC and the Civil Aeronautics Administration to use each other's radars. Back in March 1956, Headquarters USAF had advised ADC that it had established as a matter of policy the need for joint use of Air Force and CAA radars and designated ADC as the agency to implement a joint use program.<sup>13</sup> ADC and CAA met the following September and formed a Joint Radar Planning Group to coordinate activities and recommend programs.

This joint group drew up ground rules in November 1956 for joint radar use which were signed by CAA's James T. Pyle and ADC's Lieutenant General Joseph H. Atkinson. These rules established the general policy that joint use of radar facilities would be made wherever practical in the interest of economy and effective accomplishment of both missions.<sup>14</sup>

In negotiating with the CAA on use of radars for the collocated sites, USAF ADC had general CONAD backing. In a plan for integrating Missile Master sent to the JCS on 19 September 1956, CONAD had assigned to ADC the responsibility for providing the surveillance and identification data for all weapons control systems. And in a letter to both components on 25 January 1957, CONAD made ADC responsible for maintaining a master display of air surveillance information at the joint CONAD centers.

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The latter statement was reiterated to ADC on 8 February 1957 in reply to an ADC letter on the specific problem of joint use of ADC and CAA radar. CONAD's backing was again repeated on 10 June 1957 in reply to an ADC letter in which ADC stated that ARADCOM objected to use of CAA radar at joint centers. CONAD requested ADC to:<sup>45</sup>

...proceed with the development of detailed plans for the joint use of radar facilities on the basis of existing CONAD directives and policies, insuring that all interested agencies are adequately represented during all negotiations.

CONAD also stated its policy to USARADCOM and on 10 June 1957 summarized the actions to date. CONAD concluded with the following statement: "The concept of joint use of radars, having been directed by CINCONAD and concurred in by the Department of Defense, is no longer considered debatable."<sup>46</sup>

It should be noted that at this time (mid-1957), ADC and ARADCOM disagreed both in concept and in specifics with regard to integrated use of civil and military radars. As summarized by the NORAD officer handling the primary portions of the project, Lieutenant Colonel Frederick K. Nichols, ADC contended that the CAA air route surveillance radar, the ARSR-1, was equal to or better than the radar originally programmed for the Missile Master and that the ARSR-1 was compatible with ADC/ARADCOM requirements.<sup>47</sup> ADC wanted the ARSR-1's to have amplitrons, however. At a meeting of the CAA-ADC joint radar planning group in May 1957, ADC said it accepted the ARSR-1 with amplitron modification. The CAA said that it planned to add amplitrons. The first one from regular production was scheduled for March 1960 (which, the manufacturer said, could be moved up to September 1959 at some increase in cost).

Colonel Nichols stated that ARADCOM disagreed with ADC in regard to the capability of the ARSR-1 and also objected to having civilian operation and control of the radar which served Missile Master. ADC interpreted CONAD's instructions as authoritative direction to make final commitments for the two components in the military-civil joint-use-of-radar program. Colonel Nichols felt that CONAD guidance had been so broad as to justify this interpretation. But it also was broad enough to permit ARADCOM to believe that no such responsibilities and authorities had been assigned to ADC.

At any rate, one of the first areas considered by the ADC/CAA

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radar group was Los Angeles, where CMA was obligated to provide a radar traffic control facility as soon as possible. The group recommended in February 1957 the joint use of a CAA ARSR-1 to be installed at San Pedro Hill (the planned site of a collocated center). ADC concurred and passed it along to CONAD on 19 April 1957.<sup>18</sup>

On 17 July 1957, ADC proposed amendment of the joint ADC/ARADCOM plans for the ten collocated facilities to show the ARSR-1 at San Pedro Hill in place of the AN/FPS-20.<sup>19</sup>

CONAD concurred on 20 August 1957 with certain provisions. CMA was to go ahead with the installation for use only as a traffic control facility, pending implementation of this site as a joint CONAD center. The adequacy of the ARSR-1 to fulfill military requirements (particularly Missile Master requirements) was to be evaluated. Said CONAD, if this evaluation "proves the feasibility of utilizing the ARSR-1, it will be used; if not, then a military radar will be provided...."<sup>21</sup>

On 14 August 1957, ADC advised CONAD that it had accepted the ARSR-1 for joint use at Fort Heath, Massachusetts, as well as at San Pedro.<sup>22</sup> Conditional approval, the same as for San Pedro, was given by CONAD on 7 October with the request that final action be held up by ADC if possible.<sup>23</sup> And on 22 October, ADC told CONAD that it had selected the ARSR-1 for joint use at a third site, Fort Lawton, Washington.<sup>24</sup>

In the meantime, on 14 September, ARADCOM advised NORAD that the Army had investigated compatibility of the ARSR-1 with the Missile Master. The information received from the Army indicated that the ARSR-1 was not technically compatible, but could be made so with modifications.<sup>25</sup> How much this would cost and how long it would take was not known. At any rate, modification plus agreement between all agencies would cause an unacceptable delay, ARADCOM felt. For this reason, ARADCOM again recommended that the ARSR-1 not be considered for use. On 15 October, the Department of the Army told NORAD that, "Official Signal Corps position is that CAA Radar ARSR-1 is acceptable for operation with Missile Master provided it is used with an amplatron and minor modifications are made to the pedestal. However, the AN/FPS-33 is preferred."<sup>26</sup>

As a result of a decision by CINCNORAD, following discussions that he had with USAF officials, NORAD informed the executive agent on 8 November that it had concurred with the joint use of the ARSR-1 at

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San Pedro Hill, Fort Heath, and Fort Lawton and asked that the ADC-ARADCOM plans be amended accordingly.<sup>27</sup> NORAD concurrence in all cases was conditional. NORAD pointed out to ADC that "over ARADCOM's objections and primarily because it appeared that you had already made a firm commitment in the matter, this headquarters agreed to go ahead with the installation on a conditional basis, subject to review and final decision at the appropriate time."<sup>28</sup>

In the meantime, NORAD felt it essential to get more information on the relative merits of the radars. It requested this from the executive agent on 13 September and again on 1 November.<sup>29</sup> NORAD asked that a Joint Army-Air Force committee that was evaluating the radars concerned provide information as quickly as possible.

Also, on 11 December, General Partridge asked the USAF ADC Commander for a definite and detailed decision on use by ADC of the AN/FPS-33.<sup>30</sup> In addition to deciding on what radar to use at the collocated sites, CINCNORAD was responsible for advising on the disposition of the AN/FPS-33's if these were not used. The Army had procured ten of these radars for use with Missile Master, at a total cost of about \$12,000,000. One was being installed at Fort Meade for testing; the others were in storage.

General Atkinson replied on the 27th of December that this radar had been carefully investigated by ADC and that it did not have a requirement for it. ARDC had been asked to study the radar and had found that "the equipment will not meet the radar coverage, either in range or altitude, required by ADC for the air defense of the United States, and that the equipment does not compare favorably with other ADC programmed radar equipments."<sup>31</sup> General Atkinson stated that in addition, the CAA had been queried on whether the AN/FPS-33 would be acceptable for air traffic control at joint centers. The CAA had replied that it did not consider the AN/FPS-33 radar coverage acceptable for key locations in long range air traffic control.

The report from the Army-Air Force group studying the radars was received by NORAD on 27 December. It supported the conclusion of ADC that the AN/FPS-33 should not be used in the NORAD system. It also supported the choice of radars previously made. On 9 January 1958, NORAD advised the executive agent that it did not wish to change the selection of radars previously made and requested the Army and Air Force to begin on a program to install these radars.<sup>32</sup> To reiterate, the radars approved by NORAD for the ten sites were as follows: (1) AN/FPS-7's at Highlands and Lockport, (2) AN/FPS-20's at Gibbsboro, South

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Park, Arlington Park, Selfridge, and Fort Meade, and (3) ARSR-1's (with modifications) at Sa. Peiro, Fort Lawton, and Fort Heath. NORAD also said that it would back replacement of any of these with new frequency diversity radars, such as the FFS-35.

#### COLLOCATION OF REMAINING SITES IN THE U. S.

In all there were 22 primary Army Air Defense Command Posts in the continental United States. Ten of these, as has been discussed, had been approved for collocation. This left twelve to be decided upon. On 12 April 1957, CONAD directed each of its region commanders to survey their areas and recommend collocation and integration wherever operationally and economically feasible. Seven were in the Eastern Region. The Eastern Commander recommended collocation of only three: Loring AFB, Sault Ste Marie, and Savannah. Central had one, but it did not recommend its collocation. And four were in the Western Region, which recommended collocation of only one - Fairchild. Operations or economy factors were the reasons given for not collocating the others.

On 4 November 1957, NORAD told its USAF and Army component commands that, considering the planned operational date of January 1958 for the ADDC at Geiger Field, Washington, it desired collocation of the Geiger ADDC and the Fairchild AFB AADCP.<sup>33</sup> NORAD asked for a joint report of the feasibility of this from a logistic viewpoint. A formal answer had not been received at the end of the year, but informally NORAD had learned that ARADCOM had no objections provided funds could be made available.<sup>34</sup> Collocation of the others and the recommendations of the regions were still being considered at the end of 1957 at NORAD Headquarters.

#### COLLOCATION IN GREENLAND

In the Northeast Area, there was one USARADCOM AADCP -- located on North Mountain near Thule AFB, Greenland. USAF ADC had an ADDC in the area on Pingassuit Mountain. On 2 August 1957, CONAD asked the USAF and Army ADC's for a joint report on the feasibility from a logistics standpoint of collocating the two.<sup>35</sup>

ADC replied on 12 September, recommending that collocation be accomplished by bringing together the operations rooms of the two in a new facility to be built on Thule AFB proper.<sup>36</sup> Simply moving one to

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the other's existing site was impractical, ADC said. Either site would require considerable building. But the radar information could be remoted to Thule AFB from "P" Mountain.

The Army ADC agreed that collocation was feasible if the operations rooms were brought together at Thule. But Army ADC felt that "collocation of the AADCF and the ADDC will add little, if any, improvement to the present effectiveness of Army air defense units in the Thule area."<sup>37</sup>

On 8 October, NORAD approved the USAF ADC recommendations and directed implementation. NORAD noted that "collocation and integration of the AADCF and the ADDC in conformity with established CONAD (NORAD) doctrine will add substantially to the effectiveness of air defense at Thule."<sup>38</sup>

#### COLLOCATION IN ALASKA

The CONAD requirement for Alaska, as stated to the JCS, was as follows:<sup>39</sup>

A requirement exists for two Army Defense Control System sets (AN/MSG-4) in FY-1960. One system should be installed to control the fire of antiaircraft units in defense of the Ladd/Eielson bases (Fairbanks), and the other system to control antiaircraft units in defense of Elmendorf-Fort Richardson (Anchorage) and the IREM sites at Willow Run and Hidden Lake. Each of the AN/MSG-4's will be interconnected with the BADGE system. Collocation of the AN/MSG-4 and the associated ADDC is established policy.

To carry out this requirement, the commanders of the Alaskan Air Command and the U. S. Army Alaska tentatively chose Murphy Dome in the Fairbanks area and Mount Susitna in the Anchorage area as sites for collocated facilities. On 31 May 1957, CONAD approved the former, but turned down Mount Susitna because of cost and construction difficulties. On 18 June, CONAD recommended Murphy Dome to the JCS.

After extensive studies, Commander-in-Chief Alaskan Command (CINCAL) recommended on 11 October 1957 that Fire Island be selected as the joint center for the Anchorage area.<sup>40</sup> He further recommended that both Fire Island and Murphy Dome be operating by 1 October 1958,

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the expected operational date of Nike battalions in Alaska.

NORAD agreed and recommended Fire Island to the JCS on 16 October. The JCS informed NORAD of their approval of both Fire Island and Mirnye Dnie on 27 November.<sup>12</sup>

In the meantime, CINCLAN discovered a number of problems in connecting the AN/MSG-4 and the Air Force's BADGE system. As noted above, NORAD had MICOM planning for operation of these systems by FY-1960. CINCLAN watched development of the AN/MSG-4 for planning purposes, sending an officer on a tour of responsible agencies. On 25 October, CINCLAN informed NORAD that on this trip, this officer was told that:<sup>13</sup>

(1) the digital exchange of data between the BADGE system and the AN/MSG-4 under current designs was not feasible.

(2) each system was developed to provide operational-type data only for its own basic mission. To correct this, a joint committee was established to make BADGE and AN/MSG-4 operationally integral, but the committee had little guidance and no authority to direct integrated development.

(3) the BADGE program was not firmly established and there was possibility that it might be reoriented at an early date which would delay production beyond FY-1961.

(4) the AN/MSG-4 total system had been delayed, but its BOC (Battalion Operations Center) component could be made available in FY-1959. The BOC component shows promise of materially increasing the effectiveness of battalion-size Nike defenses, but the currently planned BADGE would not be able to exchange data with the BOC

NORAD forwarded CINCLAN's letter to the JCS, pointing out that the concept of centralized control demanded compatibility of systems for successful accomplishment of the NORAD mission.<sup>14</sup> NORAD recommended that the Department of Defense investigate and remedy any incompatibilities.

[REDACTED]

**NORAD'S TEST PROGRAM FOR  
SAGE-MISSILE MASTER INTEGRATION**

As noted above, on 30 October 1956, the CONAD proposals for the collocation of Missile Masters and AN/CFA-37's at ten locations were approved by the Office of the Secretary of Defense. OSD also stated that a technical plan for integration of Missile Master into the continental air defense system (both manual and SAGE) was being prepared by the OSD Research and Development Office. This plan was to be based on the CONAD proposals.

A Secretary of Defense memo to the Secretaries of the Army and the 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 for the approval of the Secretary of Defense 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 also to monitor the studies, programs, and contract actions and tests outlined in the OSD technical plan. This 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 and sent to the executive agent for forwarding to the Secretary of Defense after Army and Air Force coordination.<sup>45</sup>

CONAD's plan stated that the objectives of the tests were to: (1) determine the optimum air defense doctrine, concept, tactics, and techniques for employment of the SAGE/Missile Master system, (2) determine the operational capability of the equipments used, (3) determine the adequacy of the operational procedures employed, (4) determine the equipment, program and/or procedural modifications that might be required to meet CONAD operational requirements, and (5) accomplish the objectives of the technical plan provided by the Secretary of Defense to the Secretaries of the Air Force and Army on 28 January 1957.<sup>45</sup>

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 schedule proposed by CONAD for the tests was as follows.

Before the operational tests, the SAGE-Missile Master digital interconnections were to be checked out at the Fort Lee, Virginia, Direction Center and the Fort Meade, Maryland, Missile Master site -- the first available sites. These checks could be started about October 1958.

CONAD proposed that next there be developmental testing of a computer and program revision to be made in September 1959 at the Lincoln Experimental Subsector and the Boston Missile Master site. The Boston Missile Master was scheduled for operations in October 1960, but CONAD hoped to have this date moved up so that these tests could start earlier.

Finally, operational tests were to be held in the Detroit SAGE Sector with tie-in to the Detroit and Pittsburgh joint manual centers. These tests could start in approximately September 1960 when the Detroit joint center was scheduled to be available. The Pittsburgh joint center could be integrated into the tests by December 1960.

The CONAD plan had not been approved by the end of December 1957. On the 23rd of this month, the executive agent reported that the plan had been reviewed by the Air Force and Army and that it was generally acceptable with some reservations on detail.<sup>47</sup>

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## Chapter IV

### **Status of the Radar Net: June 1957 - December 1957**

#### UNITED STATES LAND-BASED RADAR

On 31 December 1957, ADC had a network of 156 land-based radar stations in the United States. This was an increase of 36 stations over the mid-1957 status -- three heavy radars and 33 gap-fillers. The operational radar stations in the ADC network consisted of the following according to type of radar program.<sup>1</sup>

	30 JUNE 1957	30 DECEMBER 1957*
"P" Stations	75	75
First Phase Mobile Stations	28	27
Second Phase Mobile Stations	9	12
Third Phase Mobile Stations	0	1
Gap-Filler Stations	8	41
TOTALS	120	156

In the first six months of 1957, ADC's radar program had been jeopardized by a lack of maintenance and operations (M&O) funds. The fund shortage had become so acute that ADC had been forced to defer until FY-1958 the activation of several Mobile Program stations originally funded in its FY-1957 budget. This had made it impossible for ADC to meet CONAD's FY-1957 goal of 133 heavy radar stations in the U.S.<sup>2</sup>

The CONAD ACW objective for the end of FY-1958 was 144 heavy

\* See Appendix 1 for a list of USAF ADC radar stations as of December 1957.

radars in the Continental U.S. or an increase of 11 stations over the mid-year goal. At the end of December 1957, ADC was some 29 radars short of this goal. And its programmed goal for the end of FY-1958 was for only 124 heavy radars -- 20 stations shy of the CONAD objective.<sup>3</sup>

The qualitative problems faced at mid-year were still existent at year's end, also. The air surveillance system had neither the range nor altitude to cope with the high-speed, very high-altitude threat. Also, the system was vulnerable to mass ECM-supported attacks.\* At mid-year, it was anticipated that both deficiencies were to be corrected by modification of the existing radars with the AN/GPA-27 and the acquisition of newer AN/FPS-7, AN/FPS-20 and Frequency Diversity (FD) radars.<sup>4</sup>

The AN/GPA-27 program for the Continental U.S. was revised in September 1957, however. Headquarters USAF informed ADC that FY-1958 budget limitations plus the urgent need to provide an improved ECCM capability made it necessary to revise its program. Twenty-four of the 107 AN/GPA-27's originally programmed for deployment, USAF continued, would have to be deleted from the ADC program. All AN/GPA-27 procurement would be stopped by FY-1957 and procurement of the FD radars would be started in FY-1959. USAF directed ADC to submit its list of stations to be cut from the AN/GPA-27 program.<sup>5</sup>

ADC immediately set to work to meet the revised USAF requirement. The original AN/GPA-27 program deployment criteria had been based on two factors: providing a weapons control capability from 5,000 to 60,000 feet and providing a triple overlap coverage at all altitudes to meet SAGE requirements. The latter need had been under review by Headquarters ADC for some time. The guidelines laid down for the deployment of the ground environment system in the SAGE era were not considered specific enough by ADC to meet the triple radar coverage requirement. And in September, it requested the ADES Project Office to re-state the SAGE surveillance requirements.<sup>6</sup>

The ADES group was unable to re-affirm or modify the original SAGE estimates, however. A meeting between the major SAGE agencies (i.e., ADES and Lincoln Laboratory) held in September produced but a

\* See below pp 92-94.



single comment: "...further study...<sup>7</sup> [was] required...."

The lack of concrete information on which ADC could base its plans for revising the AN/GPA-27 program made it necessary for ADC to arbitrarily select 24 sites which, left unmodified, would least degrade the system.<sup>8</sup> With the AN/GPA-27 list, ADC also forwarded its revised FD radar program. The revised program was based on USAF's FY-1959 procurement plan which was that by FY-1959, ADC could expect eight AN/FPS-28's, eight AN/FPS-35's, nine AN/FPS-24's, and 15 AN/FPS-26's.<sup>9</sup>

In the meantime, NORAD had become concerned with the unilateral action USAF had taken. NORAD asked ADC to tell it what impact the ending of the AN/GPA-27 program would have on the radar improvement program and the criteria used to determine which stations, if any, were to be affected by the revised program.<sup>10</sup>

On 8 October, ADC informed CINCNORAD of the 24 stations cut from the AN/GPA-27 program. It stated that the revised program would mean that high altitude triple coverage in some low priority areas would not be available in time to meet SAGE operational dates. However, ADC continued, the deficiency was to be eliminated with the installation of the FD radars.<sup>11</sup>

The Mobile Radar Program. At mid-1957, a total of 84 radar stations had been planned for the three phases of the mobile program: 39 stations in the first phase; 21 in the second; and 24 in the third.<sup>12</sup> Seven first phase, one second, and three third-phase stations had been cut from the program because of the shortage of funds mentioned above. On 31 December, a total of 73 radar stations were planned for the Mobile Program. This total was divided into 32 stations in the first phase, 20 in the second, and 21 in the third.<sup>13</sup>

On 31 December, the operational Mobile stations had risen to 40, an increase of three over those operational at mid-year.<sup>14</sup> Twenty-seven of the stations were first-phase, 12 were second-phase, and one was third-phase. A "fully" operational status had been reached by 24 of the first and eight of the second-phase stations. Of the remaining stations, five (four second-phase and the lone third-phase) were at a "sustained" status, and one second-phase was "limited." It was anticipated that by the end of FY-1958 a total of 47 stations in the Mobile program would be operational and the entire program completed by January 1961.<sup>15</sup>

The Gap-Filler Program. To supplement the Permanent and Mobile radars, ADC had planned to provide a total of 235 small, unattended radars known as gap-fillers. These radars were to provide low-altitude coverage and were to be equipped with either the AN/FPS-14 or AN/FPS-18 model radars.<sup>16</sup>

At mid-year, eight of the gap-fillers had begun operations -- three on a "sustained" and five on a "limited" status.<sup>17</sup> By 31 December, this total had increased to 41. Two of the radars were "fully" operational, 19 were capable of "sustained" operations, and the remaining 20 were on "limited" operations. In addition to the 41 operational radars, 19 more stations were under construction and at 32 stations, installation of the electronic components had begun.

