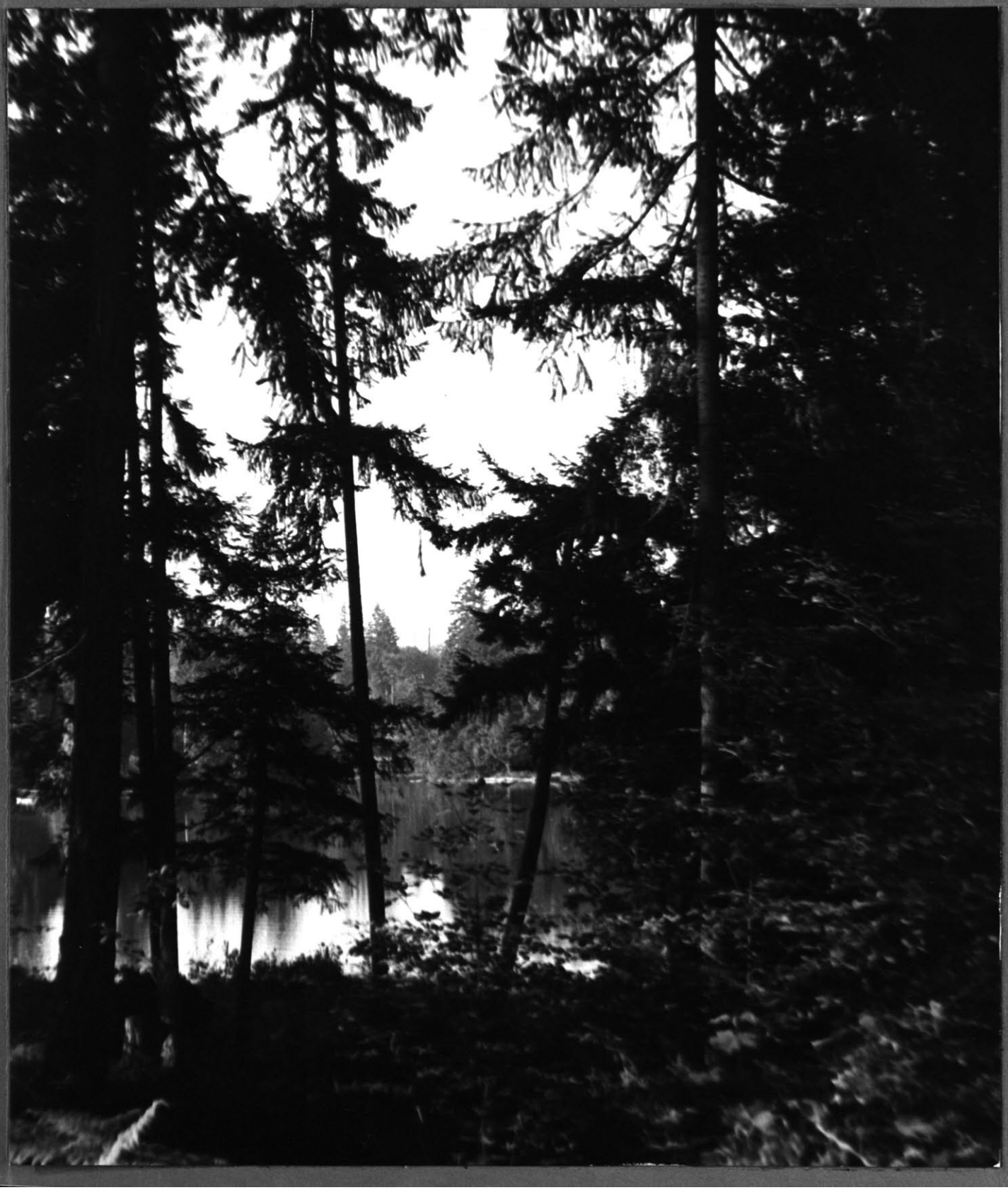
A THEORETICAL DESIGN OF THE UNITED STATES AIR FORCE ACADEMY

A thesis submitted in partial fulfillment of the requirements for the degree of Master in Architecture at Massachusetts Institute of Technology

Submitted: 18 January 1954

By: _____
Robert E. McConnell
B.Arch.E., Washington State College

To: _____
Lawrence B. Anderson
Head, Department of Architecture
M.I.T.



arch - June 3 1954

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55 Orchard Street
Cambridge 40, Massachusetts
18 January 1953

Dean Pietro Belluschi
School of Architecture and Planning
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Dear Dean Belluschi:

In partial fulfillment of the requirements for the degree of Master in Architecture, I herewith respectfully submit my thesis entitled: "A Theoretical Design of the United States Air Force Academy".

Sincerely Yours,

Robert E. McConnell
B. Arch. E.,
Washington State College

ABSTRACT

A THEORETICAL DESIGN OF
THE UNITED STATES AIR FORCE ACADEMY

Robert E. McConnell

A thesis submitted in partial
fulfillment of the requirements
for the degree of Master in
Architecture at Massachusetts
Institute of Technology

Since the creation of the Department of the Air Force by the National Security Act of 1947, the Air Force has looked forward to the day when a military academy might be established to train America's young men for positions of leadership in the air. As Congress reconvenes in January of 1954, a bill (H. R. 2328) will be placed before the nation's legislators to authorize the establishment of The United States Air Force Academy. The reader is cautioned to remember that the actual selection of an academy site and the development of a campus is entirely dependent upon congressional action.

This thesis deals with a theoretical architectural development of the United States Air Force Academy. With the kind permission of the Air Force, the use of the Lake Sawyer site

and the development of the Academy in this thesis affords an incomparable opportunity to explore the problems of developing a campus.

Limits of time and money have forced restriction of detailed designing to one structure: a general purpose classroom building and lecture hall for the Humanities; however, in the study and presentation of this structure, basic philosophies have been established that would guide the design of all academy structures.

Full understanding of the philosophies must come from the same progression of thought that derived them. The following text describes that progression of thought.

Basically, this presentation of an Air Academy is of an environment designed for "education" in its broadest sense.

Acknowledgement must be made to the following persons and groups whose aid and criticism have made this thesis a more thorough document.

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New London, Connecticut

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United States Military Academy
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King County Commissioner's
James A. Gibbs, Chairman
William H. Sears, South District
Dean C. McLean, North District

Washington State Highway Department
George F. Shearer, District Engineer

King County Planning Commission
Edgar J. Wright, Chairman
John L. Nordmark, Director

Seattle City Council
David F. Levine, President
Clarence F. Massart, Councilman

DEDICATION

TO:

My wife, Bev, for her important criticisms, tireless typing, and understanding patience.

My family in Washington for their constant encouragement, endless faith, and guiding examples.

A THEORETICAL DESIGN OF
THE UNITED STATES AIR FORCE ACADEMY

The following insert is House of Representatives Bill No. 2328, introduced in the 83rd Congress on January 29, 1953, "to provide for the establishment of a United States Air Force Academy..." This Bill is scheduled to be acted upon by the Armed Services Committee of the House of Representatives during the current Congress.

In the interest of the Air Force, it is emphasized (and will be stressed again and again) that this design of an Air Academy is purely theoretical, and does not imply any future Air Force action concerning the Lake Sawyer site. The area was recommended for use in this thesis since it is one of the sites considered by the Air Force as a suitable location for the Academy, and tends to make an academic problem more realistic.

83D CONGRESS
1ST SESSION

H. R. 2328

IN THE HOUSE OF REPRESENTATIVES

JANUARY 29, 1953

Mr. SHORT introduced the following bill; which was referred to the Committee on Armed Services

A BILL

To provide for the establishment of a United States Air Force Academy, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*
3 That this Act may be cited as the "Air Force Academy
4 Act".

5 SEC. 2. There is hereby established in the Department
6 of the Air Force a United States Air Force Academy,
7 hereinafter referred to as the "Academy", for the instruc-
8 tion and preparation for military service of selected persons
9 who shall be known as Air Force cadets.

10 SEC. 3 (a) The academy shall be located at such place
11 within the United States as the Secretary of the Air Force

1 shall determine. The Secretary of the Air Force is author-
2 ized to establish a commission, and to appoint the members
3 thereof, to advise him in connection with the selection of a
4 permanent location for the Academy.

5 (b) Following the selection of a permanent location for
6 the Academy, the Secretary of the Air Force is authorized—

7 (1) to acquire land from other Government agen-
8 cies without reimbursement, with the consent of such
9 agencies;

10 (2) to acquire lands and rights pertaining thereto,
11 or other interests therein, including the temporary use
12 thereof, by donation, purchase, exchange of Government-
13 owned lands, or otherwise, without regard to section
14 3648, Revised Statutes, as amended; and

15 (3) to prepare plans, specifications and designs, to
16 make surveys and to do all other preparatory work, by
17 contract or otherwise, as he deems necessary or advisable
18 in connection with the construction, equipping and
19 organization of the Academy at such permanent location.

20 SEC. 4. For the purpose of providing temporary facilities
21 and enabling early operation of the Academy, the Secretary
22 of the Air Force is authorized to utilize, with the consent of
23 the agencies concerned, any available site owned by the
24 United States; to rent such lands, buildings, appurtenances,
25 and facilities as he may deem necessary, without regard to

1 section 3648 of the Revised Statutes, as amended, to provide
2 for the erection of the minimum additional number of tempo-
3 rary buildings and the modification of existing structures and
4 facilities; to provide for the proper functioning, equipping,
5 maintaining, and repairing thereof; and to contract with
6 civilian institutions for such operation or instruction as he
7 may deem necessary.

8 SEC. 5. All appropriate provisions of law, not incon-
9 sistent with the purposes of this Act, which pertain to the
10 United States Military Academy shall, by the authority of
11 this section, also pertain to the United States Air Force
12 Academy. All references in these laws to the Secretary of
13 the Army, the Army, or any officer or agency thereof shall,
14 in pertaining to the Air Force Academy, be construed as re-
15 ferring, respectively, to the Secretary of the Air Force, the
16 Air Force, and such officers and agencies of the Air Force
17 as he may designate. The organization of the Air Force
18 Academy shall be prescribed by the Secretary of the Air
19 Force. In order to permit an orderly increase in the num-
20 ber of Air Force cadets, the Secretary of the Air Force may,
21 by means of competitive examinations, limit the number to
22 be appointed annually.

23 SEC. 6. For the purpose of accelerating the establish-
24 ment of the course of instruction and initial activation of the
25 Academy, the Secretary of the Air Force is authorized to

1 transfer to the Academy during its initial year of operation,
2 with the consent of the individuals and departments con-
3 cerned, cadets and midshipmen from the upper classes of
4 the United States Military Academy and the United States
5 Naval Academy.

6 SEC. 7. There is authorized to be appropriated, to remain
7 available until expended when so specified in the appro-
8 priation Act concerned, (a) not to exceed $10,000,000
9 for the purpose of section 3 of this Act, and (b) not to
10 exceed $10,000,000 for the erection of buildings and the
11 modification of existing structures and facilities as authorized
12 by section 4 of this Act.

83D CONGRESS
1ST SESSION

H. R. 2328

A BILL

To provide for the establishment of a United States Air Force Academy, and for other purposes.

By Mr. SHORT

JANUARY 29, 1953
Referred to the Committee on Armed Services

HISTORY OF THE AIR ACADEMY

"The Department of the Air Force was established as an executive department in the National Military Establishment by the National Security Act of 1947 (Public Law 253, 80th Congress, 1st session), approved July 26, 1947..... The same act established the United States Air Force under the Department of the Air Force. The Department and the Air Force officially began operation on September 18, 1947"*.

In the years since then, the Air Force has expanded as American technology has advanced; today the nation's air arm is depended upon to serve as both the major offensive and defensive strength against agression. As of late 1953, it is proposed to continue to expand air power while cutting the other services.

The sources of officers for the Air Force are varied: the collegiate Reserve Officer's Training Corps, the Officer's Candidate School, and the other service academies. These sources are all highly competent, but the Air Force still lacks a source of military-trained, Air Force indoctrinated

*The United States Government Manual 1948, p.p. 194, Division of the Federal Register, The National Archives, Washington, D. C.

officers on the level of higher education. To this end, they plan for the day when there will be established a United States Air Force Academy to train the young men who will lead us faster, higher, and longer into the air than man has ever been. The hour of the Air Academy cannot be far away.