The program was being delayed by a lack of funds, however. From the total of 235 radars originally planned, at the end of December, 67 sites were being held in abeyance. These 67 sites were either to be deleted entirely or held up until additional funds were made available. It was expected that by the end of FY-1958 a total of 82 stations would be operational.<sup>18</sup>

#### 64TH AIR DIVISION

At mid-1957, the radar system in the 64th Air Division Area consisted of 12 Permanent radars and six gap-fillers. All of the Permanent and five of the gap-fillers were operational as of 30 June.<sup>19</sup>

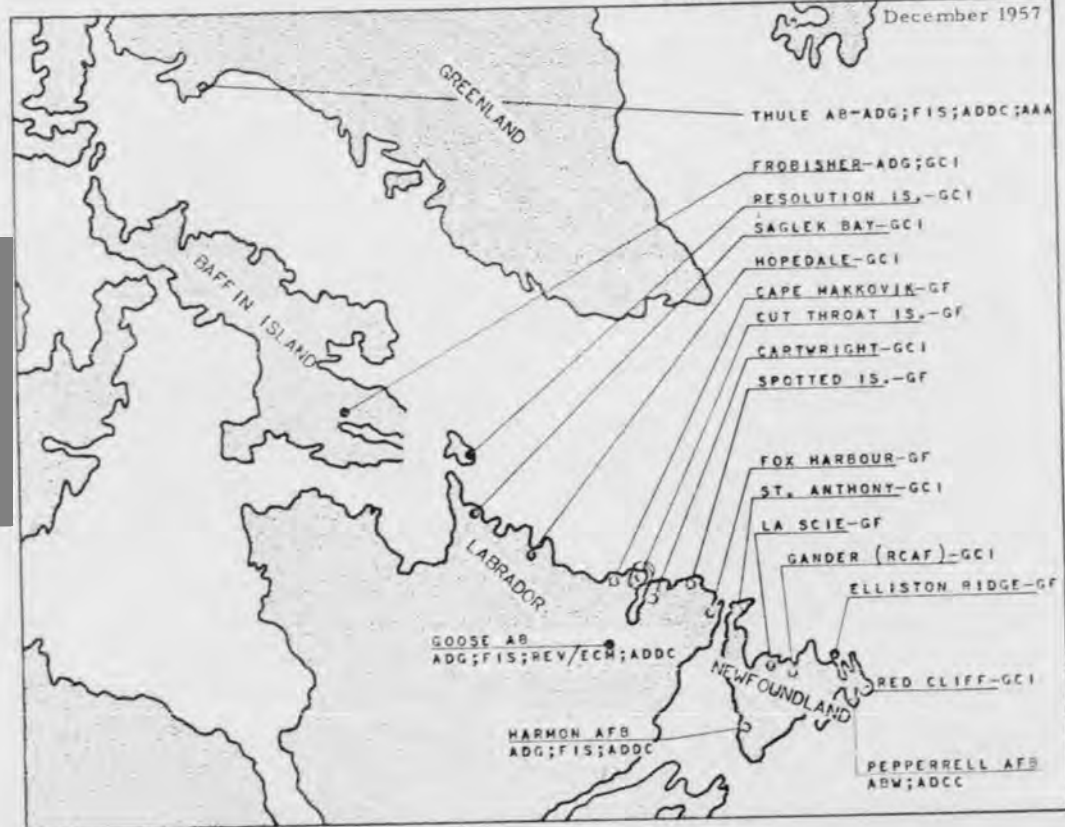
On 31 December, there had been but a single change in the system. A heavy radar station -- N-34 -- located at an ice cap site, had ceased operations. In regard to gap-fillers, five were operating, three having attained a "fully" operational status and two a "sustained" level. A sixth gap-filler station, N-27A, at Cut Throat Island, Labrador, was to become operational in January 1958.<sup>20</sup>

#### CANADA

When the RCAF ADC integrated with CONAD to form the North American Air Defense Command, there were a total of 33 radar stations (excluding the DEW and Mid-Canada Warning Lines) in Canada. These stations were strung across Canada from Vancouver Island off Canada's West Coast to Nova Scotia off the East Coast, then in a line up the east coast to Frobisher Bay, Baffin Island. These stations were built under the

# GEOGRAPHICAL LOCATION OF 64TH AIR DIV (D) UNITS

December 1957



Canada-United States Radar Extension Plan (known as the "Pinetree" plan).

Excluding the stations of the 64th Air Division (discussed above), the Canadian network had 23 stations -- eight of which were manned by USAF, the remaining 15 by Canada (in addition, the RCAF manned one station in the 64th area for a total of 16). Thirteen of the 23 were functioning as GCI stations, the remaining ten as EW stations. The stations reported to four Canadian centers and two USAF ADC divisions.<sup>21</sup>

The only change by year's end was the elimination of one Permanent Program station -- C-36 -- located on Vancouver Island (Tofino) which had been manned by Canada. The control capacity, overlap and continuity of coverage from adjacent radars at Holberg and Neah Bay were given as the reasons for discontinuing operations at Tofino.<sup>22</sup>

#### ALASKA

At mid-1957, the Alaskan radar system was scheduled to consist of two control centers (Ladd and Elmendorf) and 18 radar stations. Twelve of the stations were operational on 30 June 1957 and six were still under construction. The stations under construction were located at: Middleton Island, Bethel, Kotzebue, Unalakleet, Fort Yukon, and Ohlson Mt.<sup>23</sup> By 31 November 1957, the Alaskan network had increased by only one station over its mid-year status. The station on Middleton Island had started operating. The remaining five were expected to enter the network between March and August 1958.<sup>24</sup>

The primary search radars in operation in the Alaskan network were the AN/FPS-3 and the AN/CPS-6B. Plans at mid-year called for installing AN/FPS-7's at two of the four Alaskan DC's (Murphy Dome and Fire Island) and AN/FPS-20's at Campion and King Salmon. At all but three of the remaining stations, the AN/FPS-20 was to be installed as the primary search radar. Unalakleet, Kotzebue, and Bethel were to get AN/FPS-8's. Converting the network from the

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\* See Appendix II for a list of Canadian radar stations as of December 1957.

AN/FPS-3 to the AN/FPS-20 called for installation of the AN/GPA-27 which was to begin in FY-1958.<sup>25</sup>

Shortly after mid-year, AAC learned that a shortage of funds in USAF had caused deferment of all programmed AN/GPA-27 equipment beyond FY-1958, however. CINCAL objected to the idea that AN/GPA-27's would not be available to provide adequate high-altitude coverage between Cape Lisburne and King Salmon in time to match the operational date of the Aleutian DEW Line extension. Without this coverage there could be no adequate link-up of the two systems. Also, without high altitude coverage to the direction centers, CINCAL could not effectively use the AN/GPA-37 and F-102's, and the routes to the important Fairbanks and Anchorage target complexes could not be protected.<sup>26</sup> Appealing to CINCONAD, Lieutenant General Frank A. Armstrong, Jr. (CINCAL), asked that the AN/GPA-27 equipment be provided to preserve the "...overall integrity of [the] DEW Line high altitude coverage."<sup>27</sup>

CINCONAD was also concerned and asked USAF for further information on the subject. CONAD's capability to perform its mission, he continued, would be jeopardized by any such deferment.<sup>28</sup>

USAF informed CINCAL and CINCONAD that a shortage of funds had made it necessary to reallocate AN/GPA-27 equipment. The reallocation would eliminate four AN/GPA-27's from AAC's radar program. However, USAF continued, the reallocation of equipment would still allow AAC to match the March 1959 operational date of the Umnak-Naknek segment.<sup>29</sup>

Middleton Island, Ohlson Mt., Tin City, and the Northeast Cape stations were eliminated from the AN/GPA-27 program. The deployment of the remaining nine AN/GPA-27's was considered a sufficient -- but a minimum -- number to provide solid radar coverage for the most likely Soviet attack routes.<sup>30</sup>

Another problem in the Alaskan theater was a delay



in receipt of AN/FPS-7 equipment for Fire Island and Murphy Dome. This delay, which was caused by fund shortages, had by October 1957 changed the equipping date of the two stations from FY-1958 to the second quarter of FY-1962.<sup>31</sup> This date was unacceptable to CINCAL. A recent decision to collocate the AACC-ADDC for Anchorage and Fairbanks at Fire Island and Murphy Dome made it impractical to wait for the AN/FPS-7's. The collocated facilities were scheduled to begin operations on 1 October 1958. The single-channel, medium-altitude radars (AN/CPS-5B's) in use at both stations would not permit full use of high-performance weapons that were to be controlled from the Joint Direction Centers.<sup>32</sup>

CINCNORAD advised ADC of the Alaskan problem and requested that it provide the needed two sets.<sup>33</sup> Ultimately, ADC found that it could spare two AN/FPS-20's for AAC. The details of shipment were being worked out between AAC and ADC at the end of this period.<sup>34</sup>

#### CONTIGUOUS RADAR SYSTEM

General. On 1 August 1957, Headquarters CONAD issued a new operations plan for the contiguous radar system.<sup>35</sup> It called for extending the contiguous radar surveillance and weapons control capability of the continental air defense system at both high and low altitudes as far seaward as possible. The extension program was to be carried out by the use of Texas Towers (on one coast only), picket ships, USAF AEW&C aircraft and Navy airships.

Air Defense Command was responsible for providing AEW&C aircraft and Texas Towers for the operational control of CINCONAD. NAVFORCONAD was responsible for providing CINCONAD with picket ships and airships. Both were responsible for advising CINCONAD on tactics, techniques, and equipment to be used by their forces and to coordinate with each other in developing operational procedures and plans for the seaward extension forces. The commanders of CFWCR and CPECR were assigned responsibility for maintaining a radar surveillance and weapons control system in the contiguous zone, exercising operational control of all on-station forces, and issuing supporting plans for 9-57.

Picket ships were to be deployed on stations approximately 300 miles to sea off both coasts at intervals of approximately 150 nautical miles. This deployment provided a maximum amount of warning at 40,000 feet and still afforded radar coverage contiguous with that of shore-based radars at heights between 20,000 and 40,000 feet. The low level

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capability of the ships was limited, however. Nevertheless, the deployment plan offered the most warning against low-level attacks that could be achieved by the ships consistent with their high altitude capabilities. Lateral gaps left in the radar cover at low altitudes were being shifted continually by using a synchronized patrol along the axis of the picket ship barrier.

AEW&C aircraft and the Navy airships were to fill the low and medium-altitude gaps in radar coverage between the shore-based radars and the picket ships. They were to fly a 100-mile racetrack pattern (50 miles either side of their assigned stations) and patrols were to be synchronized so that all aircraft, excluding airships, could keep approximately the same relative position at all times.

Assignment of stations was to depend upon the type of communications available. Generally the forces depended upon UHF communications which restricted their deployment to within line-of-sight range of the shore-based radars. HF communications, on the other hand, allowed greater flexibility and for that reason were to be considered the primary means of communication. Every effort was to be made to provide HF communications. Stations using HF communications were to be known as primary AEW&C stations. If adequate HF communications were not available, as an interim measure, the AEW&C units were to be placed on secondary stations within UHF range of the shore-based radars or picket ships. No redeployment to secondary stations was to be made until after all efforts were exhausted in attempting to obtain HF facilities, and after that only with the approval of CINCONAD.

Contiguous Force Deployment. Deployment (OPLAN 9-57) was based on a requirement to extend the contiguous radar coverage and weapons directing capability of the Air Defense Combat Zone. But CFECR challenged the criteria used in determining the force locations.<sup>36</sup> It concluded that deployment had been based more on the radar coverage concept than on the weapons directing capability of the manual system. As an example, ECR pointed out that ADC's Operations Analysts as late as July 1957 recommended moving the stations closer to shore to achieve a maximum degree of contiguous coverage. But the operational concepts introduced with the newer weapons in ADC and the increased radii of such aircraft as the F-89J and the F-102 called for extending control capability even further seaward to obtain maximum use of available weapons.<sup>37</sup> Eastern's study indicated that the system could be improved if the AEW&C stations were moved some 140 miles beyond the picket stations. This would mean deploying the aircraft some 440 miles off the coast.

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According to Eastern's reasoning, the contiguous concept had been established prior to the existence of facilities within the so-called Remote Information Zone (i.e., DEW Line, Atlantic Barrier, etc.). These facilities now allowed enough time to scramble additional aircraft or airships to fill any gaps in the recommended deployment. Its recommended deployment would extend the medium and low level early warning surveillance range of the seaward extension radars, would also extend the medium and high altitude capability, and interceptors could be utilized to the extent of their combat radii.

While Eastern was considering moving the aircraft/airship stations, NAVFORCONAD was proposing moving the picket ship stations.<sup>38</sup> CONAD's 1956-1956 Objective Plan (CADOP 56-66) called for 19 picket ship stations in the off-shore program. Budget reductions, however, had forced the Navy to fix its surface force levels to man only five stations off each coast. For that reason, NAVFORCONAD had tried to find some method of employing its ships to obtain a higher return on the number of ships used.<sup>39</sup>

Because of the limited low-level surveillance capability of the ships, high-altitude target detection was considered their primary responsibility. This high-altitude capability was being enhanced by the addition of newer radars (AN/SPS-17) to the YAGR's. This retrofit program was expected to be completed in July 1958. Using this increased performance capability, NAVFORCONAD proposed to vary the intervals between ships and the seaward distance to achieve the objectives mentioned above.

The proposal for the East Coast was to increase the intervals between picket stations to  $2\frac{1}{2}$  nautical miles and move them seaward about 100 to 300 miles. This deployment was expected to provide some 85 per cent of the coverage required by CADOP. On the West Coast, NAVFORCONAD proposed increasing only the interval between stations to 272 nautical miles. Seventy-five per cent of the coverage requirements of CADOP could be met using this deployment pattern.

Eastern's study was referred to ADC by CONAD for comment. ADC's reply stated that insufficient data made it impossible to evaluate the proposed AEW&C deployment. It recommended that CFECR be allowed to conduct a test of the recommended deployment.<sup>40</sup> ADC also recommended that CONAD allow Eastern to test the NAVFORCONAD proposal at the same time. On 12 December, NORAD authorized CFECR to conduct a test of both AEW and picket ship elements. The test was expected to commence on 3 February and be completed on 1 April 1958.<sup>41</sup>



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AEW&C. At mid-1957, CONAD's Airborne Early Warning and Control (AEW&C) force was composed of six tactical squadrons -- three at McClellan AFB, California, and three at Otis AFB, Massachusetts. This force remained unchanged at the end of December 1957. The squadrons at McClellan were assigned to WADF's 552d AEW&C Wing, those at Otis to EADF's 551st Wing.<sup>43</sup>

At mid-year, both wings were having difficulty maintaining the eight stations (four on each coast) required by CADOP. Their problems stemmed from a USAF-directed cut in ADC's Fourth Quarter FY-1957 Flying Program. USAF had reduced ADC's flying-hour program by some 4.2 million dollars, causing severe restrictions on its air elements. And one of the programs curtailed was airborne early warning. Nevertheless, at mid-year, the two wings managed to man eight stations. One part-time and three full-time stations were being manned by the 551st in conjunction with the Navy Airship Squadron (ZW-1) off the East Coast. On the West Coast, the 552d also manned four stations -- three full-time and one part-time.<sup>44</sup>

In September, ADC informed the defense forces that its FY-1958 budget had been reduced by USAF.<sup>45</sup> For this reason, it was reducing the flying hours available to both AEW&C wings for the Second Quarter of FY-1958 to 15,405 hours. This gave WADF and EADF only 2,268 and 2,125 flying hours per month for performing their primary mission. This allowed manning only two AEW&C stations continuously off each coast.

CONAD was informed of the impending flying-hour reduction at the same time as the defense forces. ADC asked how CINCONAD proposed using the time: (1) covering the two highest priority stations on each coast continuously, (2) covering the maximum number of stations on each coast during the hours of darkness, or (3) some alternate plan.

On 20 September, NORAD informed ADC that it did not approve the 40 per cent flying-hour reduction proposed. OPLAN 9-57 required that all stations were to be manned continuously and had been approved by ADC. The latter had provided for the land-based radar system to operate on a 24-hour-a-day, seven-day-a-week basis, and it was inconsistent not to provide similar coverage for the contiguous system.<sup>46</sup>

ADC was asked to review its flying-hour program to see if enough time could be restored for continuous AEW&C coverage. If this could not be done, then it was to protest to USAF, with CONAD supporting it in any way possible. But if this accomplished nothing, all flying

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time of the AEW&C program was to be used on-station. In the event the capability could not be fully restored, the absolute minimum on-station time CONAD would accept was as follows:

<u>EAST COAST STATIONS</u>	<u>ON-STATION TIME</u>
# 2	During hours of darkness
# 4	24-hours-a-day, 7-days-a-week basis
# 6	24-hours-a-day, 7-days-a-week basis
# 8	Occasionally
# 10	Unmanned

<u>WEST COAST STATIONS</u>	<u>ON-STATION TIME</u>
# 1	Unmanned
# 3	16 hours per day
# 5	16 hours per day
# 7	16 hours per day
# 9	Occasionally

ADC adopted CONAD's minimum requirements. The defense forces were informed that their future flying schedule should conform with the station schedule outlined by CONAD.<sup>47</sup>

ADC's reply to NORAD was received in October. ADC said that it realized the cut in AEW&C flying hours was not in the interest of the most effective operations, but that it also had to think of its interceptor squadrons which also flew "active air defense missions." Also, CONAD OPLAN 9-57 provided that "all stations [were] to be manned continuously within the resources of the task organization concerned."<sup>48</sup> Its present resources, ADC continued, would not permit additional AEW&C station manning without severely reducing its interceptor operational capability.<sup>49</sup>

In the meantime, NORAD protested the unilateral action and the reduction in flying hours to the JCS. NORAD pointed out that not only had USAF cut AEW&C aircraft station coverage, but by a separate directive the CNO had reduced on-station time on the Atlantic Barrier.<sup>50</sup>

The protest to the JCS did not bring immediate relief. In October, NORAD was informed that both the CNO and USAF were reviewing their flying time allocations. A final answer would be forwarded later.<sup>51</sup>

The reduced station time at the regions also produced its share of problems. On 1 October, CFWCR informed CINCNORAD that the intermittent manning of stations 3, 5, and 7 provided coverage to the San Francisco target complex only. It suggested manning two alternate stations 24-hours-a-day. The two stations would be an extension of the picket ship line on the West Coast and would provide maximum early warning for the San Francisco, Los Angeles, San Diego, and Seattle target complexes.<sup>52</sup> NORAD approval was granted immediately and stations 7A (33-55N - 120-40W) and 9A (31-25N - 124-30W) were manned.<sup>53</sup>

On the East Coast, Texas Tower # 2 was being shut down for a period of 75 to 90 days in mid-October in order to install an AN/GPA-27. During installation, the tower could not provide any coverage. To compensate for this loss, EADF asked ADC to provide additional flying hours in order to man stations 2, 4, and 6 continuously. Manning of the three stations would require about 18 additional hours per day flying time.<sup>54</sup>

ADC informed NORAD of this request, stating that it would not be able to provide the hours. But ADC stated that since Texas Tower # 2 was within the radar coverage of AEW&C station 2 and 4, that the shut-down of the tower could be compensated for by manning the two stations according to NORAD's minimum standards.<sup>55</sup>

NORAD had little choice. It directed CFECR to use ADC's solution and man stations 2 and 4 while the tower was inoperative.<sup>56</sup>

A change in the flying-hour program came in early December, however. In this month, NORAD informed the regions that the flying-hour restrictions previously imposed on AEW&C operations had been lifted through 31 December 1957.<sup>57</sup>

Actual operational activity of the two AEW&C wings during October and December is shown in the following table.<sup>58</sup>

AEW&C AIRCRAFT ON-STATION TIME							
STATION	OCTOBER 1957			STATION	DECEMBER 1957		
	SCHED	ACTUAL	EFFECTIVE		SCHED	ACTUAL	EFFECTIVE
2	343	366	351	2	744	730	717
4	720	715	669	4	744	738	734

STATION	SCHED	ACTUAL	EFFECTIVE	STATION	SCHED	ACTUAL	EFFECTIVE
6	389	380	365	6	437	419	413
8	0	0	0	8	446	415	413
10	0	0	0	10	24	16	16
552d WING							
1	0	0	0	1	0	0	0
3	0	0	0	3	0	0	0
5	0	0	0	5	596	586	572
7	627	577	565	7	744	738	720
9	616	606	593	9	744	716	697

Lighter-Than-Air. At mid-1957, COMAD Operations Plan 9-56 called for one lighter-than-air airship station to be manned off the East Coast by 1 July 1957. On the West Coast, the plan called for a station to be manned full time by 1 July 1959. The Navy was to do this with one lighter-than-air squadron on each coast, each equipped with four blimps.

On 1 July 1957, the first Navy airship squadron was declared operationally ready and assumed an air defense commitment in the middle of the line. The squadron -- Airship Airborne Early Warning Squadron One (ZW-1) -- operated from Lakehurst NAS, New Jersey. Its airships (ZPG-2W's) manned station six from 1 July through 24 July on alternate days in conjunction with ADC's 551st Wing.

ADC had objected to this employment plan. Station six, it contended, was a number two priority station in the East Coast system and should be manned continuously. Coverage of the station could best be provided by AEW&C aircraft of the 551st Wing. ADC proposed that ZW-1 move from Lakehurst to Weeksville NAS, North Carolina, and from that base cover station ten.

In August 1957, COMNAVFORCONAD told ADC that its plans had been rejected. The CNO had informed him that Elizabeth City NAF, North Carolina, was being decommissioned on 1 October 1957. Lakehurst was considered the only station from which it would be practical to operate ZW-1. Station ten, the CNO continued, was some 360 miles from Lakehurst and about 430 miles from another station at Glynco NAS, Georgia. The transit time made it impractical to even attempt manning station ten. Also, manning station ten would place the airships in an area where there was no readily accessible alternate station in case of an

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emergency or bad weather. Thus, the CNO believed that ZW-1 would be most effectively used on stations six or eight.<sup>59</sup>

The matter settled, ADC continued to use ZW-1 to man station six off the East Coast. The ZPG-2W's manned the station on every odd numbered day of the month.<sup>60</sup>

In regard to West Coast operations, NAVFORCONAD informed CINCONAD that the CNO did not plan to establish an LTA station nor to commission a ZW squadron. Plans at year's end called for only six ZPG-2W/3W airships in the contiguous system. These were to be assigned to ZW-1 for operations on the East Coast.<sup>61</sup>

The Picket Ship Force. On 31 December, the manning of picket ship stations remained unchanged from the mid-1957 level. Five picket ship stations were being manned around-the-clock off both coasts of the United States.<sup>62</sup>

CONAD plans at mid-year called for 19 picket ship stations. A reduced budget had forced the Navy to fix surface vessel operations at a level of five stations off each coast, however. This force level was reflected in CONAD's OPLAN 9-57. Realignment of the force was anticipated if the tests in CFECR proved successful.<sup>63</sup>

At mid-1957, the communications network for picket ship operations had been unreliable. The problems were low power output of the picket ships and poor frequencies that suffered from interference. It had been proposed that the Navy take over operation of ship-to-shore communications. The picket ships would broadcast to Naval radio stations on shore and they would transmit by teletype to the ADC direction centers.<sup>64</sup> But in August, the Navy said it was unable to support the shore station requirement.<sup>65</sup>

To correct the situation, the JCS informed CONAD that USAF would provide the shore terminals for the Direction Center-Picket Vessel Communications. The Navy would provide the required shipborne terminals. CONAD directed ADC to proceed with programming action for the facilities.<sup>66</sup>

Texas Towers. The final element of the contiguous system was the off-shore radar platforms called Texas Towers. At the end of December 1957, only one of the three towers programmed for the system was operational. This tower, designated number Two, was on Georges Bank located approximately 100 miles east of Cape Cod.<sup>67</sup> The tower at mid-

year had been on "limited" operations. In October, it lost even this status while workmen installed newer electronic components.<sup>68</sup> On 31 December, the tower was considered to be at a "sustained" level, with full operation set for February 1958.<sup>69</sup>

The other two towers in the program remained inoperative. Tower Three, scheduled for Nantucket Shoals, 100 miles south-east of Rhode Island, was expected to start operations in March 1958.<sup>70</sup> The remaining tower, designated number Four, was being built on an unnamed shoal about 80 miles southeast of New York City. The beneficial occupancy date of this tower occurred in December 1957. It was to become operational in June 1958.<sup>71</sup>

#### DISTANT EARLY WARNING LINE

At mid-1957, the land-based section of the DEW Line running from Cape Dyer, Baffin Island, generally within about two degrees of the 69th parallel, to Cape Lisburne, Alaska, was in what was best described as a semi-operational status. But in October 1957, the U. S. Service Report to the PJED described the stations along the Line as "fully operational."<sup>72</sup>

The interpretation of "fully operational" was subject to much debate, however. The contractors' work on the line was finished by the end of July 1957. And the Air Force held its formal dedication of the line in August. But the line was not capable of performing its assigned mission and was not expected to attain that capability for months to come.<sup>73</sup>

In the First Phase Employment and Suitability Test (F&ST) conducted by APCC in June and July, it was found that facilities on the line itself (i.e., radar and lateral communications equipment) were satisfactory. But both the test and subsequent operations revealed deficiencies in the performance of the rearward communications circuits to existing NORAD communications facilities.<sup>74</sup> Also, it was discovered that the various agencies associated with DEW Line operations were not clear as to their responsibilities. In fact, in October 1957, NORAD communication officials considered the organizational and rearward communications problems of such magnitude that they could not consider the DEW Line project completed.<sup>75</sup>

The DEW Line Project Officer in ADC held a view similar to that of NORAD. The line, he felt, could be considered fully operational, but

[REDACTED]

there was no way to actually tell if it would perform its mission until planned tests of the line were made and procedures for operations on the line had been disseminated and used.<sup>76</sup> Thus, as of December 1957, the line was being described as "fully operational" subject to the reservations outlined above.<sup>77</sup>

Testing. A two-phase DEW test program had been established for the line in March 1957. Phase I of the test had been carried out as planned in June and July 1957.<sup>78</sup> Phase II had had to be postponed, however, because of numerous operational limitations. Most of the discrepancies had been corrected by year's end, and Phase II was rescheduled for 1 April 1958.<sup>79</sup>

Operational Procedures. In May 1957, CONAD had found itself in opposition to the Early Warning Operations Working Group on the identification system to be used on the line. The matter was submitted to the JCS for resolution and CONAD received approval to use its flight plan procedure. CONAD procedures required a ground-filed flight plan and compulsory reporting by all inbound aircraft to the DEW stations. Time and distance tolerances for aircraft penetrating the DEWIZ were plus or minus one hour and 100 nautical miles from the estimated time and point of penetration.<sup>80</sup>

The question of identification procedures having been temporarily resolved, it was still necessary to publish and disseminate DEWIZ information to all operating agencies in order to implement the system. At mid-year, the CAA and DOT had been expected to publish the needed information in September 1957.