The pertinent information on the history of the Air Academy is stated breifly in an informative letter from Lt. Col. Thomas L. Sheldrake, USAF, Office of the Special Assistant for Air Force Academy Matters, in reply to my request for data on the projected plans for an academy. I quote from that letter:

"Establishment of the proposed Air Academy is dependent upon enactment of appropriate legislation by the Congress. The Department of Defense sponsored Air Academy bill was re-introduced in the House of Representatives as H. R. 2328 by the Honorable Dewey Short, Chairman of the House Armed Services Committee on 29 January 1953. This bill is identical to the Air Academy bill introduced in the 82nd Congress on 22 June 1951 by the Honorable Carl Vinson, then Chairman of the House Armed Services Committee, and contains the following provision: 'The Secretary of the Air Force is authorized to establish a commission, and to appoint the

members thereof, to advise him in connection with the selection of a permanent location for the Academy'.

"On 25 November 1949 the then Secretary of the Air Force, W. Stuart Symington, appointed an Air Force Academy Site Selection Board to study the Air Academy site question and make appropriate recommendation. Approximately 354 separate site proposals were considered by this Board during 1950 and 1951."

(Among these 354 proposals was the Lake Sawyer site, used in this thesis.) Continuing to quote from Lt. Col. Sheldrake's letter:

"However, in view of the provision in the bill introduced by Mr. Vinson in June 1951, the Board did not submit a final report and was dissolved in December 1952. Inclosed is a copy of the last announcement made by the Air Force Academy Site Selection Board." (See appendix)

Two sites were considered in the Seattle area: the site at Lake Sawyer (near Beaver Lake) and a site near Lake Sammamish. Of these two sites, the Lake Sawyer site was considered more favorably by the King County Planning Commission, Seattle, Washington. Much of the information on

Lake Sawyer included in this thesis was gathered by that Commission, and is included here with their permission, and with this writer's gratitude.

PROPOSED ACADEMY PROGRAM

Generally, the Air Academy has been planned along the lines of the existing service academies, with the curricula on a four-year basis. Lt. Col. Sheldrake's letter continues:

"Under the provisions of the present Air Academy bill the maximum enrollment of the Air Academy at full strength would be 2,496 plus certain foreign students and sons of Congressional Medal of Honor winners. For planning purposes.....the total maximum enrollment at a specific time would include 750 Freshmen, 615 Sophomores, 597 Juniors, and 585 Seniors, making a total of 2,547.

"Present planning envisages that the Air Academy will be a four year college level institution granting the BS Degree. It should not be classed as a strictly liberal arts college nor as an engineering college. The curriculum would be tailored to the specific needs of the Air Force. The curriculum is still in the process of development and has not been finalized. Of course, it will never become static..... The Science and Social-Humanistic courses appearing on the outline are close to present thinking; however, the military

(professional training) program being considered at the present time is quite different from that appearing on the outline."

"For the purposes of (this) study, you may assume that a comprehensive tactics and military training program will be interwoven throughout the four academic years and that the summer program will be composed of this type of instruction almost exclusively. The amount and type of flying training to be offered is still under discussion; however, it would be appropriate.....to assume that the cadets will participate in several aerial flights and will be given some type of flying instruction, i. e., observer training.

"It is anticipated that the academic section sizes would average approximately 14 students each. Of course in certain laboratory and lecture courses this ratio may be increased. When the academy reaches full strength, the education and training staff and faculty may include approximately 400 persons (Regular officers, Reserve Officers, and civilians)."

Selection of Cadets

The majority of appointments to service academies are controlled by members of Congress; this being a representative method of selection on a national basis. The United States Military Academy Catalogue, 1953-54, lists the allocation of sources of nomination as follows:

Sources of Nomination*

Noncompetitive:		
Representatives (4 each)		1,740
Senators (4 each).		384
Miscellaneous		
Hawaii and Alaska (4 each). . . .	8	
District of Columbia.	6	
Canal Zone Government	2	
Puerto Rico	4	
Vice Presidential	3	
Total Miscellaneous		23
Competitive:		
Army and Air Force		
Regular Components.		90
Reserve Components.		90
Presidential		89
Sons of deceased veterans.		40
Honor military and Honor naval schools .		40
Total		2,496 cadets

*Catalogue of the United States Military Academy, 1953-54, United States Government Printing Office, Washington, D. C. 1953

In addition, sons of Congressional Medal of Honor winners may be appointed, provided they are qualified, together with one Filipino cadet per year and not more than 20 cadets at a time from the Latin-American Republics and Canada. These cadets meet rigid physical and mental entrance requirements, insuring the highest quality officer product.

The complexities of the Air Academy's physical plant must be interpolated from the existing academy plants, and from the projected aims of the Air Force. This is the only satisfactory approach, although difficult at best. Approach to the design phase of the campus pattern and the individual structure must also carefully consider all characteristics of the region and the site; therefore the Northwest must be an object of study before data can be translated into architecture.

THE PACIFIC NORTHWEST

From Magellan to the close of the long period of America's discovery and exploration, Spain, Russia, France, England, Portugal, and the Netherlands all sent explorers along the rugged western coast of North America seeking the elusive Northwest Passage and the River of the West. All, at one time or another, had claims to ownership by discovery, some supported by small settlements; and many of the place names, Juan de Fuca, Bogachiel, and Fort Vancouver, reflect and are indeed almost the only remnants of the period.

As the young United States became a growing power, Thomas Jefferson looked west as well as south and sent out the Lewis and Clark expeditions; about the same time the British were surveying the 49th parallel and sending their men to establish trading posts for the Hudson's Bay Company. Dr. John McLoughlin, chief factor for Hudson's Bay and for a number of years the most urbane, hospitable, and powerful man in the Oregon Territory, presided over Fort Vancouver, one of the earliest settlements and a major trading center.

This was the time of the missionaries like Marcus Whitman,

who brought God to the Northwest. This was the time of the mountain man, who hunted and trapped and lived wild among the great peaks. This was the time of the Northwest pioneer who left the fevers of the Mississippi to travel 2000 miles through savage wilderness, arrid plains, cascading rivers and mile-high forests to the shelter of Mount Hood and Mt. Rainier in the sparkling Oregon Territory.

By the 1840's, Puget Sound was being settled - - ambitious little towns that loaded lumber on ships for transport to California, Australia, and Singapore, and much later, to gold-frenzied Alaska. Ocean trade with China, Japan, and around the Horn was going on almost before the new settlers arrived; the seas were both local and continental highways that nourished a Western Cape Cod with its Oriental and Occidental treasures.