The September deadline was not met, however. It was late in December before the DOT furnished the information and it was anticipated that dissemination would be completed about 1 February 1958.<sup>81</sup> Also, some question remained as to whether a standardized identification zone to include Alaska could be adopted. At the end of 1957, all action to establish a standardized zone was being held in abeyance pending the completion of a study by CUSSAT.<sup>82</sup>

Communications. As has been noted above, the unreliability of the communications facilities on the line was becoming one of the major problem areas in DEW Line operations. It occupied most of the agenda at an EWONG meeting in November 1957.

One of the first matters brought to the attention of the Group was a NORAD proposal to improve DEW Line communications. The NORAD

[REDACTED]

representatives pointed out that to meet current operational concepts the line had to: (1) provide a high-quality data flow to the NORAD COC; (2) meet a S/C requirement to permit contact with SAC aircraft at the line via voice circuitry; and (3) permit ICEM warning data to be relayed over its circuits at a faster rate than presently possible. To accomplish these objectives would require altering the current BC<sup>1</sup> Line operational concept and making several improvements beyond the communications requirements outlined in the current operations plan.<sup>33</sup>

The group could not reach a position regarding many of the communications proposals. The changes as outlined by NORAD could not be considered unless a change in the operations concept of the line were made. The chairman of the Group stated that a change was anticipated; however, the Group agreed that meeting the NORAD proposals required actions beyond their "Terms of Reference." It was decided that NORAD should submit its proposals to the executive agent.

The need for improving the rearward circuits was not considered beyond the Groups' "Terms." In the course of the meeting, the NORAD representatives pointed out that many times, data received at the NORAD COC had been unreliable and at times even unusable. And on two separate occasions, the COC had lost contact with the line for long periods. Lieutenant Colonel D. G. Roth, speaking for NORAD, stated that the condition resulted from unsatisfactory rearward circuitry. The condition could be remedied, he continued, by installing "repeat-back" equipment on the DEW ionospheric rearward telling circuits -- duplexing the radio portions of the circuits. As an added measure, NORAD wanted a central communications control point established at Dawson Creek.<sup>34</sup>

Many of the representatives present did not feel as did NORAD that the problem lay in the circuits. It was pointed out that the rearward links from Main to Base stations had already met a 98 per cent reliability test which was USAF-contracted. The problem, many felt, was the lack of a detailed operations manual to provide systematic control over and standardized procedures for the entire line. Some 16 companies were concerned with the operations between Colorado Springs and the Main stations, the Group pointed out, and all that was needed was cooperation and development of standard line checks and maintenance procedures.

An example of the problem presented by the rearward circuits was the Barter Island-Anchorage (BAR-AGEX) rearward EPIS circuit. In the entire period, this circuit never reached peak operational efficiency.<sup>35</sup>



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CINCNOAD brought the matter before the JCS and asked that the DEWFO expedite action to bring the circuit up to a satisfactory operational capability. The problem was laid before the DEWFO in mid-November.<sup>86</sup>

The circuit was still unsatisfactory in December, however. CINCAL received NORAD support to reinstall a VHF frequency capability at Barter and AGEX as a back-up for the FPIS system.<sup>87</sup> In January, the JCS agreed to the proposal and informed CINCNOAD that a high-frequency back-up to the BAR-AGEX rearward circuit could be installed subject to certain restrictions. Installation of the circuit was to be held in abeyance, however, until it was determined that CINCAL and COMMAC had resources available for the project.<sup>88</sup>

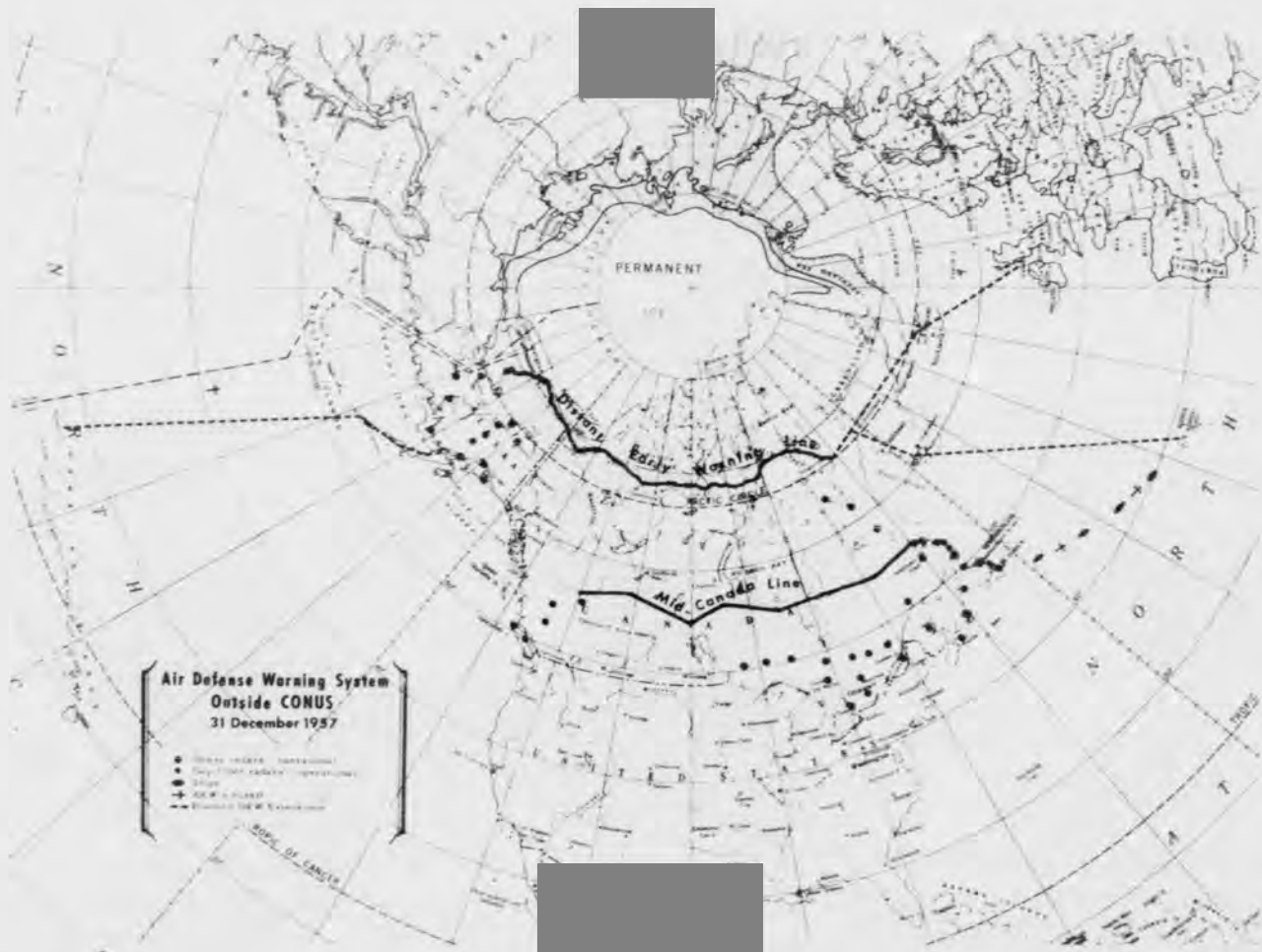
While CINCNOAD supported the emergency installation of the VHF back-up in Alaska, his staff was studying the overall communications needs to support the NORAD mission. The study was completed and forwarded to the JCS in December 1957. It contained seven recommendations to improve the military communications network: (1) improvement of White Alice to DEW communications; (2) augmentation of Alaskan long-line communications; (3) construction of alternate facilities to the Aleutian extension of the DEW Line (Project STRETCH OUT); (4) establishment of a communications monitor and control point in the Dawson Creek area; (5) installation of repeat-back equipment to DEW rearward telling circuits; (6) improvement of POLE VAULT communications to DEW communications; and (7) support of a proposed FOX-CHURCHILL tropospheric system from the DEW to MCL.<sup>89</sup>

Change in Operational Control. The USAF-ROCAF DEW Operations Plan of 1 June 1956 split operational control of the line between AAC and NEAC. Changes in the U.S. air defense organizations and responsibilities had caused ADC to assume, through the 6th Air Division, operational control of those parts of the line formerly assigned to NEAC.

At the meeting of the EMOWG discussed above, the Group proposed that operational control of the line be assigned to USAF ADC. AAC and CINCAL representatives objected and Lieutenant Colonel Luther W. Hough, Jr., Chairman of the Group, stated that he thought NORAD should be given the operational control.<sup>90</sup>

However, on 17 January 1958, USAF told ADC that the EMOWG recommendation had been accepted and that responsibility for operational control of the Cape Lisburne-Cape Dyer segment was assigned to it (which excluded AAC from operational control of the western segment).

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ADC was to assume this responsibility on 15 February 1958. Also, USAF assigned ADC WEO contract administration for this portion of the line effective the same date.

#### SEA BARRIERS

Eastern Extension and the Atlantic Barrier. At mid-1957, plans for extending the DEW system in the Atlantic called for two barrier locations. The first 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 a point to be selected in Scotland. This line, often referred to as the G-I-UK extension, was the responsibility of the USAF and the Navy. USAF was responsible for building the land-based portion of the line running from Cape Dyer across Greenland to Iceland. The Navy was to extend the line from Iceland to the UK. The second barrier was a Navy-sponsored sea segment running from Cape Farewell, Greenland, to the Azores.<sup>32</sup>

At mid-year, plans for the Greenland portion called for four stations extending from Holsteinsborg, Greenland, across the ice-cap to Ikateq, with a fifth station on Kangek Island. The Kangek station was to provide a link with the Azores barrier but not the DEW line. The station at Ikateq was to connect with one of four Icelandic stations and would link with the DEW system. All stations were to be equipped with the AN/FPS-30 as a primary search radar; the AN/FRC-47 tropo equipment was to be used for over-water links; and AN/FRC-39 tropo equipment was to be employed for the icecap links. Completion of site surveys was set for September 1957, with early 1958 expected to be the earliest date construction could be started.

By the end of 1957, planning for the extension had run into two snags, however. The first involved siting. Both coastal stations had been surveyed as scheduled by the 64th Air Division. The September deadline for the icecap stations could not be met, however. On-the-ground surveys of both locations had to be postponed until the spring of 1958 because of inclement weather conditions. This left all planning for the two icecap locations to be accomplished from flight surveys.<sup>33</sup>

The second snag involved funding the stations. In October, USAF informed ADC that only a two-station increment of the five-station complex could be funded in FY-1958. Planning for the stations would have to be based, USAF continued, on one of two alternatives: procur-

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ing a two-station increment in FY-1960, with the balance in FY-1959 and installation to be completed in FY-1960 and 61, or procuring a minimum of equipment in FY-1958, the balance in FY-1959 and installation at all five stations during 1961.<sup>94</sup> With NORAD approval, ADC informed USAF that it had decided to proceed with the installation of equipment at two of the stations in FY-1958 and complete the remaining three as funds became available. Plans as of December 1957 called for construction of the coastal radars in the spring of 1958 and the radars to become operational by 1960.<sup>95</sup>

With respect to the remaining radars in the G-I-UK line, three of the four radar stations in Iceland had become operational by year's end, and H-4 at Straumnes was scheduled for operations in the near future. All four of these stations were to tie into the DEW line.<sup>96</sup> A NATO radar, planned by SACEUR in the Faeroes, had been sited and funds released for its construction. This station was scheduled to become operational in December 1958 and was to link NATO and the distant early warning system.<sup>97</sup> In addition, plans were being made by England for a radar station in the Shetland Islands to provide continuous coverage between the DEW system and the European SHAPE system.<sup>98</sup>

The Navy sea extension to the Azores had begun full operations on 1 July 1957. On that date, a full barrier, operated continuously, was established between Argentia, Newfoundland, and the Azores with four DER's and four AEW aircraft. No changes were made in the line until mid-August. In this latter month, a shortage of operating funds forced the Navy to reduce the number of aircraft on barrier patrol from four to two.<sup>99</sup>

A shortage of money and of stations was also responsible for a general reduction of the planned barrier force. The Navy had anticipated keeping three AEW squadrons (29 WV-2 aircraft) available for each barrier. In the Atlantic, two squadrons were to operate from Argentia and one squadron from Lajes Field in the Azores. Difficulties encountered in base rights negotiations with the Portuguese Government had by the end of the year voided this plan. In keeping with the limitations imposed by AEW aircraft facilities, budgetary deficiencies, and personnel ceilings, the Navy received JCS permission to cut its planned barrier force by two squadrons -- one each in the Atlantic and the Pacific. This would leave an operational force in each ocean of 24 WV-2's. For the Atlantic barrier, one squadron was being maintained on station at Argentia, rotating with one at Pautuxent River, Maryland, until housing facilities at Argentia for both squadrons could be completed.<sup>100</sup>

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Western Extension and the Pacific Barrier. The JCS-approved Pacific extension was a line running from Naknek to Umanak by land-based radar and then by sea to Midway. The land segment was scheduled to begin limited operation in January 1959, and full operation by March 1959. The sea barrier deadline was 1 July 1958.

At year's end, the Aleutian land-based segment called for a total of six stations stretching between King Salmon on the east and Nikolski on the west. Construction contracts for the project, codenamed STRETCH OUT, had been awarded in March 1957, and by August, construction was in progress at all six stations.<sup>101</sup> The status of the sites as of 31 August was as shown below.<sup>102</sup>

STATION	% COMPLETED
Driftwood Bay	12
Sarichef	20
Nikolski	17
Port Moller	26
Cold Bay	20
Port Heiden	30

Limited funds for the project and construction problems at Driftwood Bay and Sarichef threatened the operational deadline of 31 March 1959, however. A closely related problem was the lack of a contract for building a communication terminal at King Salmon. The latter site was needed for aligning and testing the remaining stations. Western Electric Company, the electronic system designer, felt that unless this station were completed by June 1958, the entire project would be delayed.

Another of the communications problems facing the planners of STRETCH OUT was that of providing alternate facilities. The communications specification called for extending the WHITE ALICE system (the relay improvement project in Alaska) by lateral tropospheric scatter from King Salmon along the Aleutians to about Umanak. The project did not include an alternate return to the Alaskan mainland in case an island segment failed, however. In essence, this meant that a failure along the island chain would cost CINCONAD early warning data west of the point of failure. An alternate would insure receipt of early warning data regardless of the operational status of STRETCH OUT communications.<sup>103</sup>

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Since NORAD felt that the STRETCH OUT communications extension was subject to more hazards (i.e., earthquakes, land slides, etc.) than other stations in the WHITE ALICE system, it recommended to the JCS in December that an ionospheric scatter radio system be provided from the Western terminus to the mainland. It was anticipated that this would cost close to four million dollars. NORAD also proposed that the JCS-directed Navy FPIS facility at Adak be coordinated with that of STRETCH OUT, satisfying the requirement for alternate communications.<sup>104</sup>

One problem existing at mid-year had been solved. In March 1957, USAF had informed CINCOMAD that the Aleutian segment operational date had slipped from September 1958 to March 1959. COMAD had objected to the new deadline because of the serious gap which would exist for about eight months between it and the date set for operation of the sea barrier -- July 1958.

In the following six months, several solutions were offered to the problem. The one given most consideration was that of adjusting the sea barrier so that it would cover the exposed area. Ultimately that was the solution agreed upon. In January 1958, the CNO agreed to shift the barrier line and cover the exposed flank from 1 July 1958 until the Aleutian segment became operational. When the land-based radars became operational, it was proposed to shift the line back between Midway and Umnak.<sup>105</sup>

The sea extension between Midway and Umnak had begun limited operations on 1 July 1957, when a partial barrier was established by CINCPACFLT for training purposes. At the end of 1957, the barrier was still in a training status. A progressive build-up to full operations was planned for 1 July 1958, when 15 DER's and 25 WV-2 (AEW) aircraft were scheduled to start operations.<sup>106</sup>

#### MID-CANADA LINE

On 1 January 1958, the Mid-Canada Line (MCL) became fully operational. Originally, the line had been scheduled to begin operating on 1 January 1957. This date was changed at mid-year to 1 October 1957.<sup>107</sup>

Neither deadline was met, however. The Doppler detection (flutter) radar equipment was not working properly, making sustained operations impossible. Thus, on 1 January none of the eight doppler

sections were operational. Six months later four of the eight sections were considered to be on limited operations although their capability was only marginally satisfactory. On 1 October, the four sections were still the only ones operational.<sup>108</sup>

On 31 October, all eight sections had reached a limited operational status. The dates that these sections started limited 24-hour operations are shown on the following table.<sup>109</sup>

SECTION	OPERATIONAL DATE
Dawson Creek	1 May 1957
Stoney Mountain	3 June 1957
Cranberry Portage	24 May 1957
Bird	21 June 1957
Winisk	2 October 1957
Great Whale River	24 October 1957
Knob Lake	31 October 1957
Hopedale	31 October 1957

In the two months that followed, the difficulties with the radar equipment had been sufficiently corrected so that the entire line was declared fully operational on 1 January.<sup>110</sup>

## Chapter V

# Status of Combat Weapons June 1957 - December 1957

### REGULAR FIGHTER-INTERCEPTOR FORCES

At the end of 1957, there were 86 regular fighter-interceptor squadrons under the operational control of CONAD/NORAD, an increase of nine over the 77 present at mid-year. This numerical increase resulted from the integration of the RCAF ADC with CONAD. This increase was more apparent than real, however.

Twelve of the 86 squadrons were either due for inactivation in FY-1958 or merely "paper" squadrons without aircraft and/or crews, leaving a total of 74 squadrons with which to meet an attack on the North American continent. At mid-year, the force total had included only two "paper" squadrons, leaving 75 squadrons available for combat operations. In reality then, NORAD had one less operational squadron at year's end than at mid-year.

The 86 squadrons were owned by three commands: the USAF Air Defense Command (including the continental U.S. and the 64th Air Division in the Northeast Area), the Royal Canadian Defence Command, and the Alaskan Air Command.

### USAF ADC INTERCEPTORS

Seventy-four of the 86 fighter squadrons -- including three stationed outside the U.S. with the 64th Air Division (Defense) -- were owned by ADC. This figure represented a net increase of three squadrons from mid-year due to the transfer to ADC of five Alaskan squadrons (the 64th, 65th, 66th, 18th and 433d) and the transfer to Alaska of two ADC squadrons (the 317th and 31st).<sup>1</sup>

Of the 74 squadrons, seven were scheduled for inactivation in the

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\* For a complete list of the USAF/ADC interceptor force see Appendix III.





third and fourth quarter of FY-1958, which would reduce the force to 67 squadrons.\* Further lowering the combat potential were those squadrons that were either unmanned or unequipped. At mid-year two squadrons -- the 484th and 518th -- were without aircraft or crews. At year's end, these two had been joined by the 65th, 66th, and 433d, making a total of five squadrons unmanned and/or unequipped. Eliminating those to be inactivated in the immediate future, ADC had only 64 squadrons with an air defense mission.<sup>2</sup>

ADC INTERCEPTOR FORCE		
TYPE AIRCRAFT	SQUADRONS	
	JUNE 1957	DECEMBER 1957
F-86D	13	1
F-86L	10	25
F-89D	5**	3**
F-89H	4	4
F-89J	1	8**
F-94C	5	2
F-102A	13	17**
F-86D/L	11	0
F-86D/F-102A	0	1
F-89D/F-102A	1	0
F-89H/J	5	2
F-94C/F-102A	1	1
TOTAL	63	64
Sqns no acft	2	10
OVERALL TOTAL	71	74

\* Inactivating in January 1958 were the 96th and 97th at Newcastle, the 354th and 469th at McGhee-Tyson, the 432d at Minneapolis-St. Paul, and the 63d at O'Hare. The 42d at Greater Pittsburg was to reduce to "paper" status in January and move to Stewart AFB where it would remain until July. In this latter month, it too would inactivate.

\*\* Includes the squadrons of the Northeast Area.

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As the above table indicates, the ADC squadrons at mid-year were in the midst of extensive conversion and modification programs. By 31 December 1957, many of these programs had been practically completed, giving the force improved or new fighting machines. The ratio of crews and aircraft over mid-1957 showed only slight improvement, however, due to the reduction of several squadrons to record status -- pending their inactivation -- to absorb a shortage of Operations and Maintenance funds.<sup>3</sup> At mid-year, 1,501 mission aircraft were assigned to ADC, with 830 (55%) operationally ready. To man this fleet, 2,112 crews were assigned of which 1,124 (56%) were operationally ready.<sup>4</sup> As of 31 December 1957, these totals had reached the following proportions: 1,446 aircraft assigned -- a loss of 55 planes -- with 847 (59%) ready; 1,844 crews assigned (a loss of 268) and 1,000 (54%) ready.<sup>5</sup> The year-end total represented a ratio of 1.18 operational crews per operational aircraft, a figure that was to go even lower so as to meet the 1-to-1 ratio set by USAF for the end of FY-1958.<sup>6</sup>

The added combat potential expected from the conversion and modification program was somewhat less than anticipated, also. The introduction of the F-102, F-89J, F-89H, and F-86L to replace the F-86D, F-94C and F-89D promised to give CONAD a much greater defensive capability. But this potential lagged.<sup>7</sup>

The phasing in of new aircraft had increased F-102A squadrons from 13 to 17 by year's end. However, of the 405 F-102A's in ADC, only 191 (47%) were operationally ready. Even more serious was the problem of untrained crews for this aircraft. Only 94 (18%) of the 509 crews assigned had reached a combat ready status at the end of December.<sup>8</sup>

The number of F-89J squadrons had by 3 January 1958 risen to eight. This was significant because the "J" was designed to fire the MB-1 rocket whose atomic warhead provided ADC with its only nuclear capability. One hundred fifty-eight "J's" out of 242 assigned were operationally ready; the crew figures were 151 ready out of 270 assigned.<sup>9</sup>

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The "J" had serious performance limitations, however. Writing to General Thomas D. White, USAF Chief of Staff, General Partridge pointed out that the F-89J was barely able to cope with the current subsonic bomber threat. "It will be hopelessly inadequate," he continued, "to meet the supersonic air breathing threat of tomorrow."<sup>11</sup> General Partridge strongly urged the modification of the F-102 to

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carry the MB-1, stating that he and the ADC Commander were convinced that the capability had to be provided without delay. Both of them had decided to make "most any concession" to achieve that capability.<sup>12</sup>

USAF would not approve the F-102A/MB-1 combination, however. But USAF did state that it might be possible to equip the aircraft with nuclear Falcons.<sup>13</sup>

General Partridge then proposed substitution of the nuclear GAR-1Y Falcon missile for the MB-1. The missile impressed him as providing the only practical means for giving the F-102A an atomic capability at an early date and at minimum cost. He further urged the GAR-1Y for the F-101 and the GAR-3Y for the F-106, stating that these nuclear missiles could be in the air defense inventory by mid-1960, providing early approval was given by USAF.<sup>14</sup>

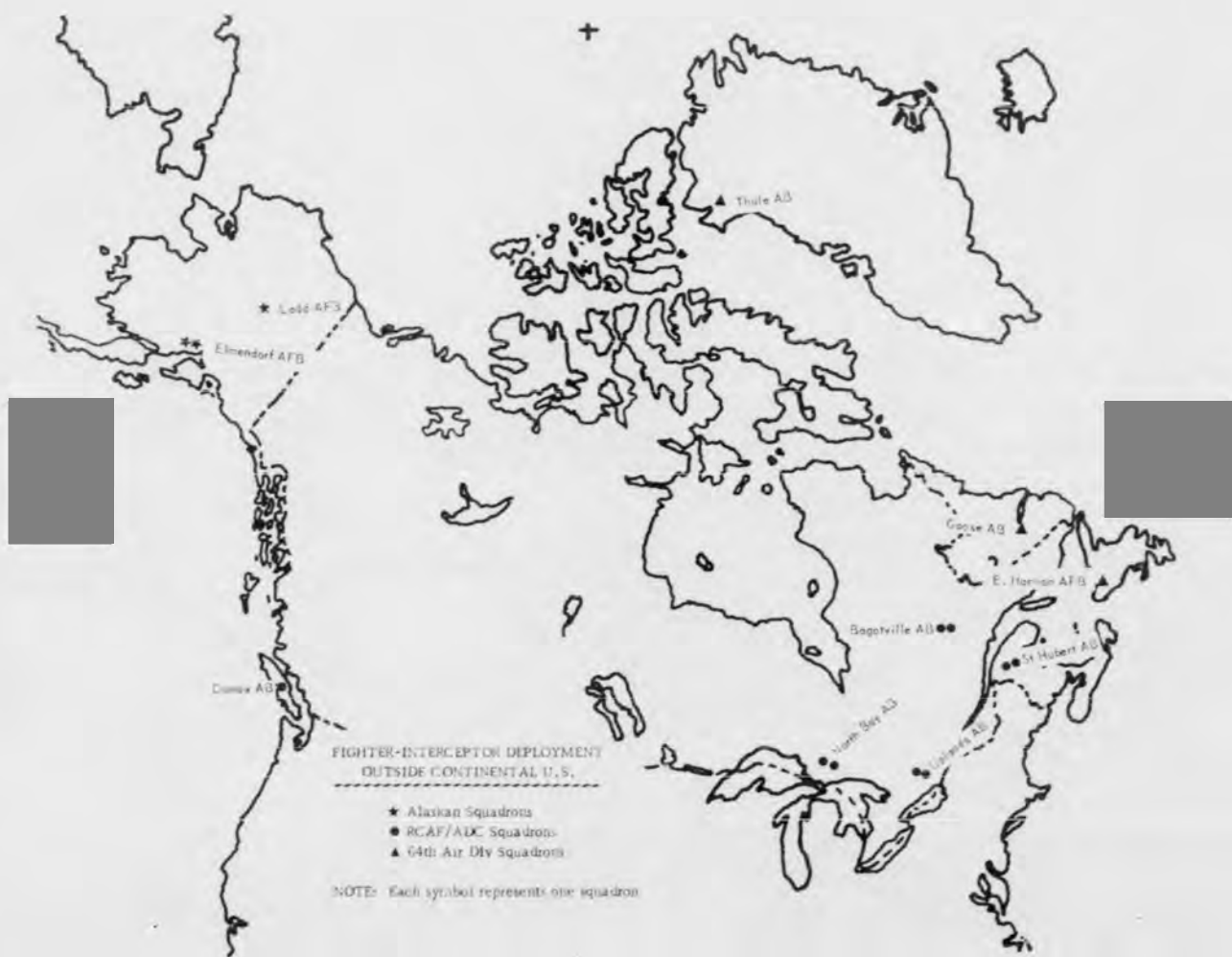
The Northeast Area (64th Air Division). At mid-year, the three squadrons in the Northeast Area were equipped with F-89D's. These 15 squadrons were located at Goose (59th), Harmon (61st) and Thule (74th). By 31 December, the squadron at Goose had converted to F-89J's, and the Harmon squadron had been replaced by an F-102A unit from the 21.

At Thule, ADC had encountered opposition from Strategic Air Command (SAC) which had jurisdiction over that base to its requirement for an interceptor squadron there. By year's end, a compromise had been reached. This arrangement placed a half-squadron of F-89D's at the Greenland base. The "D's" were to be replaced by F-102A's in the spring of 1958. In all, the 64th Air Division had 65 aircraft assigned, of which 46 were operationally ready. To man the planes there were 62 crews assigned, with 43 ready.<sup>15</sup>

#### ALASKAN AIR COMMAND

In June 1957, the interceptor program for the Alaskan theater had been in a state of flux. CINCAL had recommended that AAC's six F-89D squadrons be replaced by two F-102A squadrons, the level at which he considered that Alaska could best support the defense effort. However, CINCONAD had recommended that a third squadron employing F-89J's be kept since construction of MB-1 facilities had already been started at Ladd AFB.<sup>17</sup>

CINCONAD's recommendation was followed. The 449th FIS, equipped with F-89J's was left at Ladd. The five "D" squadrons redeployed to



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the continental U.S. and two F-102A squadrons came in. The following table shows the number and location of the AAC interceptor units as of 1 November.<sup>19</sup>

SQUADRON	LOCATION	TYPE AIRCRAFT
317	Elmendorf	F-102A
31	Elmendorf	F-102A
449	Ladd	F-89J

To maintain its air defense posture in Alaska, AAC planned to keep four F-89J's at Galena Airport, an advanced base, on a year-round basis. Six F-102A's from Elmendorf were to be placed at King Salmon Airport, another advanced base, during the winter and possibly summer months depending upon runway conditions at this field.<sup>19</sup>

However, the runway at the latter base was not usable the year around. General Fartridge pointed this out to General White, stating that the runway would not withstand continued operations unless it was frozen. This meant that six to eight months of the year the F-102A's had to be withdrawn to Elmendorf. Without the base, he continued, AAC had limited area defense and no identification-intercept capability for the Aleutian segment to the DEW Line. Furthermore, he pointed out that without the base, the GCI stations at King Salmon and Bethel would be in limited use during the summer months. He urged that the base be made a year-round facility by the expenditure of a "relatively modest amount of money" to improve the runway.<sup>20</sup>

#### RCAF AIR DEFENCE COMMAND

The Canadian ADC had nine squadrons at five bases across Canada, each with 20 aircraft. Two of these aircraft in each case were CF-100 MK3D's, comparable in performance characteristics to the U.S. F-89D. The other 18 were CF-100 MK5's, a more advanced aircraft whose characteristics were roughly between those of the F-89D and F-102A. In all, the RCAF ADC possessed 18 MK3D's and 162 MK5's, for a total of 180 fighter-interceptor aircraft, in October 1957.<sup>21</sup>

\* For a list of the Canadian interceptor squadrons and their locations see Appendix IV.

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### AUGMENTATION FORCES

USAF Augmentation. The figures for USAF augmentation forces rose from 593 at mid-year to 1,569 at year's end. These figures did not reflect actual growth of such extent, however. The July 1957 totals included only the 468 augmentation aircraft of TAC (all of which were to be used in-place) and the 90<sup>1</sup> fighters of Air Training Command (ATC) that were scheduled for deployment in an emergency. The January 1958 computations included also the 635 ATC planes scheduled to be employed "in-place." Only 176 of ATC's fighters were scheduled for deployment at year's end. TAC augmentation forces, still planned to be used at their home bases, had risen to 753 aircraft.<sup>22</sup>

Air Force Reserve. The eight Air Force Reserve squadrons previously slated for an air defense role had dropped from the picture with the inactivation of the Reserve augmentation program.<sup>23</sup>


Navy Augmentation. The mid-year figures for Naval augmentation showed 2,112 Navy and Marine fighter aircraft. The total for 15 January 1958 was 1,246. The difference between the two figures was more apparent than real, however. The former represented the total U.S. shore-based Navy and Marine jet aircraft, while the latter figure represented the number actually available. It did not include such aircraft as those aboard carriers and research and development aircraft.

The 1,246 Navy and Marine planes were grouped into three categories: 772 Fleet aircraft; 238 Training aircraft; and 236 Reserve Training aircraft.<sup>24</sup>

Air National Guard. The Air National Guard (ANG) augmentation force was comparatively stable during the period, standing at 1,247 aircraft on 1 July 1957, and 1,227 on 9 January 1958. All these planes were scheduled to be employed "in place."

The ANG combat capability had suffered, however, due to the major conversion program begun during this period. The principal conversions, designed to create all-weather capability, were the phasing-out of F-94A/B's, F-84F's, and F-86A/E/F's, and their replacement by F-86D's, L's, and H's. It was estimated that one year would be required for each squadron to become operationally ready following conversion.<sup>25</sup>

RCAF ADC Augmentation. In addition to the nine RCAF all-weather



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fighter squadrons mentioned above, the following Canadian forces would be available for use in case of an attack. The training stations of Chatham and Cold Lake were to each provide fighter forces equivalent to one squadron. Chatham was to provide at least 12 Sabre aircraft on D-Day. All the forces at this base would be employed "in-place." Cold Lake was to supply all available CF-100 aircraft of the Third All-Weather (F) Operational Training Unit and of the Weapons Practice Unit. These planes were to be deployed in accordance with the orders of the AOC, RCAF DC.

In addition, the Royal Canadian Navy (RCN) expected to provide a maximum of eight Banshee aircraft on a "when available" basis. Two of these could be counted on for action on D-Day. All were to come from the Atlantic Fleet and were to be under the operational control of the Commander of the 8nd (Canadian) Air Defense Control Center at St. Margaret's.<sup>26</sup>

#### ANTI-AIRCRAFT WEAPONS STATUS: CONTINENTAL UNITED STATES

The U.S. Army Air Defense Command goal for FY-1957 had been to obtain 61 on-site Nike Ajax battalions. This goal had been met on schedule. In June 1957, the last of the programmed batteries was on site. As of 30 June 1957, USARADCOM had 58 battalions (244 fire units) on site, in fire power the equivalent of 61 battalions.<sup>27</sup> On 31 December 1957, the status of the Nike missile units remained the same -- 58 battalions programmed and assigned. And the Nike program for FY-1958 called for but a single change in the force structure.<sup>28</sup>

USARADCOM's goal for FY-1958 was unchanged in so far as the number of battalions was concerned. However, it was planned to convert the equivalent of one battalion from the Nike Ajax (a missile designed to carry a conventional warhead) to the Nike Hercules in order to incorporate a capability to fire missiles carrying atomic warheads. The change was to be accomplished by converting one battery in each of four defense areas (New York, Washington-Baltimore, Chicago and Philadelphia) from the Ajax to the Hercules.<sup>29</sup>

In regard to gun and Skysweeper battalions, the Department of the Army decided to abolish the active on-site gun battalions of both the Regular Army and the National Guard. The Army's action resulted from cuts in its budget. By August, USARADCOM had been directed to prepare a plan inactivating all of its battalions by 30 June 1958.



The inactivation was to be carried out in two phases: the first would eliminate nine battalions by 31 December 1957; the second was to eliminate the remaining 11 battalions by 30 June 1958.<sup>30</sup>

Hardly had plans for carrying out the programmed reduction been completed when the Department of the Army accelerated its drive to reduce the active gun force. In September, USARADCOM advised that the Army had established a FY-1958 force structure of 58 Nike battalions for the U.S. and one 90mm battalion and two batteries of 75mm guns in Greenland. The Army directed USARADCOM to inactivate 17 gun battalions and one Skysweeper battalion by 30 December 1957. The remaining two CONUS 75mm battalions were to be transferred to CONARC at the same time.<sup>31</sup>

On 4 October 1957, thirteen 90mm and four 120mm gun battalions were relieved from their operational mission. The units were subsequently inactivated on 20 December 1957.<sup>32</sup> Three Skysweeper units (two at Savannah River sites and one at Sault Ste. Marie) kept their operational status past the December deadline. By the end of 1957, one of the Savannah River units had been relieved of its tactical mission, leaving but two Skysweeper units operational.<sup>33</sup>

National Guard Units. The Army's cutback in forces also had affected the National Guard on-site program. At mid-1957, 100 batteries of the Guard were on-site of the 101 programmed. Ninety had been designated to the Special Security Force (SSF) -- a force considered to be of such high skill that they could quickly move to on-site emergency positions and provide effective and sustained fire against an aggressor. In addition to the 25 Guard gun battalions in the on-site program, 32 National Guard (90mm) and 13 Skysweeper battalions had M-Day missions to augment and/or replace active Army gun units.<sup>34</sup>

With its own forces scheduled for inactivation, USARADCOM questioned the wisdom of keeping the Guard units. And in November 1957, it prepared a letter for the Army requesting that the on-site Guard program be abolished also. The missions of the Guard, USARADCOM wrote, were to provide replacements for the active Army gun units, to augment established defenses, or to establish new defenses. Since all CONUS Army gun units were to be inactivated the units would not be needed as replacements. USARADCOM also felt that the Guard units would not contribute sufficiently to the air defense effort to warrant expending the money and manpower needed to maintain them. Some units could be maintained, if suitably located, to provide organizational integrity until they could be converted to missile units, however.<sup>35</sup>

Before sending the letter to the Army, USARADCOM forwarded it to CONAD where it met with approval.

Even before the letter was forwarded, the Army had taken steps to eliminate the National Guard on-site gun program. On 8 October 1957, the 29 National Guard gun units then in existence were relieved from their on-site tactical missions. The units were placed in a training status from which it was anticipated some 22 battalions (68 batteries) would emerge by FY-1960 as Nike units. At year's end, three of the Guard units had been redesignated as Nike units and one had begun training for its future missile role.<sup>36</sup>

As a matter of record, most of the Guard units retained their designation in the Special Security Force since they would continue to keep a degree of mobility for some time to come. On 31 December, the total task organization of the National Guard numbered 82 gun battalions which held M-Day assignments (13 Skysweeper, 66 90mm, and three 120mm). Of the total, 12 Skysweeper, 63 90mm and the three 120mm retained a designation of Special Security Forces.<sup>37</sup>

Operational status of the active Army batteries in June and December 1957 is shown on the following table (both figures include Thule).<sup>38</sup>

JUNE 1957				DECEMBER 1957		
NIKE	GUN	SKYSWEEPER		NIKE	GUN	SKYSWEEPER
236	74	14	Av. No. Assigned	244	4	11
221	71	13	Av. No. On-Site	244	4	11

#### ANTI-AIRCRAFT WEAPONS STATUS ALASKA AND NORTHEAST AREA

At mid-year, the CONAD AA force structure outside the U.S. was three gun (90mm-120mm) battalions and two Skysweeper (75mm) battalions in Alaska and one gun battalion and two-thirds of a Skysweeper battalion at Thule. This structure corresponded to the CONAD FY-1957 program



requirements. However, at year's end, the same force reduction that had swept the COMUS gun battalions affected the Alaskan forces.<sup>39</sup>

In accordance with the Army plan to reduce the overall Alaskan strength, CINCAL and USARAL proposed to reduce the mid-year structure by 1,440 personnel (2,540-1,200), two Skyweeper and one 120mm battalion.<sup>40</sup> The proposal was subsequently submitted to CINCNORAD. Although the reduction brought the force level below that required by the COMAD FY-1958 program, it was approved in September.<sup>41</sup> In the interim, CINCAL authorized USARAL to relieve the 450th and 867th Skyweeper battalions at Eielson, Elmendorf and Ladd from all air defense missions preparatory to their inactivation in October 1957.\* The relief of the two 75mm battalions from active air defense operations was followed in October with that of the 93d AA Gun (120mm) battalion at Ladd in order for the latter to prepare for a February 1958 inactivation. On 31 December 1957, two gun (120mm) battalions were left for Alaskan AA defense.<sup>42</sup>

The force at Thule remained at the same level on 31 December as it had at mid-year. The number and location of the deployed units were as shown below.<sup>43</sup>

**ALASKA (DECEMBER 1957)			**NORTHEAST (DECEMBER 1957)		
UNITS	LOCATION	WEAPON	UNITS	LOCATION	WEAPON
96th Bn	Elmendorf (Ft. Richardson)	120mm	549th Bn	Thule	90mm
			428th Btry(L)	Thule	75mm(Sky)
			429th Btry(L)	Thule	75mm(Sky)
502d Bn	Ladd	120mm			

\* The main strength of the two battalions was at Elmendorf (867th) and Eielson (450th). One battery of the 450th was assigned to Ladd.

\*\* The antiaircraft units in the Northeast were under the jurisdiction of USARADCOM. Antiaircraft units in Alaska are assigned to U.S. Army, Alaska, a component command of Alaska Command.



## Chapter VI

### *Operational Requirements and Procedures*

#### ALERT REQUIREMENTS


USAF ADC Interceptors. By early 1957, the Interceptor squadrons of ADC were in the midst of a vast conversion and modification program designed to increase combat potential. The immediate results were, however, a shortage of aircraft that made it difficult for the squadrons to meet alert requirements, train crews, and fulfill proficiency requirements. Because of this, CONAD modified its alert requirements:

CONAD's new alert requirements were established by a regulation issued on 1 March and amended on 3 June 1957.<sup>2</sup> The regulation provided the CONAD Region commanders with an established set of alert minimums. Only those squadrons based near enough to an ADIZ to allow interception of ADIZ violators and under the scramble control of a direction center having an identification responsibility for an ADIZ were to be scheduled for alert. The region commanders were authorized to select the squadrons within this area for the alert force.<sup>3</sup>

Squadrons chosen to stand alert were to keep no less than two aircraft on five-minute alert, four on one-hour, and the remaining aircraft that could be operationally ready within three hours on three-hour or higher alert status. Commanders were to vary the alert pattern within the alert areas to keep duplication of ADIZ coverage to a minimum and to insure that a few squadrons in each area were not constantly on alert.

Squadrons outside the alert areas and those units within the area, but not assigned to the alert, were to get their requirements from the CONAD Region commanders. Any squadron could be designated for five-minute and one-hour duty as back-up aircraft or for training purposes. Aircraft at these bases, other than those on five-minute and one-hour alert, were expected to meet the three-hour reserve also.

CONAD Region commanders could also allow as many as 20 per cent of all three-hour reserves to be away on navigational flights, providing the alert commitments up to and including one-hour had been met.<sup>4</sup>



USAF MB-1 Alert. Special provisions for the employment of the MB-1 -- NORAD's new atomic missile -- were also established for the alert aircraft. From early March until late November 1957, aircraft armed with the MB-1 could be scrambled and employed against known hostile aircraft only. And the rockets could not be fired below 5,000 feet. On 27 November 1957, these restrictions were removed. The MB-1 could be flown in the U.S. during conditions of Air Defense Readiness or higher at the discretion of CONAD Division or higher commanders. The weapons were to be employed in accordance with the provisions of CONAD Regulation 55-6.

Over-flight of the Canada-U.S. border with MB-1's and the employment of MB-1's over Canada was not authorized except during periods of CONAD Air Defense Warning Yellow or Red. The CONAD commanders were still cautioned, however, against using the weapons below 5,000 feet to minimize damage and hazard to ground installations and personnel.<sup>5</sup>

Augmentation Aircraft. Air National Guard fighter-interceptor squadrons on active air defense operations were to keep two planes on five-minute alert 14 hours per 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.

At the end of 1957, 19 ANG squadrons were standing alert, the same number as at mid-year. An Air Force Reserve unit at Memphis, Tennessee, the 319th Fighter-Bomber Wing, had been dropped from the alert schedule, however.<sup>6</sup>

Two additional units, not covered by the CONAD regulation, standing alert were a Navy unit at San Diego and an Air Training Command unit at Perrin AFB, Texas. Both kept two aircraft on five-minute alert around-the-clock.<sup>7</sup>

USARADCOM Missiles. The operational readiness requirements for ARADCOM units were also established by CONAD Regulation 55-8 and supplemented by ARADCOM Operations Directive number 6. As of December 1957, the ARADCOM requirements were as follows.<sup>8</sup>

NIKE FIRE UNITS	*90/120mm FIRE UNITS	*7mm FIRE UNITS
<p>25% on 15-minute alert at Loring, Boston-Providence, Hartford-Bridgeport, New York, Philadelphia, Washington-Baltimore, Norfolk, Fairchild, Hanford, Seattle, San Francisco, Travis and Los Angeles.</p> <p>20% on 30-minute alert at: Niagara-Buffalo, Pittsburgh, Cleveland, Detroit, Chicago, Milwaukee, and Ellsworth.</p> <p>Remaining operational within three hours.</p>	<p>2% within 30 minutes. Remaining operational within three hours.</p>	<p>33 1/3 within 30 minutes. Remaining operational within three hours.</p> <p>*All gun units were inactivated.</p>

USAF ACW Squadrons. ACW squadrons, with the exception of those on limited operational status, were to maintain continuous radar surveillance and control capability in accordance with the region commanders' directives. Squadrons on limited operational status were to operate at least eight hours per day: during a four-hour period beginning two hours before sunrise and a four-hour period starting two hours before sunset, provided they were directly supporting or augmenting perimeter radars.<sup>9</sup>

RCAF ADC Interceptors. Although the RCAF ADC had come under the operational control of CINCNORAD in September 1957, its units continued to operate under requirements established in July 1957 by the AOC RCAF ADC. NORAD rules were expected to be issued in early 1958, however, that would cover Canadian forces.