Seattle and King County were settled about 1851, a little more than 100 years ago. The period of donation claims encouraged farmers to heed Horace Greely's famous dictum; trade with San Francisco stimulated the towns along the Sound. Lumber and then coal were sent south. The discovery of coal beds had been made as early as 1833, but lack of capital hindered development until the 1880's when the town

of Black Diamond near Lake Sawyer was founded to provide residence for the miners of a rich new coal seam. This coal seam plays an important part in the decision to locate the Air Academy at Lake Sawyer.

Meanwhile, the little town of Seattle moved from windswept Alki Point (now called West Seattle) to the more protected location of Elliot Bay, where Henry Yessler set up his sawmill. Lumber was the economic subsistence of the settlement; it was to remain so for many years. The town itself was built almost entirely of wood since the local stone was lacking and brick manufacture developed slowly. It was not surprising that Seattle had its fire as Chicago and San Francisco had theirs. The fire lasted nearly 36 hours and almost completely destroyed the town. Tacoma sent a special train with its fire-fighting equipment. Boats came from other towns to help. All the nearby towns organized relief supplies of food, tents, and clothing; and typically, as the embers cooled, the city fathers vowed to rebuild a safer, handsomer town. The lumber order couldn't wait for shipment by boat across the Sound; it went in one vast raft.

This was the time of the development of fortunes in lumber, coal, and shipping; of competition to see who could build

the most ornate and pretentious residence, and which community could attract the railroads to build their terminals and assure the economic future of the area. Booms and depressions came and went in the fast-choking East; they followed in the West. The greatest boom was the gold rush to Alaska; Seattle's struggle for supremacy over Tacoma was largely won on the supplying of the prospector's. All the picturesque types described by Robert Service (The Cremation of Sam McGee) and Jack London funneled through Seattle to the North. The gold came back; many of the prospectors never returned. The Seattle waterfront retains some of the flavor of the Alaska boom, and old-timers wistfully remember the roaring days. Seattle had the original "skidroad"; and although the streets are now paved, the skidroad remains.

Before Seattle was ten years old, there was agitation for a University. The founders cleared the land themselves and built the building east of Seattle on a ten-acre tract that is now part of the central business district. There was considerable opposition to the moving of the University to its present site (see King County Plot Plan) on the grounds that the plot was too isolated and the city would never grow that far. For some years the University of Washington was more like a secondary school, and even

elementary subjects were taught; by 1890 there were a dozen graduates each year. Now there are approximately 2,000 graduates a year, 15,000 students are enrolled, and the quality of its departments has progressed until it is on a par with the major universities of the nation. It is with the University of Washington that a friendly Air Academy rivaly should arise in athletics, debates, and other inter-collegiate activities. The instructional resources of the University will be available to the cadets of the Air Academy, both through scholastic and extra-curricular activity.

CULTURAL HERITAGE

The white man has dominated Northwest Culture for approximately 100 years. How long has it been since the Indian appeared among the rain-forests of the Cascade Range?

It is theorized that, centuries ago, primitive men fought his way across the icy Bering Strait and down the tortured Western coast of North America, each band expanding in ever-widening circles of villages, and culture. These circles spread and blanketed the Northwest with the Indian, who developed his civilization in harmony with his environment. The white man has seldom done as well in his colonization of North America.

The Northwest Indian developed skills. He was able to wrest his fiving from the sea and the forest. He was able to harpoon and kill the mighty whale. He learned to snatch salmon from waterfalls. He learned to snare the seal, and from its pelt to make clothing. He hunted deer and bear, and cooked from the berries that blanket the hills in color in the fall. He lived in harmony between the waters and the forests, and prospered.

Like all peoples, the Indian developed his own art forms. Those forms of the Northwest Indian are among the masterpieces of folk art in all history. The masks, the huge war canoes and the totems stand out among the works, together with the wooden "long houses". The totem pole has become a symbol of the Northwest and of its history. It tells a story of a family or an event in easily recognizable symbols, brightly colored; a <u>living</u> symbol, for totems grew as the years passed. They were the genealogy of the Indian tribes; they described the qualities of courage, skill swiftness, and cunning in battle possessed by the young men. Totems were made along the coast of Alaska south to Washington where fierce Haidans used the Thunderbird as an emblem. Their tribes had seagoing war canoes 70 feet long, each hewn from a single log; a hundred armed men could ride in a canoe. It is no wonder that other tribes for hundreds of miles along Puget Sound would leave a half-eaten meal and all of their possessions in the long house and run into the woods whenever the Haidans were sighted. The spirit of these Haidans, terrible in war and skilled in peace, is translated into a 20th Century totem as a symbol of the Air Academy, described in detail later in this writing.

We find, too, in the late history of the Northwest, a great influence from the Orient, principally Japan. Today the State of Washington is dotted with the famed Japanese "truck gardens", producing the most marvelous produce in the nation. Preserving essentially oriental methods, these Japanese gardeners have added to the heritage of the Northwest. Much of this activity takes place in the valley of Auburn and Kent, only a few miles from the Air Academy site. Oriental trade, has been a major factor in the development of the area. Today Seattle is a major clearing house for Oriental sea and air traffic, and its culture has come even closer. The great admiration of the Northwesterner for Japanese culture must find a niche in any architectural expression of the Northwest, and is found in the Air Academy through the use of the three-dimensional module in a game of "space-chess".

A reflection of the wooden construction of the past centuries in the Northwest becomes a difficult problem to resolve in a large multi-story building, but in essence the wooden architecture was a post-and-beam or a bent-tree system. The validity of these systems remains, and is translated into 20th Century architecture through the new materials.

The most serious mistake that can be made when attempting to apply a heritage to the development of an architecture is to take that heritage literally, rather than to study the reasons inherent in the region that developed that heritage. The use of old totems, old constructions, and old philosophies result in an architectural expression that becomes a relic when the last nail is driven. An attempt is made in this development of the Air Academy to translate the Northwest heritage into our terms. I consider this thesis as having been an important step in my development or a personal expression of the Northwest, together with having provided an incomparable experimental opportunity to study educational architecture.

THE STATE OF WASHINGTON

Perhaps there is no state in America that has such sharp extremes of terrain, climate, and vegetation as Washington. Eastern Washington is rolling wheat land; South Central Washington is desert, with small cacti growing along the roads where towns are usually separated by 30 or 40 miles; Western Washington is tremendously mountainous country with acres of untouched and unexplored timber, rippling in a green blanket to the very shores of Puget Sound and the Pacific Ocean. Walt Disney recently exposed the magnificent Olympic Range, where few men have ever been, in a motion picture entitled "The Olympic Elk", studying the life cycle of the hundreds of animals that roam the mountains, still oblivious to the coming of the white man. The Columbia River bounds the state on the south only briefly slowed at Grand Coulee and Bonneville. Mount Rainier remains snow-bound 12 months of the year, while Pasco melts in common 100° heats.