Alert requirements for a seven-station complex were issued in RCAF ADC Operations Plan 2/57. At the four two-squadron bases (St. Hubert, Bagotville, Uplands, and North Bay), the normal alert was that 2 1/2 hours per day there be two CF-100's on 15-minute readiness, four on 30-minute, and four on one-hour. At Comox, a single-squadron base, the requirements were for one aircraft on 15-minute, two on 30-minute, and two on one-hour alert. A training base at Chatham was required to keep four Sabre (F-86 series) aircraft on a "released one-hour" status from 0800-1700 hours daily. Cold Lake another training station, had no requirement at mid-year.<sup>10</sup>

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Station commanders were to adhere to the alert requirements at each base but were allowed some latitude in determining how the states were met. All aircraft except those on 15-minute readiness could be employed on squadron training. Scrambled aircraft were to be replaced by readiness aircraft allocated for training or held in reserve. Whenever units or portions of units were deployed for training, Headquarters ADC (RCAF) was to issue readiness commitments. Readiness states were to be raised only if an Air Defense Readiness was announced. Station commanders were then to bring the maximum number of aircraft to the highest state of readiness possible.<sup>11</sup>

Starting on 1 January 1958, new standards were to go into effect. All two-squadron stations were to keep two CF-100's on ten-minute readiness and ten aircraft on one-hour. The one-squadron station was to keep one CF-100 at ten-minute readiness and five aircraft on one-hour. Over and above the ten-minute commitment, a minimum of six aircraft at the two-squadron and three at the one-squadron bases were to be kept loaded but unarmed. At Chatham, four Sabre aircraft were to be maintained on one-hour readiness from dawn to dusk. And in 1958, the second training station (Cold Lake) was to be added to the alert roster. Six CF-100 aircraft were to be kept at this station on a three-hour readiness. Station commanders were still to be authorized to use all aircraft for training except those on ten-minute readiness.<sup>12</sup>

RCAF ACW Units. The ACW squadrons were to keep a state of preparedness consistent with the state of aircraft readiness. To accomplish this, ACW squadron commanders were to: (1) make certain that controllers were available at all times to provide GCI control for fighter aircraft, (2) increase readiness states as required during actual or simulated conditions of air defense readiness or air raid warning, and (3) conduct training in accordance with RCAF ADC directives. Specifically, the roles of the ACW squadrons in 1957 that reported to RCAF control centers were as shown in the table below.<sup>13</sup>

ACW UNITS (RCAF)	ROLE
------------------	------

11 Lac St. Denis  
12 Mont Apica  
13 St. Sylvestre  
14 Parent  
31 Edgar  
32 Foymount

24 hours GCI



ACW UNITS (RCAF)	ROLE
33 Peltonbridge	
34 Senneterre	
51 Comox	
501 Holberg	
52 Tofino (inactivated in October 1957)	
211 Moisie	24 hours EW
21 St. Margarets	GCI sunrise to sunset com- patible with aircraft readi- ness state of Station Chat- ham. Surveillance and identification 24-hours per day.
22 Beaver Bank	
221 Sydney	24 hours EW. Controllers to be available on 15-minute notice.
ACW UNITS (USAF)	
912 Ramore	
917 Puntzi Mt.	
918 Baldy Hughes	24 hours EW
919 Saskatoon Mt.	

64th Air Division Interceptors. The AOC RCAF ADC established the alert requirements for Goose and Harmon air bases. From July to December 1957, the alert requirements for these two bases were that 24 hours each day there be two F-89 aircraft on five-minute readiness and the remaining aircraft that were combat ready on one hour.<sup>14</sup>

One problem was keeping enough aircraft to meet the alert requirements. The three squadrons of the 64th Air Division were engaged in a modernization program called BELL BOY, changing from F-89D's to F-89J's. For Thule and Goose, the changeover posed no major problem since it merely reduced the aircraft available, causing minor scheduling difficulty. There was more of a problem at Harmon, however.

The 61st Squadron at Harmon was to receive F-89J's until about October. But in this month, the squadron was to be replaced by one (the 323d) from the RI equipped with F-102's. In the exchange, it was anticipated that the base would be without planes for about six weeks. The alert was met by using RCAF ADC aircraft, however.

During the phase-out of the 61st and the phase-in of the 323d, two Canadian All Weather Fighter Squadrons deployed to Harmon to stand the alert. The 426th Squadron arrived at Harmon on 11 September and was replaced by the 410th on 3 October. The latter squadron returned to its home base on 21 October.<sup>15</sup>

The revised schedule for Harmon and Goose, which started in January 1958, kept two aircraft on five-minute status and provided that the maximum number of remaining aircraft would be on an hour-commitment.<sup>15</sup>

At Thule AFB, the 74th Fighter-Interceptor Squadron was to maintain two aircraft on five-minute alert and six combat ready aircraft on one-hour alert.

64th Air Division ACW Squadrons. ACW squadrons were to maintain a state of preparedness consistent with aircraft readiness. Squadron commanders were to insure that the squadrons were trained, that adequate controllers were available to provide GCI control for fighter aircraft on alert, and that the readiness states were increased during simulated or actual conditions of air raid warnings or air defense readiness. The roles assigned the division radars are shown below.<sup>17</sup>

ACW UNIT	ROLE
640th Stephenville	24 hours ADC
641st Goose Bay	
931st Thule	
226th Gander	2 1/2 hours GCI
920th Resolution Island	
921st St. Anthony	
922d Cartwright	
923d Hopedale	
924th Saglek Bay	
926th Frobisher	
642d St. Johns	



Alaskan Interceptors. At mid-1957, the alert requirements established by Alaskan Command provided for three conditions: (1) a normal state of alert at Ladd and Elmendorf with all aircraft present; (2) an alert when aircraft deployed from Elmendorf to provide an alert force at an advanced deployment base (King Salmon); and (3) the state of alert to be maintained at the deployment base.

The alert requirement for the two bases with all aircraft present was that 24-hours per day there be four aircraft on five-minute readiness, four on 30-minute, and the remaining combat ready aircraft on one-hour alert. Whenever aircraft deployed from Elmendorf to King Salmon, CINCAL authorized the following alert standards at the two bases: two aircraft on five-minute readiness, two on 30-minute, and the remaining aircraft that could be operationally ready on one-hour alert. Ladd was to maintain the alert standards with all aircraft present.<sup>18</sup>

New normal alert standards were issued by ALCOM on 10 October (regulation 55-11). The interceptor alert requirements provided that 24 hours per day each division keep two aircraft on five-minute readiness, two on 15-minute, and four on one-hour.<sup>19</sup> The remaining combat-ready aircraft were to maintain a three-hour alert. Reflected in the new alert requirements was the addition of an atomic capability at Ladd. One P-89J loaded with an MB-1 was placed on 15-minute alert; a second, ready for instantaneous loading, was also placed on 15 minutes.<sup>20</sup>

Alaskan Antiaircraft Alert. At mid-year, the conditions of alert for AA weapons in Alaska were set at one-half of all 120mm guns on 20-minute alert and one-third of all Skysweepers (75mm) on 20-minute readiness. All guns were to be operational in 90 minutes.<sup>21</sup>

The October regulation revised the AA commitments, however. The new alert requirements provided that one-half of the AA force would maintain a 30-minute alert, with the remaining fire units on three-hour readiness.<sup>22</sup>

Alaskan ACW Squadrons. At the end of 1957, Alaskan ACW squadrons maintained the same status as at mid-year. All squadrons were maintaining a continuous radar surveillance and control capability.<sup>23</sup>



## RULES OF ENGAGEMENT

At year's end, four separate directives provided for enemy engagement by NORAD forces. These four directives were: (1) CONAD Regulation 55-6, issued on 13 May 1957; (2) ALCOM Supplement No. 1 to CONADR 55-6; (3) RCAF ADC Air Staff Instructions (ASI) 2/5, dated 15 June 1957; and (4) the "Thule Rules of Engagement...." The procedures for intercepting and engaging an enemy force laid down in the four directives are described below.

### CONAD REGULATION 55-6

Interceptors. The CONAD rules of engagement provided instructions for units operating in the United States, Alaska, and the coastal

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Surface-to-Air Weapons. For surface-to-air weapons unit operations, CONAD Regulation 55-6 provided for four states of fire. These states were: "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."

CONAD Division commanders were authorized to change the status of weapons to accomplish an effective air defense. But under normal conditions all ground-to-air weapons were to remain on a Weapons Tight status until an Air Defense Warning Yellow with SCATER implemented was declared. Hold Fire was to be imposed only as a temporary measure to permit friendly aircraft operations in or through predetermined corridors, altitudes, or sectors in instances where any other state would prove impractical.

Hold Fire could be ordered by CONAD Division commanders or their representatives. The authority could be delegated by the division commander to senior directors at an ADDC. In instances where a Hold Fire was ordered by a director, the state had to be relayed to and confirmed immediately by the division commander; otherwise, the surface-to-air units were automatically released from the condition.

The AA status was designated by the CONAD Division commander who had operational control over all weapons in his sector. All orders and information were to be given directly to the AA commanders at the AADCP's, communications permitting; otherwise, the orders were to be issued through the ADDC. If there was a complete breakdown of communications in a sector, the AA defense commander could designate the weapons control status.

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\* Neither CAA nor the Canadian DOT had approved these visual signals.



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#### ALCOM RULES

CINCAL modified CONAD Regulation 55-6, tailoring it to fit the Alaskan theater. The ALCOM supplement issued on 4 November 1957, provided a sixth condition for determining hostile aircraft. An aircraft was to be declared hostile when it was on a course which, if continued, would carry it within three miles of any Alaskan land mass area of responsibility. Because the Little Diomed Island (U.S.) and the Big Diomed Island (U.S.S.R.) were only two and three-quarters miles apart, the rules specifically provided that the condition applied only over Little Diomed or within three miles to the North, South, or East of the island.<sup>27</sup>

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CANADA'S ASI 2/5

Canadian authority to intercept and engage unknown aircraft over  
Canada was contained in Air Staff Instruction 2/5, issued on 15 June  
1957. 28 (b) (1)

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Antiaircraft Rules for Canadian Operation. Procedures for the use of American surface-to-air missiles over Canada were set up in June 1957. The two countries agreed that operational control over surface-to-air units was to be exercised by or through the CONAD Division commander, in whose sector the weapons were located, with the concurrence of the Canadian division/sector commander, over whose territory the weapons were to be employed.


The operations of the five border defense areas in the United States were to be controlled in the following manner. The defenses at Fort Huron and Detroit, Michigan, and Niagara Falls-Buffalo, New York, were to be controlled by the commander of the 30th Air Division. To engage a target over Canada, the commander of the 30th Air Division was to get permission from the sector commander of the 3d ADOC in Canada. The Canadian sector commander, under normal conditions, was to authorize engagement of specifically designated targets -- a condition of Discreet Fire. When the tactical situation dictated either more or less fire than that provided by the Discreet Fire state, the sector commander was to permit either a Weapons Tight or Weapons Free condition.

A similar arrangement was to exist between the 32nd CONAD Division Commander (i.e., the Loring AFB, Maine, Defense) and the 1st or 2nd Sector Commander in Canada, depending upon the space needed.

Separate provisions were established for the Sault Ste. Marie, Michigan, defense (under the 37th CONAD Division). This defense was capable of engaging targets some distance within Canada. Air defense actions by this unit were to be authorized and conducted solely in accordance with instructions of the AOC ADC (RCAP).<sup>29</sup>

[REDACTED]





### THULE RULES

At Thule, a Danish possession, American forces at the end of 1957 were still operating under interim engagement authority. Units under the Northeast Air Command operated under a temporary regulation approved by that command in December 1953. But the regulation had not been approved by either the U.S. State Department or Denmark. Efforts were being made by the State Department to obtain Danish approval of permanent operating procedures.<sup>30</sup>

The base was still using the temporary rules in 1957. The 64th Air Division tried to get formal approval of the temporary regulation. CINCOMAD could not approve the rules without JCS or DOD approval. The rules were forwarded by CINCOMAD to the JCS for approval in May 1957.<sup>31</sup>

The executive agency replied to COMAD that it could not approve the rules, however. The Department of Defense and the Department of State, it continued, were working on "a set of negotiating instructions" that were to be submitted to Denmark. Without further instructions, in August, CINCOMAD directed the 64th AWD to continue using the temporary regulation until formal approval was received.<sup>32</sup>

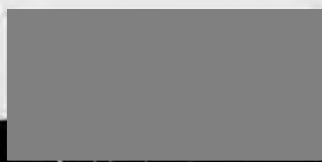
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As in other cases of American aircraft operating over Canadian soil, once the aircraft from Thule overflow a Canadian sector, the procedures outlined in ASI 2/5 were to be used.<sup>33</sup>

#### CANADIAN AIR RAID WARNING

The policies and procedures for the Canadian air defense warning system were established by two RCAF ADC directives issued in December 1956. These were Air Raid Warning (Air Staff Instruction 2/13) and Air Defence Readiness (Air Staff Instruction 2/14). These directives outlined conditions of warning and preparedness; the methods by which these conditions were transmitted to RCAF ADC echelons, other commands and agencies having collateral air defense responsibilities; and the actions to be taken under each condition.

The air raid warning directive established three degrees of warning: Air Raid Warning Red, attack by hostile aircraft imminent (using the criteria of ASI 2/5 for a hostile), or unknown aircraft manifestly hostile in the immediate vicinity of an air defense sector with a high degree of probability of entering the sector (again using the criteria of ASI 2/5); Air Raid Warning Yellow, attack by hostile aircraft probable; and Air Raid Warning White, attack improbable.

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In the second directive (2/14), there was one advanced preparedness condition -- Air Defense Readiness. This condition would place the entire air defense system in a state of maximum operational readiness. Air Defense Readiness could be called by the AOC or his appointed deputy, i.e., Deputy AOC, D/O, Commander 5th Air Division (within his own area of command), Commander 64th CONAD Division (within his own command and subject to the limitations of the RCAF ADC-CONAD agreement), and such other individuals as the AOC RCAF ADC might designate. A list of agencies to be notified by each command level and actions to build up the force similar to those for the Air Defense Warnings were included in the directive.<sup>35</sup>

Both directives were still in force at the end of 1957. However, plans called for combining the ASI's with the CONAD Regulation (55-3).<sup>36</sup>

#### SECURITY CONTROL OF AIR TRAFFIC AND ELECTROMAGNETIC RADIATIONS (SCATER)

CONAD issued a new SCATER regulation and plan on 11 September 1957. The regulation established CONAD policies and responsibilities for its lower echelons. It also provided general instructions for planning and implementing a new Department of Defense/Department of Commerce (DOD/DOC) SCATER plan. The SCATER plan was developed in coordination with the Civil Aeronautics Administration (CAA) and consisted of the DOD/DOC SCATER plan and CONAD/CAA supplements. The regulation and plan were designed to aid CAA officials and CONAD commanders in controlling civil and non-tactical military air traffic, air navigation radio aids and aeronautical communications (civil and military) during an Air Defense Emergency.<sup>37</sup>

The new CONAD SCATER plan superseded the DOD/DOC SCAT plan of 15 July 1952, Air Division (Defense) SCATER plans, and all previous SCATER instructions. The major changes in the new plan were: (1) it substituted the term Air Defense Emergency for Military Emergency; (2) it dropped the use of Air Defense Warning Conditions Red, Yellow, and White for initiating SCATER actions and instituted specific instructions such as Implement Full SCATER, Terminate Full SCATER, and Apply Emergency SCATER Rules; (3) it dropped simulated air defense warnings for test purposes and made test instructions an integral part of the basic plan; (4) it established emergency SCAT rules and incorporated them within the plan; and (5) it was made applicable to all areas of the United States and the approaches thereto.<sup>38</sup>

Specifically the plan provided for three implementing conditions. In the event of an Air Defense Emergency, each CONAD Division Commander was to instruct the appropriate CAA ARTC Center to accomplish one of the following: apply Emergency SCAT rules (these rules were continuous restrictions applicable to the movement of civil and nontactical military aircraft), or implement Full SCATER (this meant the grounding and/or diversion of air traffic and the shutting down of navigation aids and aeronautical communications, or terminate Full SCATER. This condition was to be implemented when an attack phase was over and the resumption of operations was authorized under the Emergency SCAT rules.<sup>39</sup>


These rules went into effect on 1 October 1957. Procedures and operating instructions relating to the movement of tactical air traffic, authentication tables, and requirements for the control of air navigation radio aids and/or aeronautical communications were to be published in separate directives in early 1958.<sup>40</sup>

CONAD/CAA Memorandum of Understanding. On 8 August 1957, a CONAD/CAA "Memorandum of Understanding" was issued as a CONAD regulation. It outlined mutually agreed arrangements on responsibility, functions, and working relationships of CAA and CONAD to insure that the air defense mission was accomplished within existing laws and directives.

The memorandum reiterated the JCS directive that CONAD and CAA were responsible for plans and policies establishing a system for identifying and security control of aircraft and air navigation aids. It pointed out that close coordination was essential to carry out air defense requirements efficiently and without undue restrictions to civil and non-tactical military aircraft.<sup>41</sup>

CONAD/Federal Communications Commission Memorandum of Understanding. An FCC/CONAD Agreement was issued as CONAD Regulation 55-7 on 11 September 1957, setting forth the responsibilities, functions, and working relations between CONAD and the FCC.<sup>42</sup>

CONAD was responsible for furnishing guidance and assistance to all government departments and agencies concerned in developing and implementing CONELRAD plans; manning CONELRAD operating positions at ADCC's; and initiating and disseminating the CONELRAD radio alert and, subsequently the CONELRAD radio all clear. The FCC was responsible for coordinating air defense activity with civil and military agencies. It provided liaison personnel at CONAD 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.



## ELECTRONICS WARFARE POLICY

On 5 January 1958, NCRAD issued a policy statement on electronic warfare in regulation 131-9. It was to serve as a guide in determining equipment, operational training, and personnel requirements to counter enemy ECM. Of the two major subdivisions of electronic warfare (i.e., ECM and ECCM\*), NCRAD was primarily concerned with establishing an adequate ECCM program.

The ECCM program was divided into two major areas: (1) intensive operator training in order to use both present and proposed air and ground equipment and (2) full realization and consideration of the impact of ECM in the design and development of new air defense weapons and ground environment.

The regulation pointed out three important actions that had to be taken to meet the ECM threat. These were (1) to emphasize operator and unit training with increased attention on ECCM tactics and techniques and to provide a maximum capability within the current weapons and environment systems, (2) to retrofit the present weapons and ground environment with all possible proven anti-jamming devices, and (3) to program the maximum anti-jamming features as well as the diversity of weapons and frequencies into future weapons and support equipment.

To accomplish these three actions, NCRAD continued, would require considerable effort on everyone's part. The air defense of North America had to be considered as a fully integrated system. This meant the exchange of ECM-ECCM training, operations, development and planning matters between the components and the RCAF ADC as well as such commands as SAC, TAC and ALCOM.

The steps already taken included an agreement between USAF and RCAF, emphasizing the need for effective ECCM defenses, additional facilities for ECM operations and training in Canada and Alaska, and

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\* ECM was defined as that major subdivision of electronic warfare involving actions taken to prevent or reduce the effectiveness of enemy equipment and tactics employing or affected by electromagnetic radiations. ECCM was the major subdivision of electronic warfare involving actions taken to insure our own effective use of electromagnetic radiations in spite of the enemy's use of countermeasures.

exchange of information and equipment. SAC and TAC had agreed to conduct airborne ECM activities on routine training sorties and simulated combat missions against air defense units in Canada and Alaska. ADC and AAC had agreed to make ECM radar evaluation flights against units in Canada and Alaska. And ADC was to provide airborne ECM facilities for ECCM training of all components in the system.<sup>44</sup>

The primary interest in ECM planning, the regulation continued, had been ground-based jamming that included spot and distributed area jamming (DAJ) techniques. After investigating both fields, it had appeared that the DAJ concept was best for the NORAD mission and a requirement had been submitted. However, advanced bombing systems (such as doppler inertia), costs involved, and the anticipated short life-span of the equipment had forced the planners to consider a revision to the original requirement. The DAJ was now probably to be employed only on a limited basis in defense of certain SAC "hardened" targets.<sup>45</sup>

The JCS were also concerned with the ECM threat. In September 1957, they asked CINCONAD to outline his operational requirements in the ECCM field.<sup>46</sup> After analyzing available WSEG documents, the NORAD-SAC monthly ECM exercises, and consulting the components as to their needs, CINCONAD submitted his requirements on 20 January 1958. The list covered five fields needing strengthening. The fields and their priorities are shown below.<sup>47</sup>

PRIORITY	FIELD
I	ECCM Operator Training and Facilities <ol style="list-style-type: none"> <li>a. On-the-Job Training</li> <li>b. ECM Simulator Devices</li> <li>c. ECM Configured Hi-Speed Hi-Altitude Training Aircraft</li> <li>d. POL Funds for ECM Training Aircraft (ADC-SAC)</li> </ol>
II	ECCM Improvements for Ground Environment <ol style="list-style-type: none"> <li>a. ACM Radars and Height Finders</li> <li>b. Picket Ships, ASW, Towed Towers</li> <li>c. Primary and Back-up Control Facilities (WSEG and Area Direction Centers)</li> </ol>

PRIORITY	FIELD
II (cont)	<ul style="list-style-type: none"> <li>d. Ballistic Missile Defense Radars</li> <li>e. Frequency Diversity Radars</li> <li>f. Ground-to-Air IFF</li> <li>g. Active-Passive System</li> </ul>
III	<p>ECCM Improvements to Weapons Systems</p> <ul style="list-style-type: none"> <li>a. Surface-to-Air Missile Systems (NIKE, TALOS, BOMARC, HAWK, IMX, etc.)</li> <li>b. Air-to-Air Missile Systems (FALCON, SIDEWINDER, GENIE, etc.)</li> <li>c. AI Fire Control System (MG-10, MA-1, etc.)</li> <li>d. Air-to-Air IFF</li> <li>e. Frequency and Weapons Diversity</li> </ul>
IV	<p>Communications</p> <ul style="list-style-type: none"> <li>a. Time Division Data Link</li> <li>b. Scatter Communications</li> <li>c. Single-Side-Band Transmission</li> <li>d. Data Link BROPICON</li> </ul>
V	<p>Defensive ECM and Passive System</p> <ul style="list-style-type: none"> <li>a. Radar Absorption Materials</li> <li>b. Reflective and Deception Devices</li> <li>c. Distributed Area Jamming System</li> </ul>



## Chapter VII

### *Exercises and Tests*

#### EXERCISES

Realistic Operational Exercise of the Air Defense System (Exercise FIR FLY). At mid-1956, CINCONAD asked his staff to work out an exercise that could be used to determine the capability of each air defense element to carry out its function and the capability of the entire system. In particular, he wanted to include live firing on drone targets in the test.<sup>1</sup>

The test of the first three functions of air defense -- detection, interception, and identification -- posed few problems. These functions had been tested numerous times in past exercises. But testing the final function -- destruction -- was a problem. To actually fire live loads at realistic targets, the CONAD staff had to find suitable target areas, suitable target drones, and areas in which all elements of the system could be tested.<sup>2</sup>

It was decided that a realistic test could be run over an ocean area near the location of defense areas. The staff contemplated a small correlated exercise with an air division commander defending against a multiple-target attack penetrating from outside the contiguous radar zone. The attacking force would be from SAC and the Navy, using high, low, and very low altitude attacks. In addition, it was decided to incorporate drones to be intercepted and destroyed by aircraft and Nike batteries.<sup>3</sup>

By mid-1957, the preliminary steps had been taken to get the assistance of SAC and Navy. By that time, it had been decided that an operational exercise of the system within Western CONAD Region was best. SAC had promised support of the mission and the Navy had offered planes and a SAM cruiser to launch Regulus I missiles for the drone portion of the exercise.<sup>4</sup>

A conference held at Colorado Springs in August 1957 gave CFWCR responsibility for planning, conducting, and executing the two-phase exercise named FIR FLY. The first phase was to test the first three



functions of the system and was to be run from 10 through 13 January 1958 in the 28th CONAD Division area. In this phase, Navy carrier and shore-based planes were to make very low level attacks, similar to those used in HOME RUN, penetrating from outside the seaward extensions of contiguous coverage. SAC faker aircraft would run high altitude penetration tests. Phase II was to test the destruction function using drones as targets.<sup>5</sup>

At year's end, Phase I of the programmed exercise remained firm. Planning for Phase II had run into snags that threatened to cancel this portion of the mission, however. Since early 1957, CFWCR had been working with the Navy on the West Coast using the Regulus I missile as a target drone. Western CONAD Region had discovered that the missile could not be augmented with spinners, reflectors, or any other modification that would make it easier to detect and track. Doubt arose as to the ability of the radar to detect the drone in the so-called "clean" configuration. As a result, a series of tracking missions were run in the 27th CADD against a "clean" Regulus to see what could be done. The tests were begun in September and completed in December. It was found that the Regulus I could not be adequately carried in the system.<sup>6</sup>

While these tests were being run, General Partridge asked both ADC and ARADCOM to find a suitable drone for the exercise. Both replied that they had nothing available. Because it was anticipated that their continued search would take too much time, CINCONAD asked General Thomas H. White, USAF Chief of Staff, to look throughout the Air Force for a suitable drone.<sup>7</sup>

Proposed Simulated Submarine-Launched Missile Exercise (OCEAN WAVES). A second exercise, programmed for early in 1958, was to be a test of the air defense system against a simulated submarine-launched missile. This exercise, code-named OCEAN WAVES, was scheduled to take place in the Eastern Region in February 1958.<sup>8</sup>

The exercise concept was first presented at the CONAD Commanders' Conference in July 1957. Details of the exercise were worked out between Eastern CONAD Region -- CONAD's action agency -- and CINCLANTFLT. The exercise plan was as follows. About 24 February, high-performance carrier fighter aircraft were to penetrate the 26th and 85th CADD's areas. To simulate missiles, the aircraft were to launch in three flights of two aircraft each at varying heights and distances. The first flight was to use maximum climb and cruise altitude and then make a vertical descent attack; a second flight would climb to its

maximum operating altitude midway between the carrier and the target and then descend upon the target. The final wave would cruise and attack at a very low level. The commanders of the two CONAD Divisions were to defend their areas, performing all functions except destruction.

NORAD/CONAD-SAC ECM Exercises. By April 1957, SAC and CONAD had agreed to a series of ECM exercises to be run monthly for evaluation and training. The program would aid SAC by providing a test of the penetration and ECM tactics of its bomber force. For CONAD, the exercises would give ECM training to and evaluation of its defense network.<sup>10</sup> For ADC, the training features of the joint missions were particularly appealing because of the susceptibility of its S-band radars to jamming and a lack of suitable ECM training aircraft. Each exercise gave the ECM radar operators an opportunity to gain experience in "reading through" jamming.

With respect to suitable ECM training aircraft of its own, ADC had until late 1957 expected to get modified RB-57A's to replace its older TB-29's. These new aircraft were to provide ECM training not only for its own forces, but also for other service forces. However, in October 1957, a shortage of funds forced USAF to abandon plans for modifying the RB-57A's and sending them to ADC. Instead the planes were reassigned to the Air National Guard. This made it even more imperative that adequate ECM training be provided for NORAD (CONAD) forces through the SAC-NORAD joint training program.<sup>11</sup>

The monthly tests had begun in April 1957. By 1 July, two exercises had been run. Neither of the tests gave conclusive evidence on which to evaluate the air defense system. But they provided ECM-ECOM training and experience in collecting data on which to base a planned series of controlled tests.

In July, the tests were expanded to incorporate operational inspections (ORI's) and exercises of the component services. This was done to avoid a dual workload. Combining the two, gave maximum mutual benefits and made economical use of the available test aircraft. At year's end, the tests had been further expanded to provide for testing the Canadian component of NORAD. The nine months of tests yielded valuable qualitative information. But they still did not have the rigid controls to provide for quantitative analysis of the air defense system.<sup>12</sup>

The missions were most valuable from a training and experience viewpoint. Most of the commanders favored increasing their frequency. The tests illustrated such shortcomings of the system as: the danger of saturating the system with fighter-interceptors, the lack of continuity in radar tracking, the delays and inaccuracies in lateral and forward telling, and the inability of operating personnel to assess the effects of ECM on the system.<sup>13</sup>

In this latter category fell the criticism of Lieutenant Colonel Michael E. Wardell, a NORAD D&E officer. Speaking before a group of C&E conferees, Colonel Wardell said that: "...personnel at ACFW sites and Nike installations do not realize the extent to which ECM can degrade their effectiveness. 'Burst' and random chaff tactics were very effective in 'breaking lock,' capturing 'Gates,' and accounting for many false targets. 'S' band electronic jamming against WCI radars has frequently been very effective."<sup>14</sup> On the other hand, the missions also provided an excellent opportunity to experiment with such tactics as the employment of "trailer" aircraft and the location of bombers by triangulating jamming strokes.<sup>15</sup>

The test design was also criticized. SAC complained that there was a lack of active participation by key CONAD personnel, resulting in inadequate training for both commands.<sup>16</sup> CINCONAD then ordered the field commanders to participate fully in the exercises "...utilizing...the same supervision that would be employed in actual combat."<sup>17</sup> CONAD Region personnel stated that they found it difficult to get SAC pertinent exercise data (such as delays, aborts, and postponements).<sup>18</sup> Although the criticism of both was probably valid, neither explained the real problems behind obtaining a test design for evaluating the defensive or offensive system.

Even with perfect coordination, the system could not get a complete test. One reason for this was that SAC ECM capability was built from requirements of its combat mission which did not provide the best means for exercising the air defense system. Also, SAC missions resulted largely from other operations (i.e., rotations, redeployments, etc.) that did not allow for a strictly controlled test environment. This scheduling often left some areas of the U. S. with no chance to participate in a realistic jamming effort.

Also, SAC did not have during 1957, and was not expected to get before FY-1959, the capability to effectively jam S-band radars operating above 3250 megacycles. This greatly hindered evaluation of the Army Nike units -- a large portion of the air defense system. All in all training was limited to less than one-fourth of the entire NORAD radar system.<sup>19</sup> These limitations were compounded in November

1957 when SAC announced that its only ECM wing -- the 376th Medium Bombardment Wing at Barksdale Air Force Base -- would be unable to participate in the ECM exercises because of an internal reorganization.<sup>20</sup>

The problem of evaluating the entire air defense system was by year's end getting a great amount of attention, however. NORAD's operations analysts were trying to establish a test design that would give the NORAD staff both quantitative and qualitative data. Considerable information from the monthly exercises had been obtained, but they did not provide enough knowledge of system effectiveness against specific offensive threats. This was necessary to show effectiveness against two general types of threat: the manned bomber and the submarine-launched missile. A test design to meet the need of the first threat was submitted to SAC in December 1957.<sup>21</sup>

#### TESTS

Nuclear Detonation Reporting (NUDET) Tests. The capability of an enemy to employ high-yield nuclear weapons focused attention on the serious problem of avoiding radioactive fall-out. It was decided that a system of reporting nuclear detonations would help save countless lives by giving warning of dangerous fall-out areas. A requirement to establish such a system was levied on CONAD by the JCS in December 1956. CONAD was given responsibility for establishing and operating an atomic detonation reporting system in the continental U.S., Alaska, and in the northeast approaches to the U.S.<sup>22</sup>

CONAD issued its NUDET plan in March 1957. An interim system was set up until an adequate remote-reading Bomb Damage Assessment system was available. The interim system consisted of observations from the Ground Observer Corps, all airborne personnel, and all units and installations under CONAD jurisdiction. Reports from any of the above sources were to be forwarded to appropriate air defense agencies. At direction centers and division control centers, the reports were to be screened and evaluated before being passed to CONAD Headquarters. From CONAD Headquarters, the reports were to be disseminated over the CONAD Alert TTY #1. This closed-loop circuit connected CONAD with some 30 agencies that required air defense warning information. This included such agencies as major commands, the 16 air divisions, the three regions, HCAF ADC, and the USAF Command Post.

[REDACTED]

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After the division received the NUDET report, it was to be placed on the MADW net and disseminated to the "key points." Subsequently the information would be passed to all interested governmental, civil and military agencies such as military bases, CAA control towers, Air Route Traffic Control Centers (ARTCC's), and detached military units.<sup>23</sup>

In July 1957, the first test of the NUDET reporting system was accomplished, in OPERATION ALERT 1957. This gave the first opportunity to test and evaluate the Alert TTY #1 and the MADW as facilities for disseminating nationwide detonation information. During the exercise, CINCONAD received approval to eliminate all air defense warnings except those he declared. This cut out lower agency traffic which had saturated CONAD's network in previous exercises such as CHECKPOINT (1954) and CRACKERJACK (1955). It also cut the time necessary to transmit the information over Alert TTY #1. Although this made the test less realistic for evaluating normal operations, it showed the capability of Alert TTY #1 to handle both CINCONAD air defense warnings and NUDET information.<sup>24</sup>

The exercise began on 12 July. About 111 NUDET reports were received and processed through the CONAD COC and disseminated over Alert TTY #1. The reporting and processing functions were accomplished in two hours and five minutes. On the 112th NUDET report, Headquarters CONAD was eliminated from the exercise. Six minutes later, the alternate command post plan (ALCOF) was in effect with Central CONAD Region assuming operational control of the CONAD forces. It continued the collection and dissemination of the NUDET reports. Forty-two additional NUDET reports were received and transmitted from the alternate post in a 40-minute period.<sup>25</sup>

The test proved that the NUDET system was workable, but that there were problems to be ironed out. One problem was an increase in traffic. NUDET reporting would either have to take a higher or lower precedence than air defense warnings. Both might be jeopardized if they held the same priority. In August, CONAD informed the JCS that the NUDET reports would take a lower precedence than air defense warnings. Such reports would be put on the network only during "free time" so as not to interfere with the primary mission of the network.<sup>26</sup>

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\* MADW networks originate at an air defense division COC and transmit information throughout that division's area of responsibility.

[REDACTED]

[REDACTED]

Communications Security Tests. NORAD had become increasingly conscious of a need to test the vulnerability of its communications to compromise by an enemy.<sup>27</sup> The three measures being used to protect information were reduction of reliance on radio as a transmission medium, encryption of all transmissions using secure station identifiers, and strict enforcement of circuit discipline. The latter measure reduced the possibility of compromise by eliminating all unnecessary talk and by denying the enemy knowledge of the intercept order of battle intelligence.<sup>28</sup>

The first two measures were being used to protect command and intelligence data. But neither was completely satisfactory as a countermeasure to use for the data transmitted in active air defense operations. This was particularly true of the point-to-point and ground-air radio systems in use along the DEW Line, in the Alaskan Command, and in 64th CONAD Division areas. These systems were extremely vulnerable because of their nearness to the USSR. Effective circuit discipline was the only successful and practical countermeasure.<sup>29</sup>

A test was the only way to determine communications vulnerability and reverse any undesirable practices. On 30 October 1957, NORAD proposed to the JCS that a communications test be held. Since all components would be affected by such a test, NORAD asked that it be a joint test.<sup>30</sup>

The following month at an Army, Navy, Air Force conference at the Pentagon, the services' security forces agreed to monitor NORAD communications. At that time, the Army and Navy expected to begin their monitoring for a 30-day period on or about 1 February 1958. The Air Force set no starting date. A full report was expected to be available to CINCNORAD by June 1958, however.<sup>31</sup>

[REDACTED]



## Chapter VIII

### *Air Defense Program and Requirements*

#### PROGRAMS

CONAD's recommendations to the JCS on the level for forces, weapons and equipment for all elements of the continental air defense system were submitted in its Continental Air Defense Objectives Plan 1956-1966 (CADOP 56-66). The plan covered objectives for the air defense of both Canada and the United States.<sup>1</sup>

CADOP 56-66 was sent to the executive agent for CONAD on 18 December 1956. Early in 1957, the services reviewed CADOP and provided the JCS with their comments (including a cost study) on the document.<sup>2</sup> In August 1957, the JCS provided CONAD with the latest service programs for FY-1958 and estimates for FY-1959. CONAD was asked to estimate the level of air defense effectiveness that could be provided by both CADOP and the estimated service programs. This estimate was sent in September 1957.<sup>3</sup>

The JCS did not approve the objectives plan in 1957, however. The plan still was undergoing review by the JCS "Black" team at the end of the year. It was anticipated that the document would be used as a guide by the JCS in their deliberations on overall future military requirements.<sup>4</sup>

Lack of JCS approval made it impossible for CONAD to obtain many of the force levels it desired from the services. At year's end, CONAD had no recognized or approved program for the air defense of North America. Numerous times, service actions taken to remain within a limited budget either reduced or deferred desired program requirements. Thus, at the end of December 1957, CONAD requirements, component plans and service programming were considerably at variance.

The effects of unilateral service actions were reflected in NORAD's planning. NORAD's Plans and Requirements Directorate was forced to make constant revisions in a piecemeal manner to supposedly firm CADOP requirements. Many times, the planners were faced with an accomplished fact in service programs which in turn had to be

incorporated into NORAD's own goals. The differences in NORAD and service goals were reflected in the plans for FY-1959 as they existed in December 1957.<sup>5</sup>

Listed below are the recommended NORAD (CONAD) goals for FY-1959 and the service-recommended or approved goals for FY-1958 and FY-1959.<sup>6</sup>

	I CONAD Requirements FY-1959	II Programmed to be Operational in FY-1958	III Service-Recommended or approved to be operational in FY-1959
<u>MANNED INTERCEPTORS</u>			
United States	66 Sqdns	61 (6 non-equipped) Sqdns	60 (3 non-equipped) Sqdns
Northeast Area	3 Sqdns	3 Sqdns	3 Sqdns
		NOTE:	One Squadron was to operate with the equipment of one-half sqdn.
Alaska	2 Sqdns	3 Sqdns	2 Sqdns
<u>BOMARC</u>			
United States	1 Sqdn	NONE	NONE
NOTE: In February 1957, the JCS approved construction of five BOMARC sites at: (1) McGuire AFB, N.J., (2) Suffolk AFB, N.Y., (3) Otis AFB, Mass., (4) Dow AFB, Me., (5) Ethan Allen AFB, Vt. (formerly Flattsburg AFB, N.Y.). The first four sites were under construction (USAF PG-59-1 provided four units to be operational in FY-1960).			
<u>NIKE/TALOS</u>			
United States	77 Bns Nike	RA 61 bns (60 Bns Nike Ajax) 1 Bn Nike Hercules)	RA 36 Ajax NG 7 Ajax RA 27 Hercules <u>70 Bns</u>



	I	II	III
Alaska	2 Bns Nike	2 Bns	2 Bns
NOTE: In December 1957, the JCS approved reducing the planned number of Bns from 3 to 2 Nike Hercules. This eliminated the Bn formerly planned for Ladd AFB. However, to make up for the reduction, the Bn at Nielson was to consist of 5 btrys, the one at Elmendorf 4 btrys.			
Thule	1 Bn Nike	1 Bn	1 Bn
(No TALOS plan approved or recommended by 14 February 1958)			
HAWK	NONE	NONE	NONE

NOTE: The JCS had approved two Hawk sites: New York and Washington D.C. The New York site was to be operational in FY-1960, and the Washington site in FY-1961. Additional battalions were expected to be operational in FY-1961; however, the number and locations had yet to be determined.

<u>GUNS (90-120mm)</u>			
United States	NONE	NONE	NONE
Northeast Area	1 Bn	1 Bn	1 Bn *
Alaska	1 Bn	2 Bns	NONE
<u>SKYSWEEPER</u>			
United States	6 Bns	2 Bns	2 Bns
Northeast Area	1/2 Bn	2/3 Bn	NONE
NOTE: The batteries in the Northeast were to be inactivated in April 1958.			
*NOTE: Through FY-1960 the Nike Hercules and the Northeast Gun Bn were to enjoy a dual role -- both would be activated; in essence an augmented Nike Hercules Bn.			

	I	II	III
Alaska	2 Bns	NONE	NONE
<u>LAND BASED RADARS</u>			
United States	148	121	142
Northeast Area	12	10	10
Alaska	21	18	18
Canada	35	11 U.S.-Manned & Financed 4 U.S.-Financed 10 Canadian <u>25 Total</u>	25
<u>GAP FILLER RADARS</u>			
United States	167	82	143
Northeast Area	6	6	6
Alaska	6	6	6
Canada	82	NONE	NONE
<u>OFF SHORE RADARS</u>			
Texas Towers	3	3	3
Picket Ship Stas	13	10	10
AEW&C Stations	13	7	To be determined

NOTE: On the West Coast two stations were being manned 24 hours a day, one station on a random basis. On the East Coast the station manning varied from day to day from 4 to 2 stations. Extensive tests were being conducted at year's end and from these, the stations to be manned in FY-1959 were to be determined.

	I	II	III
<u>SAGE DIRECTION CENTERS</u>			
United States	8	1	5
<u>BADGE</u>			
Northeast Area	To be determined	NONE	NONE
Alaska	Modified BADGE System	NONE	2 collocated AADCI-ADDC's in modified BADGE System
<u>DEW LINE</u>			
Alaska & Canada	Not included in CADOP	40 (Northern DEW Line Project)	40 6 (Project Stretchout)
Canada-N.E. Area	Not included in CADOP	11 (Northern DEW Line).	11

#### IDENTIFICATION REQUIREMENT

Another requirement urged by CONAD was in the field of identification. In July 1957, CONAD told the executive agent that it was concerned over the lack of progress in the development and procurement of a secure air-to-air IFF system. "The current lack of a secure air-to-air IFF system," CONAD stated, "places this command in a position where it cannot exploit the full potential of weapons now in the inventory. The degree of degradation on the operational effectiveness of the command increases with each passing day."<sup>7</sup> It then urged that every effort be made to expedite development and procurement of the air-to-air IFF system.<sup>8</sup>

Again in October the command urged the JCS to hasten its actions to obtain a suitable identification system. It stressed the inadequacy of past efforts and pointed out that without a practical identification system, adequate air defense was almost impossible.

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Every type of aircraft could be identified by visual recognition and many types by sound alone, the letter continued. The early attempts to obtain significant signatures or prints by using distinguishing characteristics of specific types of aircraft were only modestly successful, however. But MELPAR had recently come up with a promising idea for fine-grain structure analysis of sound and radar returns.

The obstacles to progress in the field were two fold: high security classification (started by the Air Technical Intelligence Center which pioneered in the field), and a limited budget. The former problem could be eliminated, General Partridge suggested, by allowing MELPAR to continue the work on a security lower security basis; the latter problem by getting all agencies that would benefit from the development of such a system to contribute funds toward development.<sup>9</sup>

#### ICBM DEFENSE

CONAD Actions. On 3 April 1956, CONAD attempted to provide unified direction to a missile defense program by assigning responsibility to USAF ADC for providing and operating an ICBM defense system. This was to be a total system. CONAD stated that the system "must include the capability to accomplish all functions incident to detection, identification, interception and destruction of ballistic missiles."<sup>10</sup> On the same date, CONAD informed the executive agency of this assignment, noting that NAVFORCONAD concurred but that AFADCOM did not.<sup>11</sup>

In an explanation of its action, CONAD told the executive agency that giving unified direction to the over-all program of missile defense was an urgent requirement in the interest of economy of time, funds, and limited resources in research and manufacture. CONAD recommended that development of an ICBM defense be made the sole responsibility of USAF "in view of the over-all Air Force responsibility for the air defense of the United States."<sup>12</sup> CONAD said that in the meantime it had given this assignment to ADC "in the interest of expedience and in logical association with its mission."<sup>13</sup>

As will be discussed below under service roles in ICBM defense, subsequent decisions by higher authority made it necessary for CONAD to rescind this directive. On 27 November 1957, NORAD told the executive agency that "the local assignment of responsibility by this headquarters... has been rescinded."<sup>14</sup>

[REDACTED]

[REDACTED]

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CONAD also determined, and recommended to the JCS, ballistic missile defense requirements. CONAD placed a detailed requirement for both active and passive ICBM defense in its Objectives Plan for 1956-1966 (CADOP 56-66). During 1957, the CONAD staff investigated numerous proposals of industry and of research agencies for ICBM defense. CONAD also drew up and presented research and development requirements in ten areas to the component commands on 6 June 1957.<sup>15</sup>

The areas covered by CONAD were: system study and analysis, applicability of SAGE computers to AICBM, preliminary design of a guidance system for interceptor missiles, preliminary design of an airborne digital computer for interceptor missiles, research radar test program guidance, experimental determination of radar propagation errors, development of rocket motors, development of acquisition radar, and study of a satellite infrared tracking system. USAF ADC replied that all "of the areas of concern are under study and/or development under Air Force contract and are monitored by this headquarters through the Air Research and Development Command."<sup>16</sup>

CONAD also urged action by the JCS. In March 1957, it told the executive agency that the most urgent future CONAD requirement was an adequate and timely defense against the ICBM. The executive agent replied that he agreed with the urgency of the requirement and that the problem was being studied extensively. One of the most important matters being considered, he said, was that of giving unified direction to the ballistic missile defense effort.<sup>17</sup>

CONAD added a requirement on 14 June 1957 for a defense against short and intermediate range surface-to-surface and underwater-to-surface missiles, both cruise and ballistic type.<sup>18</sup> In reply, USAF said that the requirements for the BOMARC were being revised to include interception and destruction of the air-breathing, cruise-type missile. USAF also stated that it was writing a consolidated general operational requirement that would include GOR 96 (a requirement issued by USAF in June 1955 for a ballistic missile early warning system) and defense against missiles of all types and ranges. It would include requirements for a total defense system (detection, tracking, identification, interception, and destruction).<sup>19</sup>

Ballistic Missile Early Warning System. Back in June 1955, Headquarters USAF approved and issued a GOR (#96) calling for a ballistic missile detection support system to be operational in 1960.