The sharp topographical division is the Cascade Range of mountains that begin in Canada and continue into the Sierra

Nevadas of California, separating the Pacific shelf from the plains that rise into the Rockies. It is in the Western slopes of the Cascades that the Air Academy lies.

The Seattle-Tacoma area is the hub of activity in the Northwest. Of the 2,400,000 people in the State of Washington, 500,000 reside in greater Seattle and 150,000 more live in greater Tacoma. Probably 1,000,000 or more people are situated in the general area of Seattle and Tacoma. Yet an Easterner would be impressed with the fact that 20 miles from cities of this size there can be a completely untouched wilderness. The Air Academy site lies in one of these areas of relative wilderness.

Perhaps the key to the development of the Northwest, and in particular Western Washington, has been water and its derivative - - power. Bonneville Dam, the world's only tidewater hydroelectric power development, and Grand Coulee Dam, the mightiest man-made structure in the world, tap the Columbia for power and irrigation water, but develop only a fraction of the potential.

It is the water of the Western Cascade slopes that maintains the forests of Western Washington and makes possible the great truck gardens. The area is dotted with lakes of

intimate scale providing a sportsman's paradise. Thus the green magestic Douglas Firs, the blue Lake Sawyer, and the white Mount Rainier become the frame for the Air Academy.

The usual tourist comment on these immense forests goes something like this:
"It must rain all of the time here; look at the firs and hemlock, the moldy-barked alder and birch, the forest floor covered with ferns".

All of this vegetation is characteristic of the marine climate of the Puget Sound area, but the facts are these: Chart No. I has been assembled by the King County Planning Commission from the Statistical Abstract data listing precipitation at sixty-four major cities over the United States. Seattle is halfway down the list in 33rd place and, strangely enough, with only 33 inches of rainfall. Apparently Houston, Texas; Montgomery, Alabama; Washington, D. C.; Boston, Massachusetts; and other prominent airport cities fare much worse than Seattle. And even Indianapolis, Indiana, has about 7 inches <u>more</u> per year than Seattle.

The precipitation and temperature map (Chart No. II) graphically portrays the rainfall over all of Puget Sound. Note the

200 inches of rainfall on the Olympic Penninsula and then note that all of Puget Sound from Seattle to Sequim is in a "rain shadow" which ranges from 40 inches down to less than 20 inches of precipitation per year. (More than 10 inches less per year than Fort Worth, Texas.) The Air Academy site lies on the 40-inch isohyetal line. The "rain shadow" may be a new idea to most easterners. For too long Seattle has been grouped in with the Olympic Penninsula in the 200-inch rainfall category because all the grade school geography books listed only Seattle, and not Forks, Washington where the 200 inches of rain actually lands.

A 56-year temperature summary for Seattle (Chart No. III) shows that temperatures range from a January average of 40° to a July average in the 65° area. The other temperatures for high, low, and daily high readings, as well as the lowest and highest temperatures recorded, all tell their own story. It is difficult to summarize climate in any other way than to say that a man can hardly buy an overcoat in Seattle stores; the best he can get is a light topcoat. Experience has proved that overcoats are a drug on the market.

Returning to the typical tourist's comments: "What about the ferns that form the forest floor?" The answer is found in

the invigorating mountain nights. There is almost always a blanket of night clouds shuttling from the Pacific over to the Cascades. During the trip they unload a few tiny drops of their cargo during the cold of the night. The Northwest gardeners count on this fortunate twist of climate to bring along the beautiful azalea, rhododendron, Holland bulbs, green lawns, and ever-present conifers of the area. And so it is with the forests, and the ferns.

The rundown of climate at the site would not be complete without mentioning the gravelly soils which keep the area fog-free. The complete air drainage is a result of the high and favorable topography. A little-known fact is that the sun shines about half of the time in this area and flying conditions are favorable 86 per cent of the time.

THE SITE

At the time of the activity of the USAF Site Selection Board, the Air Force drew up a fifteen point list of criteria upon which the selection of a site depended. This list still has validity, and is reproduced here.

Criteria For Site Selection: United States Air Force Academy:

1. Location of site relative to population centers.
2. Transportation of facilities (rail, air, highway).
3. Availability of power.
4. Availability of water.
5. Sewage facilities.
6. Drainage.
7. Engineering difficulties such as grading, etc.
8. Labor and materials' conditions in vicinity - construction index.
9. Climactic conditions - rainfall, temperature, humidity, etc.
10. Availability of land (approximately 9000 acres).
11. Cost of land.
12. Cost of preparation of land.
13. Obstructions such as farms, etc. which must be removed from the site.

14. Location of nearest airfield at which Air Force can acquire immediate landing rights.

15. Availability of housing, cultural, recreational, educational and other such facilities in nearby population centers.

The Lake Sawyer site was actually selected by the King County Planning Commission, Seattle, Washington, as the most appropriate site in the vicinity, and was submitted to the Site Selection Board, together with a site near Lake Sammamish, Washington. The exact result of the Board's meeting at Gaffney's Lake Wilderness Lodge with members of the Site Selection Board is not known, and is of little importance, since the use of the Lake Sawyer site was recommended to make the academic problem more realistic. The following discussion of the site stems partially from information prepared by the Planning Commission in answer to site questions raised by the Selection Board, and is entered here to complete a picture that, while theoretical, could be an accomplished reality.

1. LOCATION OF THE SITE RELATIVE TO POPULATION CENTERS

When traveling to the Air Academy, it will almost be necessary to travel through or near three major cities of Washington; Seattle, Tacoma, and Yakima. (Refer to Official Highway Map of King County, Washington. Drawing No. 1) Several minor towns are on the route and will prove to be shopping and recreational centers for cadets and faculty families. Table A lists the population of these towns and cities, and their approximate distances from the Air Academy, both by air and highway.

TABLE A

City	Population (1950 Census)	Highway Distance Approximate	Air Distance Approximate
Seattle (city center)	476,591	27	24
Seattle (city limits)		18	16
Tacoma	143,673	24	20
Yakima	38,486	108	87
Puyallup	10,010	20	16
Renton	16,039	16	12
Kent	3,278	10	9
Auburn	6,497	11	9
Black Diamond	800	3	3
Enumclaw	2,789	11	10

King County 732,992
(Seattle, Tacoma, etc.)