[REDACTED]

In mid-1956, the Air Research and Development Command estimated that the cost of an ICBM early warning system would be 1.1 billion dollars. ARDC's proposal called for an outlay of this sum over a four year period, i.e., in order to meet the 1960 operational date. ARDC said it needed 500 thousand dollars immediately for aerial surveys and four million by the end of 1956 to continue experimental test equipment and facilities.<sup>20</sup>

The USAF Aircraft and Weapons Board decided that because of Air Force budget limitations, this program could not be realized in the allotted time. The Board recommended instead that the operational date be pushed beyond 1960 and requested ARDC to restudy the program and come up with a proposed system for 1963 and 1965. In September 1956, USAF advised that it was deleting 1960 as the operational date for an ICBM early warning system (as specified in GOR 96). And in October 1956, USAF said it was studying the whole air defense program and would recommend a new date after this study was completed.

In the meantime, studies were being made of an early warning system and of a total defense system as well by numerous industrial concerns, civilian research agencies and governmental agencies. It is interesting to note the report of one group -- an Ad Hoc Group (called the Skifter Committee) -- which reviewed the Army and Air Force anti-ballistic missile programs for the Assistant Secretary of Defense for Research and Development. This group recommended in 1956 that "the potential pay-off available from maximum early warning (8-25 minutes) is so great that first priority be given to the establishment of a Northern AICBM early warning radar network."<sup>21</sup> It also reported that all of the many solutions proposed were based on detection and tracking by radar and destruction by an anti-missile with a nuclear warhead. The committee concluded that adequate consideration had been given to other methods and that at the time no other approach than anti-missiles seemed feasible.

At any rate, early in 1958, a ballistic missile early warning system received the highest priority. On 4 February 1958, Headquarters USAF announced that program approval and funding support had been received for development of a ballistic missile early warning system (phase I of USAF weapons system 224-A).<sup>22</sup> The current plans, USAF said, were to develop a three-station (Alaska, Greenland, and Scotland) system and have it in operation at the earliest possible date (estimated to be calendar year 1960). These stations were to be connected to a central computer and display facility in the ZI. This

[REDACTED]

central facility was to be collocated with the NORAD/ADC control center and would service requirements in the U.S. and Canada for warning information. The USAF ADC was to participate in site selection, preparing operation plans, and determining organization of the system; in planning for supervision of initial contractor operation of the system; in planning for eventual ADC manning and operation of the system; and in planning for personnel training.

This was to be an all-out program. USAF pointed out that this "system has been directed by the President, has the same national priority as the ballistic missile and satellite programs and is being placed on the Department of Defense master urgency list."<sup>23</sup>

Army--Air Force Roles in ICBM Defense. The question of how the services were to divide the responsibility for ICBM defense reopened the question of air defense responsibility that was first answered in 1948. Meeting at Key West, Florida, the Joint Chiefs of Staff agreed on the roles and missions of the services. This agreement was approved by the President and became an official directive on 21 April 1948.

The so-called Key West Agreement gave the Air Force the over-all air defense responsibility. Specifically, it made the Air Force responsible for defense of the United States against air attack in accordance with JCS policies and procedures; for formulating joint doctrines and procedures for air defense, in coordination with other services; for developing, in coordination with other services, doctrines, procedures and equipment for air defense from land areas, including the continental U.S.; and for providing forces required for air defense.

The Army was given responsibility for providing forces as required for air defense of the U.S. in accordance with JCS-approved joint doctrines and procedures, and for organizing, training, and equipping Army antiaircraft artillery units.

These responsibilities of the Army and Air Force in air defense were reiterated exactly in a revision of the functions of the services issued by the Secretary of Defense on 1 October 1953.

No mention was made of ICBM defense specifically. But both the Army and Air Force could interpret their missions as giving them responsibility for developing an ICBM defense.

[REDACTED]

[REDACTED]

As discussed earlier, COMAD recommended to the JCS in April 1956 that the Air Force be given sole responsibility for development of an ICBM defense. At the same time, COMAD assigned to USAF ADC the responsibility for providing and operating an ICBM defense system. COMAD later rescinded this order, however.

On 26 November 1956, the Secretary of Defense issued a so-called clarification of roles and missions of the services.<sup>24</sup> In this paper, he assigned responsibility for point and area defense. He explained that area defense involved the concept of locating defense units to intercept enemy attacks remote from and without reference to individual vital installations, industrial complexes, or population centers. For such a system to be effective, he said, extensive information gathering networks, such as the SAGE system were required. This meant that area defense missiles, because of their more widespread sitings, would normally receive their guidance information from the network system rather than from acquisition and tracking radars located near the missile launching site.

The purpose of point defense, the Secretary said, was the defense of specified geographical areas, cities and vital installations. One distinguishing feature of point defense missiles was that their guidance information was received from radars located near the launching sites. The current state of the art, he said, justified development of point defense missiles for use against targets at altitudes out to a horizontal range of the order of 100 nautical miles.

In conformance with the above, the Secretary assigned the Army responsibility for the development, procurement and manning of land-based surface-to-air missile systems for point defense.<sup>25</sup> He assigned the Air Force responsibility for the development, procurement and manning of land-based surface-to-air missile systems for area defense. In addition, the Secretary stated that:<sup>26</sup>

In general, it is intended that development programs for surface-to-air missile systems for defense against either aircraft or missiles, including ballistic missiles, will be governed by the principles set forth above. For the time being, I consider that development of an anti-missile weapon system should be carried forward under a joint Army-Air Force program. Full advantage should be taken of progress achieved under current unilateral Service

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programs. In order to avoid unwarranted and undesirable duplication, these programs will be monitored and coordinated by appropriate agencies of the Office of the Secretary of Defense. At this time, the Army will be responsible for development of point defense missiles designed specifically against the ballistic missile and such acquisition and tracking radar and other equipment as would be required at the defending point, leaving to the Air Force missile defense developments other than the point defense portions specifically assigned to the Army.

Some further direction to the ICBM defense development effort was provided by the Secretary of Defense on 25 April 1957. In a memorandum to the Secretaries of the Army and Air Force, he gave approval, subject to certain conditions (mentioned below), to recommendations of a committee that reviewed the Army-Air Force anti-ICBM programs. This committee recommended that:<sup>27</sup>

(1) the Air Force proceed with research and development directed toward a systematic development of an early warning system in accordance with their present plans.

(2) the Air Force carry out research and development directed toward the advanced acquisition radars required for the active defense system against the ICBM. The Committee also agrees that the Air Force should carry out studies on the communication problems involved in transmitting information to the active defense system.

(3) the Army carry out research and development work in local acquisition and target tracking radars along with moderate effort on the defense missile for the active portion of the ICBM defense system at a level about that now planned.

(4) an Army-Air Force coordinating agency be established....

The Secretary of Defense said that his approval was subject to the following conditions: (1) it did not affect in any manner the roles and missions of the services, especially those set forth in his 26 November 1956 memorandum; (2) it should not be construed as approval of specific budgets for this program for FY-1958 or for any

complete program; (3) the FY-1958 projects and programs were to have specific approval of the Secretaries of the Army and Air Force for their parts of the program; and (4) the responsibilities of COMAD were not to be affected by the setting up of the Army-Air Force coordinating agency.

On 16 January 1958, the Secretary of Defense sent a memorandum to the Secretary of the Army in which he stated that he had decided to assign the direction of the effort to develop a missile system for defense against the ICBM to an Advanced Research Projects Agency (which was later placed under Roy W. Johnson, a General Electric executive).<sup>28</sup>

Until the ARPA was functioning, the Secretary continued, the urgency of the effort demanded that there be maximum coordination of the Army and Air Force work and it was important that there be no unwarranted duplication of effort. He said that accordingly, he desired that the Army continue its development in the Nike Zeus program as a matter of urgency, concentrating on system development that would demonstrate the feasibility of achieving an effective, active ICBM defense system in an electronic countermeasure and decoy environment. But the Army program was to be limited to the missile and launch system and the acquisition, tracking and computer components required. Development by the Army of other elements, such as communications links between early warning radars and the active defense system and SAGE, and the forward acquisition radars for area coverage, was to be limited to that required for planning purposes. Also it was to be compatible with Air Force planning and development which was sponsored under the WIZARD program.

APPENDIX

APPENDIX I

USAF ADC ACW STATIONS  
(Data As of 31 December 1957)

PERMANENT PROGRAM RADARS

Site No.	Location	Defense Force	Air Div	Sqdn No.	Function
1	McChord AFB, Washington	WADF	25th	635	DC
2	Cambria AFS, California	WADF	27th	775	DC
6	Curlew AFS, Washington	WADF	9th	638	DC
7	Continental Divide AFS, New Mexico	CADF	34th	769	DC
8	Tierra Amarilla, New Mexico	CADF	34th	767	DC
9	Highlands AFS, New Jersey	EADF	26th	646	DC
10	North Truro, Massachusetts	EADF	26th	762	DC
11	Yaak AFS, Montana	WADF	9th	680	DC
12	North Bend AFS, Oregon	WADF	25th	761	DC
13	Brunswick AFS, Maine	EADF	32nd	654	DC
14	St. Albans AFS, Vermont	EADF	32nd	764	DC
15	Santa Rosa Is., California	WADF	27th	669	DC
16	Calumet AFS, Michigan	EADF	37th	665	DC
17	Wadena AFS, Minnesota	CADF	31st	739	DC
18	Chandler AFS, Minnesota	CADF	31st	787	DC
19	Antigo AFS, Wisconsin	EADF	37th	676	DC
20	Selfridge AFB, Michigan	EADF	30th	661	DC
21	Lockport AFS, New York	EADF	30th	763	DC
24	Cut Bank AFS, Montana	CADF	29th	681	DC
25	Havre AFS, Montana	CADF	29th	778	DC
26	Opheim AFS, Montana	CADF	29th	779	DC
27	Fortuna AFS, North Dakota	CADF	29th	780	DC
28	Minot AFS, North Dakota	CADF	29th	786	DC
29	Finley AFS, North Dakota	CADF	31st	785	DC
30	Benton AFS, Pennsylvania	EADF	26th	648	DC
31	Williams Bay AFS, Wisconsin	EADF	37th	755	DC
32	Condon AFS, Oregon	WADF	9th	636	DC
33	Klamath AFS, California	WADF	28th	777	DC
34	Empire AFS, Michigan	EADF	37th	752	DC
35	Osceola AFS, Wisconsin	CADF	31st	674	DC
37	Pt. Arena AFS, California	WADF	28th	776	DC
38	Mill Valley AFS, California	WADF	28th	666	DC
39	San Clemente I., AFS, California	WADF	27th	670	DC
40	Othello AFS, Washington	WADF	9th	637	DC
42	Lake City AFS, Tennessee	EADF	85th	663	DC
43	Guthrie AFS, West Virginia	EADF	85th	783	DC
44	Neah Bay AFS, Washington	WADF	25th	758	DC
45	Montauk AFS, New York	EADF	26th	773	DC
46	Blaine AFS, Washington	WADF	25th	757	DC
47	Hutchinson AFS, Kansas	CADF	20th	793	DC
49	Watertown AFS, New York	EADF	32nd	655	DC

No.	Location	Defense Force	Air Div	Sqdn No.	Function
50	Saratoga AFS, New York	EADF	26th	696	DC
51	Moriarty AFS, New Mexico	CADF	34th	768	DC
52	Oklahoma City AFS, Oklahoma	CADF	33rd	746	DC
53	Rockville AFS, Indiana	EADF	58th	792	DC
54	Palermo AFS, New Jersey	EADF	26th	770	DC
55	Quantico AFS, Virginia	EADF	85th	647	DC
56	Cape Charles AFS, Virginia	EADF	85th	771	DC
57	Naselle AFS, Washington	WADF	25th	739	DC
58	Mather AFB, California	WADF	28th	668	DC
59	Boron AFS, California	WADF	27th	750	DC
60	Colville AFS, Washington	WADF	9th	760	DC
61	Fort Austin AFS, Michigan	EADF	30th	754	DC
62	Brookfield AFS, Ohio	EADF	30th	662	DC
63	Claysburg AFS, Pennsylvania	EADF	30th	772	DC
64	Kirkville AFS, Missouri	CADF	20th	790	DC
65	Charleston AFS, Maine	EADF	32nd	765	DC
66	Sault Ste. Marie AFS, Michigan	EADF	37th	753	DC
67	Custer AFS, Michigan	EADF	30th	781	DC
68	Fordland AFS, Missouri	CADF	20th	777	DC
69	Finland AFS, Minnesota	CADF	20th	756	DC
70	Belleville AFS, Illinois	CADF	20th	798	DC
71	Omaha AFS, Nebraska	CADF	20th	789	DC
72	Olathe AFS, Kansas	CADF	20th	738	DC
73	Bellefontaine AFS, Ohio	EADF	85th	664	DC
74	Mather AFB, California	WADF	28th	668	DC
75	Lackland AFB, Texas	CADF	33rd	741	DC
76	Mt. Laguna AFS, California	WADF	27th	751	DC
77	Bartlesville AFS, Oklahoma	CADF	20th	796	DC
78	Duncanville AFS, Texas	CADF	33rd	745	DC
79	Ellington AFB, Texas	CADF	33rd	747	DC
80	Caswell AFS, Maine	EADF	32nd	766	DC
81	Waverly AFS, Iowa	CADF	20th	788	DC
82	Snow Mountain AFS, Kentucky	EADF	58th	784	DC
85	Hanna City AFS, Illinois	CADF	20th	791	DC

MOBILE PROGRAM RADARS

88	Amarillo AFB, Texas	CADF	33rd	688	DC
89	Sweetwater AFS, Texas	CADF	33rd	683	DC
90	Walker AFB, New Mexico	CADF	34th	686	DC
91	Texarkana AFS, Arkansas	CADF	33rd	703	DC
92	Mt. Lemmon AFS, Arizona	CADF	34th	684	DC
93	Winslow AFS, Arizona	CADF	34th	904	DC
94	West Mesa AFS, New Mexico	CADF	34th	687	DC
95	Las Cruces AFS, New Mexico	CADF	34th	685	DC
97	Ellsworth AFB, South Dakota	CADF	29th	740	DC
98	Miles City AFS, Montana	CADF	29th	902	DC
99	Gettysburg AFS, South Dakota	CADF	31st	903	DC

Site No.	Location	Defense Force	Air Div	Sqdn No.	Function
100	Mt. Hebo AFS, Oregon	WADF	25th	689	DC
103	North Concord AFS, Vermont	EADF	32nd	911	DC
110	Bucks Harbor AFS, Maine	EADF	32nd	907	DC
111	Marietta AFS, Georgia	EADF	35th	908	DC
112	Hunter AFB, Georgia	EADF	35th	702	DC
113	No. Charleston AFS, South Carolina	EADF	35th	792	DC
115	Fort Fisher AFS, North Carolina	EADF	85th	701	DC
117	Roanoke Rapids AFS, North Carolina	EADF	85th	632	DC
118	Burns AFS, Oregon	WADF	9th	634	DC
121	Bedford AFS, Virginia	EADF	85th	643	DC
125	England AFB, Louisiana	CADF	33rd	653	DC
126	Houma NAS, Louisiana	EADF	35th	657	DC
127	Winnemucca AFS, Nevada	WADF	28th	658	DC
128	Kingman AFS, Arizona	WADF	27th	659	DC
129	MacDill AFB, Florida	EADF	35th	660	DC
130	Winston Salem AFS, North Carolina	EADF	85th	810	DC
138	Grand Rapids, Minnesota	CADF	31st	707	DC
139	Willmar AFS, Minnesota	CADF	31st	721	DC
143	Walnut Ridge AFS, Arkansas	CADF	20th	725	DC
145	Joelton AFS, Tennessee	EADF	58th	799	DC
147	Malstrom AFB, Montana	CADF	29th	801	DC
156	Fallon, Nevada	WADF	28th	858	DC
157	Red Bluff AFS, California	WADF	28th	859	DC
159	Aiken AFS, South Carolina	EADF	35th	861	DC
162	Vincent AFB, Arizona	WADF	27th	864	DC
163	Las Vegas AFS, Nevada	WADF	27th	865	DC
164	Tonopah AFS, Nevada	WADF	28th	866	DC
165	Flintstone AFS, Georgia	EADF	58th	867	DC
193	Tyndall AFB, Florida	EADF	35th	678	CC

GAP FILLER RADARS

P-9A	Gibbstown, New Jersey	EADF	26th	646	
P-10A	Westboro, Massachusetts	EADF	26th	762	
P-10B	Ft. Dearborn, New Hampshire	EADF	26th	762	
P-12A	Port Orford, Oregon	WADF	25th	761	
P-13A	Sedgewick, Maine	EADF	32nd	654	
P-20A	Burnside, Michigan	EADF	30th	661	
P-21A	Brockport, New York	EADF	30th	763	
P-21B	Charlotte Center, New York	EADF	30th	763	
P-24A	Browning, Montana	CADF	29th	681	
P-24C	Oppegard, Montana	CADF	29th	681	
P-25A	Galeta, Montana	CADF	29th	778	
P-25B	Hoyleland, Montana	CADF	29th	778	
P-26A	Whitewater, Montana	CADF	29th	779	
P-27A	Whitehall, Montana	CADF	29th	780	
P-28A	Nisota, North Dakota	CADF	29th	786	
P-29A	Siyanenne, North Dakota	CADF	31st	785	

Site No.	Location	Defense Force	Air Div	Sqdn No.	Function
P-29E	Grafton, North Dakota	CADF	31st	785	
P-30F	Ulysses, Pennsylvania	EADF	26th	648	
P-33A	Capetown, California	WADF	28th	777	
P-34A	Petoskey, Michigan	EADF	37th	752	
P-35B	Northfield, Minnesota	CADF	31st	674	
P-45A	Manorville, New York	EADF	26th	773	
P-45B	Chilmark, Massachusetts	EADF	26th	773	
P-49A	Suttons Corner, New York	EADF	32nd	655	
P-50A	New Preston, Connecticut	EADF	26th	656	
P-50E	New Salem, Massachusetts	EADF	26th	656	
P-55B	Hermanville, Maryland	EADF	85th	647	
P-55D	Hanover, Pennsylvania	EADF	85th	647	
P-56A	Temperanceville, Virginia	EADF	85th	771	
P-56B	Bethany Beach, Delaware	EADF	85th	771	
P-56C	Elizabeth City, North Carolina	EADF	85th	771	
P-62B	Lewisville, Ohio	EADF	30th	662	
P-67A	Midland, Michigan	EADF	30th	781	
P-69C	Askov, Minnesota	CADF	31st	756	
P-76A	Tecate, California	WADF	27th	751	
P-76D	Coyote Wells, California	WADF	27th	864	
P-77A	Ottawa, Oklahoma	CADF	20th	796	
M-90A	Orla, Texas	CADF	34th	686	
M-95A	El Paso, Texas	CADF	34th	685	
M-95B	Columbus, New Mexico	CADF	34th	685	
M-126A	New Orleans, Louisiana	EADF	35th	657	

SOURCE: ADC ACW Summary and Station Reports (2-AF-V20) of 31 Oct; 30 Nov; and 31 December 1957

APPENDIX II

RCAF ADC ACW STATIONS  
Data as of 31 December 1957

SITE	LOCATION	UNIT	RADAR	FUNCTION	SECTOR
C-1	Mont Spies	12 ACW Sq	CPS-6B EW Kit CPS-6B	GCI	1 ADCC
C-2	Isle St. Denis	1 ADCC		ADCC	
C-2	Isle St. Denis	11 ACW Sq	CPS-6B CPS-6B	GCI	1 ADCC
C-3	Foymount	32 ACW Sq	FPS-3 FPS-6 TPS-501	GCI	3 ADCC
C-4	Edgar	3 ADCC		ADCC	
C-4	Edgar	31 ACW Sq	FPS-3 FPS-6 TPS-501	GCI	3 ADCC
C-5	St Margarets	2 ADCC		ADCC	
C-5	St Margarets	21 ACW Sq	FPS-3 FPS-6 TPS-501	GCI	2 ADCC
C-6	St Sylvestre	13 ACW Sq	CPS-6B EW Kit CPS-6B FPS-502 TPS-502	GCI	1 ADCC
C-7	Parent	14 ACW Sq	FPS-3 FPS-6 TPS-501	GCI	3 ADCC
C-8	Senneterre	34 ACW Sq	FPS-3 FPS-6 TPS-501	GCI	3 ADCC
C-9	Falconbridge	33 ACW Sq	FPS-3 FPS-6 TPS-501	GCI	3 ADCC
C-10*	Remore	912 ACW Sq	FPS-3 TPS-502 FPS-502	EW	3 ADCC



SITE	LOCATION	UNIT	RADAR	FUNCTION	SECTOR
C-11	Beaver Bank	22 ACW Sq	CPS-6B EW Kit CPS-6B FPS-502 TPS-502	GCI	2 ADCC
C-14*	Pagwa	913 ACW Sq	FPS-3 TPS-502 FPS-502	EW	37 Air Div.
C-15*	Armstrong	914 ACW Sq	FPS-3 TPS-502 FPS-502	EW	37 Air Div.
C-16*	Sioux Lookout	915 ACW Sq	FPS-3 TPS-502 FPS-502	EW	31 Air Div.
C-17*	Beausejour	916 ACW Sq	FPS-3 TPS-502 FPS-502	EW	31 Air Div.
C-18	Holberg	53 ACW Sq	FPS-3 TPS-502	GCI	5 Air Div.
C-19*	Puntzi Mt.	917 ACW Sq	FPS-3 TPS-502 FPS-502	EW	5 Air Div.
C-20*	Baldy Hughes	918 ACW Sq	FPS-3 TPS-502 FPS-502	EW	5 Air Div.
C-21*	Saskatoon Mt.	919 ACW Sq	FPS-3 TPS-502 FPS-502	EW	5 Air Div.
C-33	Moisie	211 ACW Sq	FPS-3 TPS-502 FPS-502	EW	2 ADCC
C-34	Sydney	221 ACW Sq	FPS-3 TPS-502 FPS-502	EW	2 ADCC
C-35	Comox	51 ACW Sq	CPS-5D (Interim) TPS-502 FPS-502	GCI	5 Air Div

SITE	LOCATION	UNIT	RADAR	FUNCTION	SECTOR
C-36**	Tofino	52 ACW Sq	CPS-5D(Interim) CPS-502 TPS-502	EW	5 Air Div.
	Vancouver	5 AD COC		ADCC	
	St. Hubert	COC		COC	

\* USAF Manned  
 \*\* Tofino started phasing out of the Canadian System in October; in December the station had been completely closed out.

SOURCE: RCAF ADC Air Defence Command Data and Program Book, 1 Oct 1957;  
 USAF ADC, ACW Status Report (2-AF-V2C), 31 December 1957.

APPENDIX III

USAF ADC FIGHTER - INTERCEPTOR SQUADRONS  
As of 30 December 1951

ADC Div	Sqdn	Location	Base Assign	Type Acft	Acft		Crews		
					Asgd	Opr Rdy	Asgd	Opr Rdy	
EASTERN AIR DEFENSE FORCE									
26th	2	Suffolk	ADC	F-102A	26	12	32	1	
	5	Suffolk	ADC	F-102A	25	12	27	0	
	46	Dover	MATS	F-94C	23	17	30	10	
	49	Hinscom	ARDC	F-86L	25	14	26	11	
	58	Otis	ADC	F-89J	24	16	29	23	
	60	Otis	ADC	F-94C	23	16	34	30	
	*26								
	*97								
	98	Dover	MATS	F-89J	25	17	29	0	
	324	Westover	SAC	F-86L	24	17	28	25	
	330	Stewart	ADC	F-86L	25	17	39	16	
331	Stewart	ADC	F-86L	25	16	37	24		
332	McGuire	MATS	F-102A	23	4	29	0		
337	Westover	SAC	F-86L	24	17	25	7		
539	McGuire	MATS	F-86L	23	10	29	19		
30th	42	Greater Pitt			----- Negative due to inactivation -----				
	47	Niagara Falls	ADC	F-86L	28	15	29	22	
	71	Selfridge	ADC	F-86L	28	21	36	26	
	86	Youngstown	ADC	F-102A	19	5	45	0	
	94	Selfridge	ADC	F-86L	28	21	29	24	
	445	Wurtsmith	ADC	F-89J	25	16	27	0	
	18	Wurtsmith	ADC	F-102A	8	0	28	0	
32nd	27	Griffis	AMC	F-94C	1	1	0	0	
				F-102A	22	11	29	0	
	37	Ethan Allen	ADC	F-102A	4	3	0	0	
				F-86D	8	7	31	20	
	75	Presque Isle	ADC	F-89H	28	18	26	23	
	76	Pinecastle	ADC	F-89H	28	10	26	0	
465	Griffis	AMC	F-89J	26	16	30	24		
35th	444	Charleston	MATS	F-86L	28	21	34	28	
37th	62	O'Hare	ADC	F-86L	17	10	45	32	
	*63	O'Hare	ADC	F-86L	17	9	0	0	
	325	Truax	ADC	F-102A	25	15	26	4	
	61	Truax	ADC	F-102A	25	15	19	0	
	438	Kinross	ADC	F-89D	23	16	26	21	
	484	K. I. Sawyer	ADC	No aircraft and/or aircrews assigned					

Air Div	Sqn	Location	Base Asgmt	Type Acft	Acft		Crews	
					Asgd	Op'r Rdy	Asgd	Op'r Rdy
58th	56	Wright-Patt	AMC	F-86L	28	19	39	32
	87	Lockbourne	SAC	F-36L	28	13	36	29
	319	Banker Hill	TAC	F-89J	26	14	28	21
	*354	McGhee-Tyson						
	*469	McGhee-Tyson						
89th	48	Langley	TAC	F-102A	25	11	39	0
	95	Andrews	MATS	F-86L	14	7	36	23
	482	Seymour-Johnson	TAC	F-102A	19	13	19	0
CENTRAL AIR DEFENSE FORCE								
20th	13	Sioux City	ADC	F-86L	24	13	31	22
	14	Sioux City	ADC	F-86L	23	12	32	27
	65	Richards-Gebaur	ADC	No aircraft and/or aircrews assigned				
	85	Scott	ATC	F-86L	25	14	35	29
	326	Richards-Gebaur	ADC	F-102A	24	9	25	24
29th	29	Malmstrom	SAC	F-89H	13	6	28	23
	54	Ellsworth	SAC	F-89J	7	0	24	0
31st	11	Duluth	ADC	F-102A	17	11	25	5
	**432	Minn-St. Paul	ADC	F-89H	1	0	8	4
33rd		None						
34th	15	Davis-Monthan	SAC	F-86L	20	10	33	25
	93	Kirtland	ARDC	F-86L	9	4	29	21
	433	Minot	ADC	No aircraft and/or aircrews assigned				
WESTERN AIR DEFENSE FORCE								
9th	322	Larson	TAC	F-86L	23	16	33	30
	497	Geiger	ADC	F-86D	28	17	31	27
	498	Geiger	ADC	F-102A	22	11	29	19
	538	Larson	TAC	F-86L	21	13	29	24
25th	64	McChord	ADC	F-102A	24	6	30	0
	318	McChord	ADC	F-102A	25	7	31	9
	321	Paine	ADC	F-89H	2	1	0	0
				F-89J	28	19	26	20
	460	Portland	ADC	F-89D	23	15	28	25
27th	66	Oxnard	ADC	No aircraft and/or aircrews assigned				
	327	George	TAC	F-102A	18	14	22	20
	329	George	TAC	F-86L	24	21	32	28
	437	Oxnard	ADC	F-89H	6	5	0	0
				F-89J	24	19	29	25



Air Div	Sgdn	Location	Base Asgmt	Type Acft	Acft		Crews	
					Asgd	Opr Rdy	Asgd	Opr Rdy
28th	82	Travis	SAC	F-102A	24	15	29	0
	83	Hamilton	ADC	F-86L	18	12	25	19
	84	Hamilton	ADC	F-89J	28	20	30	23
	456	Castle	SAC	F-86L	27	19	31	23
	518	Klamath Falls	ADC	No aircraft and/or aircrews assigned				

64th AIR DIVISION (DEFENSE)

	59	Goose	SAC	F-89J	29	18	21	15
	74	Thule	SAC	F-89D	11	11	16	16
	323	Harmon	SAC	F-102A	25	17	25	12

- \* Preparing for inactivation in January 1958
- \*\* Preparing for transfer to CONAC in January 1958



[REDACTED]

APPENDIX IV

RCAF ADC FIGHTER - INTERCEPTOR SQUADRONS  
As of 1 October 1957

Air Div/ADCC	Sqn	Location	Type Acft	Aircraft		Crews	
				*Estab	Asgd	Estab	Asgd
1 ADCC	416	St. Hubert	CF100 MK 3D CF100 MK5	2 18	2 18	27	27
	425	St. Hubert	CF100 MK 3D CF100 MK5	2 18	2 18	27	24
	413	Bagotville	CF100 MK 3D CF100 MK5	2 18	2 18	27	27
	432	Bagotville	CF100 MK 3D CF100 MK5	2 18	2 18	27	25
3 ADCC	410	Uplands	CF100 MK 3D CF100 MK5	2 18	2 18	27	25
	428	Uplands	CF100 MK 3D CF100 MK5	2 18	2 18	27	26
	414	North Bay	CF100 MK 3D CF100 MK5	2 18	2 18	27	26
	433	North Bay	CF100 MK 3D CF100 MK5	2 18	2 18	27	25
5th Air Div	409	Comox	CF100 MK 3D	2	2	27	26

[REDACTED]



Air Div/ADCC	Sqdn	Location	Type Acft	Aircraft		Crews	
				*Estab	Asgd	Estab	Asgd
5th Air Div (cont)	409	Comox	CF100 MK5	18	18		

\*Authorized

SOURCE: RCAF ADC, Air Defence Command Data and Program Book, 1 October 1957



## APPENDIX V

KEY PERSONNEL - HEADQUARTERS NORAD  
December 1957

Commander-in-Chief General E. E. Partridge, USAF	DCS/Plans and Operations (cont.) Director/Plans and Requirements Brig. Gen. A. J. Pierce, USAF
Deputy Commander-in-Chief Air Marshal C. R. Slemon, RCAF	Asst. Director Col. W. H. Murray, USA G/C G. S. Austin, RCAF
Chief of Staff Maj. Gen. M. S. Carter, USA	Ch, Requirements Division Capt. G. W. Snider, USN
Asst. Chief of Staff and Secretary Col. C. H. Scott, Jr., USAF	Ch, Policy and Programs Division Col. R. T. Carlisle, USAF
Director of Administrative Svs. Lt. Col. W. J. Birmele, USAF	Ch, Plans Division Col. J. F. Kirkendall, USAF
Asst. Secretary Audio-Visual Svs. Lt. Col. R. A. Bassler, USAF	Director of Operations Col. J. H. Jeffus, USAF
Asst. Secretary Protocol Maj. J. J. Costello, USAF	Asst. Director Col. L. R. Seibert, USMC
Command Information Services Officer Col. A. B. Oldfield, USAF	Ch, Training and Exercise Division Col. R. S. Dingle, Jr., USA
Asst. Command Info Svs. Officer Lt. Col. C. E. Towme, USA	Ch, Tactics and Techniques Division Col. H. B. Allen, USAF
Director of Special Projects Cdr. J. R. English, USN	Director of Operational Evaluation Capt. N. H. Head, USN
Chief Press Branch Maj. C. H. Franks, USAF	Director of Combat Operations Center Col. H. W. Shoup, USAF
Chief Radio/TV Branch Maj. M. S. Azzolina, USAF	Asst. Director Cdr. J. W. Lawyer, USN Lt. Col. L. H. Tyree, USA
Director of Command History Mr. L. H. Buss	Plans and Evaluation Officer Maj. M. D. Surratt, USAF
DCS/Plans and Operations Maj. Gen. H. T. Alness, USAF	Ch, Combat Reporting Center Capt. K. O. Butler, USAF
Asst. DCS/P&O Brig. Gen. T. V. Stayton, USA Capt. E. Tatom, USN	



DCS/Plans and Operations (cont.)

Director of Plans Analysis  
Col. E. H. Callahan, USAF

Executive Officer  
Lt. Col. K. K. Howenstine, USAF

Ch, Feasibility Division  
Col. O. K. Marshall, USA

Ch, War Gaming Division  
Cdr. H. R. Nylund, USN

Director of Operations Analysis  
Mr. P. S. Ball, Jr.

Asst. Director  
Dr. R. H. Jordan

Ch, Electronics Division  
Mr. R. E. Donegan, Jr.

Ch, Ident. & Raid Recognition Div.  
Dr. R. H. Jordan

Ch, Interceptor & Missile Division  
Mr. E. C. Helfrich

Ch, Systems Analysis Division  
Mr. R. H. Blythe, Jr.

DCS/Communications and Electronics  
Brig. Gen. F. F. Uhrhane, USA

Asst. DCS/C&E  
Col. P. H. Long, USAF

Director of Electronics Warfare  
Col. O. W. Miller, USAF

Ch, Electronics Warfare Division  
Lt. Col. M. E. Wardell, USAF

Ch, Emission Control Division  
Lt. Col. J. A. Gahr, USA

Director of Plans and Requirements  
Lt. Col. D. G. Roath, USAF

Ch, Operational Rgmts. Division  
Maj. D. L. Faulkner, USAF

DCS/Communications & Electronics (cont.)

Director of Systems  
Lt. Col. F. K. Nichols, USAF

Ch, Electronics Division  
Maj. W. R. Goodrich, Jr., USAF

Ch, Communications Division  
Lt. Col. K. N. Keyte, USAF

DCS/Intelligence  
Brig. Gen. R. Taylor, 3d, USAF

Asst. DCS/I  
Capt. J. E. Lang, USN  
Col. R. Totten, USAF

Special Asst. to DCS/I  
Col. H. C. Brown, Jr., USAF

Executive  
Lt. Col. E. C. Rowe, USAF

Director Collection and Dissemination  
Col. J. D. Hand, USA

Ch, Collection Service Division  
Maj. R. P. Reinsch, USAF

Ch, Publication & Dissemination Div.  
Capt. W. N. Wilson, USAF

Director of Research and Estimate  
Col. M. R. Graham, USAF

Asst. Director  
Lt. Col. A. J. Roman, USA

Ch, Estimates Division  
Lt. Col. J. M. Mooneyham, USAF

Ch, Technical Division  
Lt. Col. J. N. Young, USAF

Ch, Military Capabilities Division  
Lt. Col. T. S. Ryan, USAF

Director of Operational Intelligence  
Col. J. F. Setchell, USAF

Asst. Director  
Cdr. T. C. Schaible, USN

Dir. of Operational Intelligence (cont.)

Ch. Intelligence Watch Division  
Lt. Col. W. F. Zeller, USAF

Ch, Combat Intelligence Division  
Lt. Col. C. E. Becker, USAF

Ch, Procedures Branch  
Maj. A. B. Harper, USAF

Ch, Systems Analysis Branch  
Capt. J. D. Fletcher, USAF

HEADQUARTERS AIR DEFENSE COMMAND

COMMANDER  
Lt. Gen. J. H. Atkinson

HEADQUARTERS ARMY AIR DEFENSE COMMAND

COMMANDING GENERAL  
Lt. Gen. C. E. Hart

HEADQUARTERS NAVAL FORCES CONAD

COMMANDER  
RADM W. F. Rodee

HEADQUARTERS RCAF AIR DEFENCE COMMAND

COMMANDER  
Air Vice Marshal L. E. Wray

RCAF PLANNING LIAISON STAFF

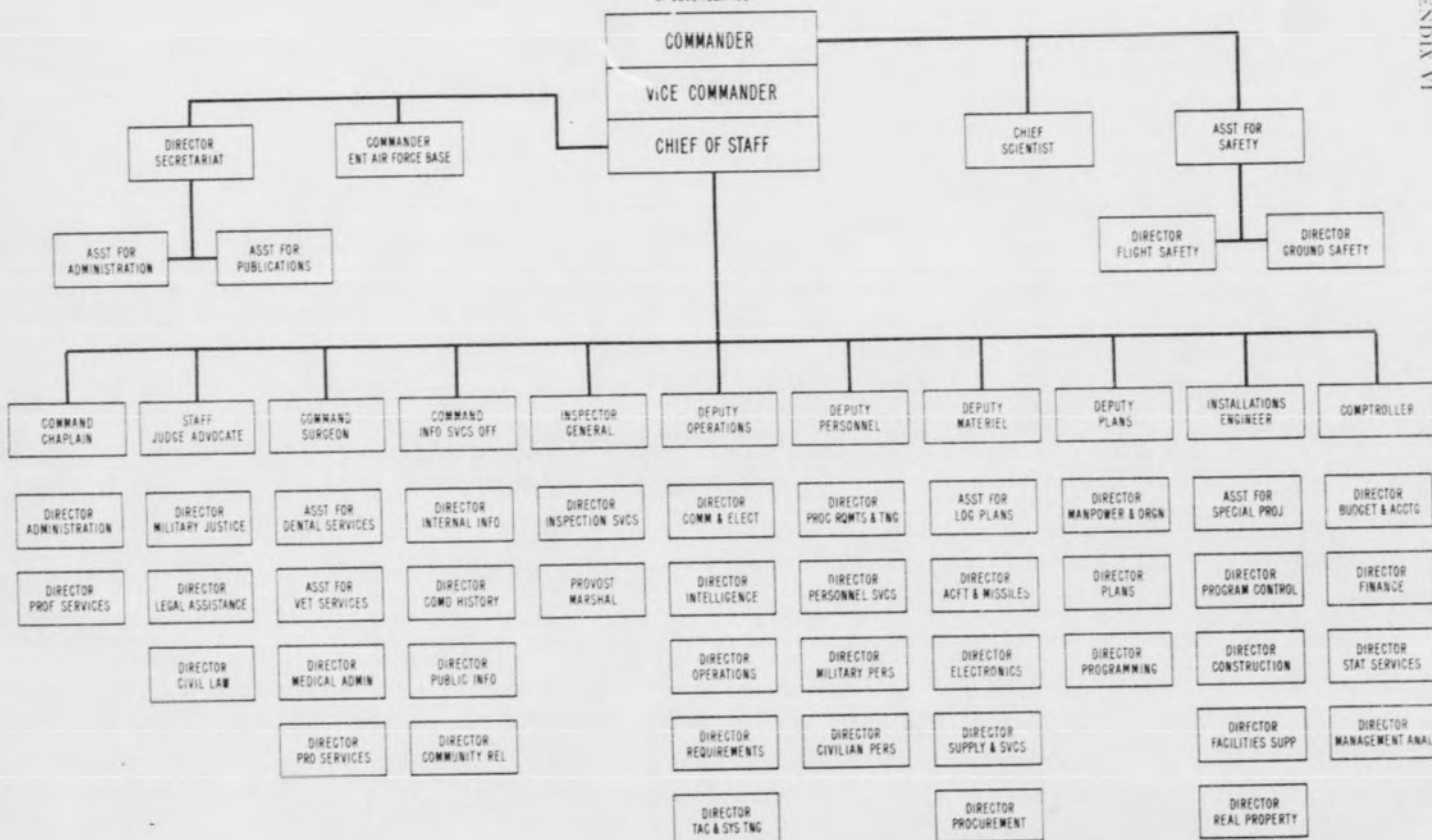
SENIOR PLANNING LIAISON OFFICER  
Group Captain G. S. Austin

# HEADQUARTERS USAF AIR DEFENSE COMMAND

## ORGANIZATIONAL CHART

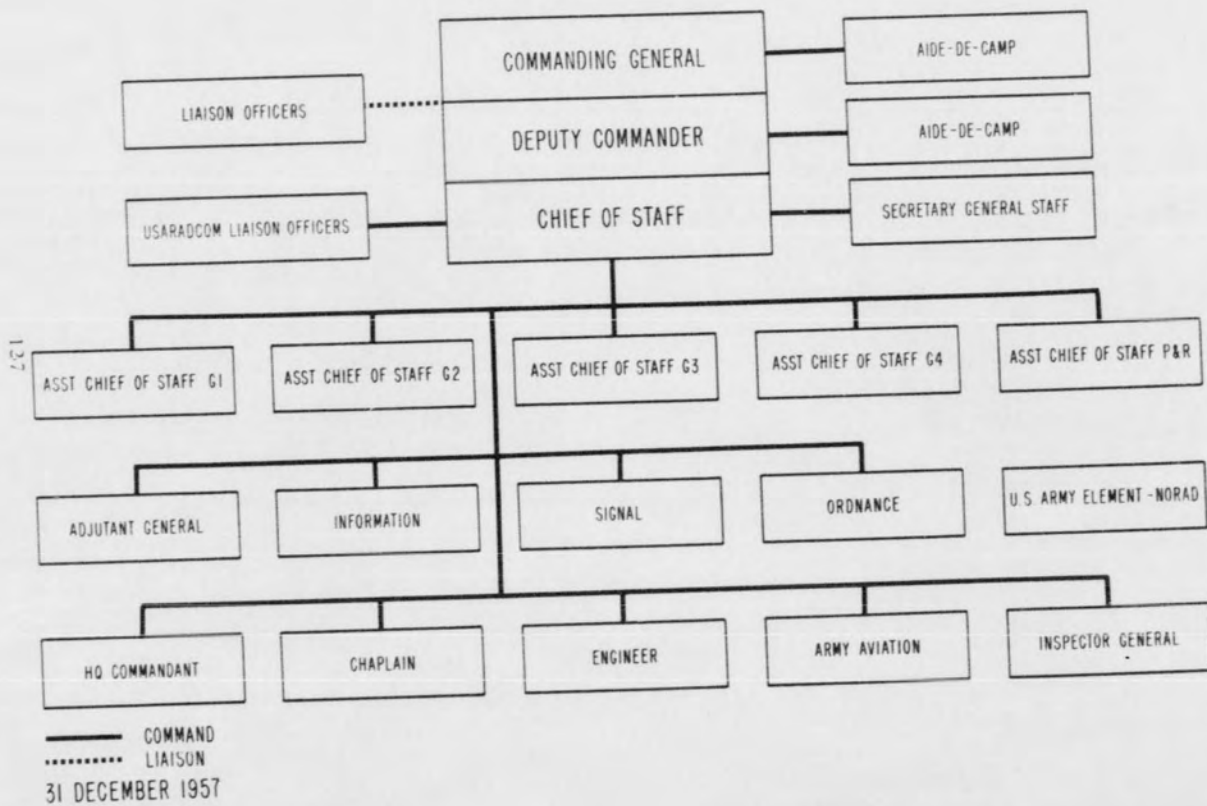
31 DECEMBER 1957

APPENDIX VI



# HEADQUARTERS UNITED STATES ARMY AIR DEFENSE COMMAND

## ORGANIZATIONAL CHART

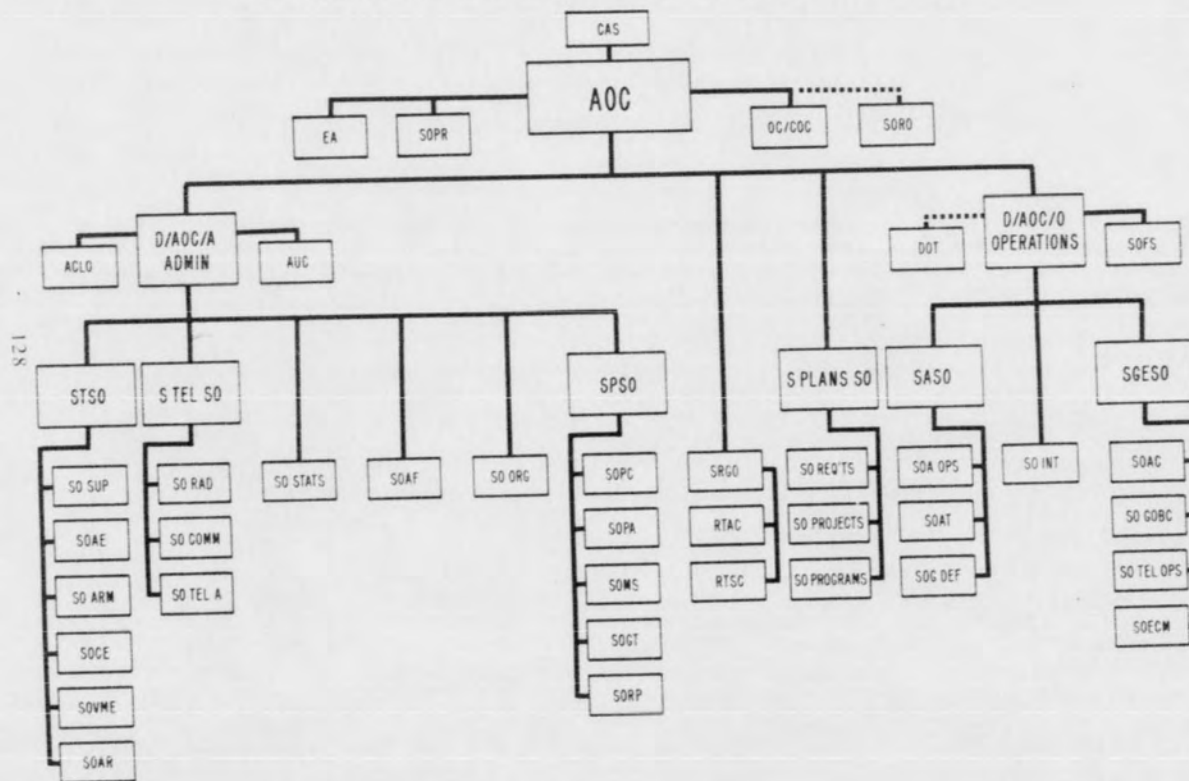


APPENDIX VIII

CONFIDENTIAL

# HEADQUARTERS CANADIAN AIR DEFENCE COMMAND

APPENDIX VIII



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31 DECEMBER 1957

CONFIDENTIAL

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