Yakima County 135,732
(Yakima, etc.)

2. TRANSPORTATION OF FACILITIES (RAIL, AIR, HIGHWAY)

The Lake Sawyer site is excellently situated on a cross-state highway, a cross-state railway, and near several aerial hubs of the Pacific Northwest.

State Road No. 5, running north and south, passes the Air Academy on the east, connecting in the north directly into Renton and Seattle, joining State Roads No. 2 (US Alternate 10) and 2A which will carry all traffic from Central Washington and the "Inland Empire" of Spokane; and connecting on the south to US Highway 410 continuing to Yakima and South Central Washington. The East Gate to the Academy, one of two highway entrances, comes from State Road No. 5.

State Road No. 5A running east and west, passes the Air Academy on the north, joining State Road No. 5 east of the Air Academy, and passing through Kent on the west, connecting to State Road No. 1 (US 99) which is a superhighway between Seattle and Tacoma. The great majority of visitors and business will enter the Academy from the west along this route. The North Gate to the Academy comes from State Road No. 5A.

An additional approach to the Academy from the south will bring visitors from Tacoma to Auburn onto State Road No. 5B, which, after traveling approximately 8 miles of an existing unimproved road (improved to provide easy access to the Academy from the south), would join State Road No. 5 and the East Gate.

Air access to the Pacific Northwest and the Seattle area has become increasingly easy in recent years with the construction of a major airport between Seattle and Tacoma, known either as the Sea-Tac Airport, or Bow Lake. Sea-Tac is the clearing house for all commercial aviation entering and leaving the area. Military facilities in active condition at this writing are McChord Field, near Tacoma and Fort Lewis, and Paine Field, near Everett. Boeing maintains private strips at Seattle and Renton capable of taking the largest aircraft. There are many minor fields in the area.

The Academy will be served directly by the Air Gate Field to be constructed on the west side of Lake Sawyer. A discussion of the Air Gate Field follows in a later section.

Rail facilities are completely as adequate as the highway and air links to the Academy. The Northern Pacific Railroad

cross-state line passes just north of the Academy site. The King County Planning Cimmission recommends " ..... the Northern Pacific Railroad would be re-routed around the project along with a new cross-state freeway from the valley ..... The railroad change can be made without sacrafice of the one per cent sustained grade which the Northern Pacific has through this area. The existing rails into the campus can be used as a service spur for the utility buildings and housekeeping warehouses ..... "

It will be noted that a spur is brought into the campus along the Air Gate Field, however, it did not seem necessary to disrupt or remove the existing Northern Pacific line, unless the re-routing is a planned part of another project. The demands of the Academy tend to favor leaving the Northern Pacific as it now exists.

The Great Northern Railroad runs along State Road No. 5, and does not seem to be of value to the campus, except perhaps as a passenger route for excursions of large groups.

It will be necessary to construct overp asses where the two entrance roads to the Air Academy intersect these railroad lines. The cost will be small compared to the removal and re-routing of a rail line.

Thus, it will be noted that the campus and the area is well served with transportation of all modes.

3. AVAILABILITY OF POWER

Existing transmission lines of the Bonneville Power Administration from the great dam on the Columbia River cross the site north of the campus, but in a position that would make air travel in and out of the Air Gate Field hazardous.
The King County Planning Commission again recommends, "The Bonneville transmission lines would be moved about a mile north ..... (the) line will carry power from the great Bonneville Power Administration Substation at Covington, two miles to the (north) west ..... up to the academy substation ....."

Because of the nature of jet aircraft and the shallow glide paths required, it may be necessary to move the power lines even further north than the Commission recommended. The drawings indicate that this has been done.

As with the lumber of the Northwest, power seemed at first to be inexhaustable, and the local power companies were lavish in their inducements. Now, suddenly in the Northwest, power too is seen to have limits. Five years from now, we may

seriously be considering a self-contained atomic power plant for a project of this type; independent of lines. However, a realistic project must be set up to use the existing power available in the area. Electricity is the best solution in 1954.

The heating plant, utilizing coal to produce steam heat, will be amply supplied with fuel from nearby coal mines that tap the recources of the Cascades. Steam distribution systems have been proven through the years to be an economical method of heating a large institution, particularly when the fuel comes from less that 20 miles distant. Here again, we may find atomic energy replacing coal as a source of heat power within the decade.

4. AVAILABILITY OF WATER

Finding a source of pure water is seldom a problem in the Northwest, particularly on the western Cascade slope. In the immediate area lakes with such picturesque names as Pipe Lake, Lake Morton, Lake Retreat, Lake Wilderness, Black Diamond Lake, or Lake No. 12 dot the hills, many at a natural higher elevation than Lake Sawyer or the Academy site. Of these, perhaps Pipe Lake is the only one of value as a water

source, however many streams flow near the site. It is sufficient for this problem to establish the fact that water is available; the methods of storing, purifying, and distributing the water are numerous. It might even be possible to use Lake Sawyer if proper control of water activity and careful purification are practiced. This may be more costly than bringing the water from a more distant, but purer source.

5. SEWAGE FACILITIES

Undoubtedly this is a problem which will have to be dealt with mechanically or by a complex sewage system draining to the north or west. Probably the construction of sewers to connect with existing facilities to the west or to connect with a new disposal plant to serve the area is the most practical. It is difficult to handle sewage in other ways in country that is well-populated with lakes and streams feeding to centers of population. The increase in population in the area as a result of constructing the Academy would probably warrant the preparation of adequate facilities.

6. DRAINAGE

Because of the rugged nature of the Cascade slope and because of the fantastic number of streams that trace the slopes, drainage is almost automatic. In particular at the Academy

site, the soils are gravelly, readily controling water, and even in what would be considered a flood condition in some areas of the nation, the water is moved away swiftly. The actual site drains in two directions: a gentle slope south toward Lake Sawyer, and a slope north into the Soos Creek Valley. By retaining the natural flora wherever possible, the removal of water should be as swift as necessary and well controlled. (In a well-drained area like the Academy site, man can seldom improve on nature.) Provision will have to be made to create drainage away from structures and roads where the natural slopes have been distrubed.

7. ENGINEERING DIFFICULTIES SUCH AS GRADING, ETC.

The philosophy of campus design employed in this thesis will minimize most engineering difficulties as far as earthwork is concerned. As mentioned above, with the exception of the grading necessary for structures and roads, there will be little disturbing of the existing ground. There is no necessity for great expanses of lawn which the students can trample and on which the Buildings and Grounds Department can spend thousands of dollars each year. In fact, a great manicured lawn makes one feel more like driving a golf ball

through the trees.

The forest will be cleared intermitently between the structures to create the network of interlocking vistas that make the campus unit, but again, little need is seen for an expansive problem of stump removal. If you have ever hiked through primeval rain forest, you know that much of the character comes from the forest floor which records life and death. The tombstone of the great fir is the stump. In the course of nature, the stump will remove itself.

After the removal of some trees in area, the forest floor will change, too. The ferns will be intermingled with grasses, and the native types are far hardier than golf green grass. It will create for itself the soft greeness of the nountain meadow. Leave nature; it is far wiser than we are.

The site for Air Gate Field is a major reason for choosing the Lake Sawyer site, for it is one of the remaining level, unpopulated pieces of land that are suitable for flying operations. Very little grading will be necessary to provide level strips, and in some places it will only be necessary to clear the land and lay a base for the runway. Soos Creek will have to be run in culverts where the planned strip crosses the stream bed.

8. LABOR AND MATERIALS' CONDITIONS IN VICINITY — CONSTRUCYION INDEX

Economies of scale in such a large project will definitely make themselves felt and actual costs will be lower than indicated by trade indexes. This would be true, regardless of location. Indications of costs on the basis of such over-all planning as included here would be more deceiving than accurate.

It is suggested that an ideal location for the Air Academy will override any short-term financial considerations.

9. CLIMATIC CONDITIONS - RAINFALL, TEMPERATURE, HUMIDITY, ETC.

These conditions are covered in detail on pages 28, 29, and 30.

10. AVAILABILITY OF LAND (APPROXIMATELY 9000 ACRES)

Another prime reason for selecting Lake Sawyer was the fact that 9000 and more acres are available. With this much land, it would be difficult to lay out a campus proper on more than two or three thousand acres, leaving the remainder for use as Air Gate, drill grounds, maneuver areas, and field demonstration sites. It is suggested that the approximate boundaries be State Road No. 5A on the north, State Road No. 5 on the east, Lake Morton on the west, and the rugged

Green River Gorge on the south. While much of this area would seldom be used, it will provide a buffer against the encroachments of business and residences, and will permit safer operation of Air Gate, both from civilian and military viewpoints. The King County Planning Commission considers this site to be desirable from the standpoint of the quantity of land available.

11. COST OF LAND

Figures are not available for this report as to the land cost, but it must again be assumed that the advantages of the site will make the cost reasonable. At present the few farms and residences in the area should not make the cost prohibitive, particularly in light of its distance from industrial and other high-priced land.

12. COST OF PREPARATION OF LAND

As touched on in Item 7, the cost of preparation should be small when compared with many new campuses that are being developed, such as Michigan, Brandeis, and other monumental schemes. The revision of the natural contours to conform with the contours of the 6th hole at Tam O'Shanter is being avoided, and little major work is necessary to accomplish Air Gate.

The cost can only be gauged by comparison with similar schemes on similar terrain.

13. OBSTRUCTIONS SUCH AS FARMS, ETC., WHICH MUST BE REMOVED FROM THE SITE

A few farms occupy the site, but it would only be necessary to remove several buildings to the north. The other structures are primarily residences bordering on Lake Sawyer. Those at the north end of the lake must be removed, but the homes on the east side might be retained for use in the indicated faculty housing area. This would provide fine quality housing for most of the higher echelon personnel; the remainder would need new housing on a modest scale. It is believed that water and sewage facilities are adequate for these homes, together with the Officer's Club, and the VIP housing.

14. LOCATION OF THE NEAREST AIRFIELD AT WHICH THE AIR FORCE CAN SECURE IMMEDIATE LANDING RIGHTS

The airfields are called out in Item 2. As to which of these might be chosen by the Air Force, personal speculation is the only guide. Perhaps the Sea-Tac airport would be the most desirable.

15. AVAILABILITY OF HOUSING, CULTURAL, RECREATIONAL, EDUCATIONAL AND OTHER FACILITIES IN NEARBY POPULATION CENTERS

Regardless of the position of the housing, whether in the nearby villages or in the campus complex, it will be necessary to travel by automobile in some activities. In attempts to simplify life, we may have oversimplified it until we are barely living at all, and the necessity of traveling a few miles to work or shop is a small matter and becomes necessary to break the usual stagnation of the day. While shopping facilities for daily essentials will be provided at the Air Academy, trips to Black Diamond, Kent, Auburn, and occasionally to US 99 (shopping facilities line the route) will be fairly frequent. Even in the winter, this is not difficult. Seattle seldom gets a snow that disables traffic. This is true only for the civilians and families of personnel; the cadets will have all essentials either provided or available at the Academy.

"Culture" is defined either as "Act of developing by education, discipline, training, etc." or "the enlightenment and refinement of taste acquired by intellectual and aesthetic training". It would seem to me that it is largely what you make it, and whether it stems from classroom exercises, exposure to prominent public figures, or from sitting by a

lake, the source has little importance. "Culture" can be found anywhere if it is considered important to a full life. The formal culture by defination will be strongly transmitted to the cadets in their collegiate activity, or is available in its commercialized form in Seattle and Tacoma, which would probably be the cadet's weekend goal. Informal culture surrounds and permeates the very campus, and if the cadet is sensitive, there is much to be learned in each contact with the woods. It is not clear what the cultural value of a campus is when it is surrounded by walls of city brick, flanked with cafeterias and taverns, bathed in smoke, and paved with concrete; but if there is a cultural value in that atmosphere, this project lacks the benefit.

The recreational activities of a college atmosphere should be a part of the campus and readily at hand when desired. Therefore an extensive program of tennis, swimming, boating, field games and gymnasium sports will be maintained at the campus. At Lake Wilderness, there is a golf course which may be available to the cadets on occasion, as well as to the faculty. Cadet dances should be held on campus, with transportation problems being solved through the use of buses or the private vehicles the cadets may be fortunate enough to

have available. It is a policy at similar institutions to ban automobiles for the students; this is healthy and desirable.

The opportunity to recreate with one's classmates is important. Relaxed associations with friends in the collegiate atmosphere will do much to temper the rigidness connected with the cadet's formal activities.

Improvements would be made to elementary school facilities in the neighborhood of the Academy to accommodate children of the staff and children from surrounding small communities, and safe play areas for faculty children will be constructed among the faculty homes.

For visitors to the Academy (other than those who will occupy the VIP quarters), the Lake Wilderness Lodge provides excellent housing, and would welcome the increased winter trade. The two transcontinental railroad stations will serve all visitors and arrangements could be made for USAF transportation for expected guests.

Although at the present time some commercial aspects of the area are non-existant, it must be emphasised that immediately upon the announcement that an Air Academy would be constructed

at Lake Sawyer, these commercial interests will invade the scene. The problem will be to control their advance and prevent their proximity from disrupting the Academy routine. Any community of over 3000 persons will immediately acquire its commercial satelites.

Through the analysis of the points suggested by the Site Selection Board, a general picture of the Lake Sawyer area, its problems and advantages, has been sketched. The conslusion must be drawn that the site is advantageous to the extreme.

Perhaps a normal liberal arts institution might have difficulty maintaining enrollment in a location at a population fringe and in such proximity to so major colleges; but it must be borne in mind that the Air Academy does <u>not</u> draw its students in a normal way. They are appointed and do not depend in any sense upon the population of the area in which the Academy lies. Enrollments will not fluctuate, therefore the establishment of this institution of 2500 depends upon the most advantageous combination of factors contributing to the policies and functions of the Academy.

OUTLINE OF FACILITIES

OUTLINE OF FACILITIES

The final design of a higher educational institution depends largely on the interlacing of campus facilities to form an efficient unit. These facilities are widely diversified, each with special requirements. To familiarize the reader with the complete picture of the proposed Air Academy facilities, the following outline of facilities is presented before the discussion of their relationships. This complex listing of buildings and areas has been derived from a study of comparable institutions (both military and civilian) and from an examination of the special Air Force needs.

THE AIR ACADEMY

A. Academic Facilities

1. Humanities Building & Lecture Hall
2. Sciences Building & Lecture Halls
3. Military Arts Building & Lecture Halls
4. Library & Administration Building
5. Technical Center
   a. Laboratory Building
   b. Shops and Testing Areas
   c. Wind Tunnel
6. Field Training Areas

B. Physical Training & Sports Facilities

1. Gymnasium & Fieldhouse
2. Boathouse
3. Tennis Courts
4. Track
5. Baseball Field
6. Athletic Field
7. Recreation Areas

C. Cadet Activity Facilities

1. Cadet Center
   a. Cafeteria & Dining Rooms
   b. Post Exchange
   c. Post Office
   d. Student Offices
   e. Activity Rooms
2. Auditorium
3. Cadet Chapel
4. Formal Parade Grounds
5. 20th Century Totem

D. Academy Service Facilities

1. Fire Station
2. Laundry
3. Buildings & Grounds
4. Infirmary & Clinic
5. Recieving (N. P. Railroad)
6. Heating Plant
7. Academy Substation
8. North Gate & South Gate
9. Parking Glens

E. Air Gate Facilities

1. Air Gate Field
2. Control Tower
3. Offices & Instructional Rooms
4. Hangers
   a. Maintenance Shops
   b. Fire Control

F. Housing Facilities

1. Cadet Dormitories
2. Faculty Housing
   a. Individual homes
   b. B. O. Q. (Officer's Club)
3. Air Gate Personnel Housing
4. V. I. P. Housing
5. Miscellaneous Housing
   a. Air Gate
   b. Fire Station
   c. Infirmary

G. Miscellaneous Off-Campus & Local Facilities
1. Northern Pacific Station
2. Great Northern Station
3. Sea-Tac Airport (Temporary)
4. University of Washington Football Stadium
5. Lake Wilderness Golf Course Lodge
6. Local Elementary & Secondary Schools
7. Shopping Facilities
   a. Faculty Store (Faculty Housing)
   b. Local Stores
8. Nursery & Children's Play Areas (Faculty Housing)

H. Future Facilities

1. Academy Radio-TV Station
2. Atomic Energy Heating Plant
3. Additional Specialized Educational Structures (necessitated by curriculum changes)

After such descriptions of Washington State and the Lake Sawyer site, one phase of the philosophy of design must be clear: to incorporate the luxuriousness of nature into the educational atmosphere. At Lake Sawyer nature presents itself in the form of lakes, mountains, blue sky, and in particular, in the contrast between forests and grasslands. The moods of the intimate forest make the occasional flowing meadows even more powerful in their sense of openness. Therefore, the Air Academy will be an interlacing of the rain forest and the meadow.

Nature is both delicate and vigorous; man's hand can quickly transform nature into meaningless patterns of manicured trees and shrubs, losing the magnificient spontaneity of forest growth. At Lake Sawyer, this design of the Air Academy involves the removing of this forest <u>only</u> where buildings or meadows are planned, <u>without</u> attempting to return with trucks full of saplings and seed firs to dot the landscape with geometrical foliage patterns. It is better to use the organic forms of nature to relieve the harsh geometry of building technology.

Orientation of the entire campus is just as important as the orientation of the individual structure. At the Academy north shore of Lake Sawyer, three features demand attention as a visual focus; and all three are given that attention in the design of the campus pattern. They are: 1. the brilliant white peak of Mount Rainier and the cobalt blue of Lake Sawyer (to the South-Southeast); 2. the sky, the thrill of flight, and their symbol, the airfield; and, 3. the woods and the forest floor. The orientation of the campus toward these three elements has created the matrix for the buildings.

1. To capture the view of Mount Rainier and the lake, the majority of the structures are oriented toward the South-Southeast, which also proves to be a desirable orientation for light and heat control. Therefore, the interiors of the buildings command a view of the large natural phenomena of the area.

2. The position of the Air Gate Field has been established as advantageous for flight operations, and as such is just as fixed an element relative to the campus as is Mount Rainier. For this thesis, a complex of hangars has been located on the west shore of Lake Sawyer: strong, large forms that become familiar to the pilot as symbolizing machines of

flight. These strong rippling forms become the second visual focus for the campus. Rays of sight, drawn from the hangers define entrance roads to the campus and define the lines of the central "Lea" or meadow. While the interiors of the buildings are oriented toward the mountains, the open spaces and roads of the air academy focus on the symbols of flight.

3. The orientation toward nature is unavoidable. By carefully placing the structures among the trees and ferns, nature is welcomed on all sides. The human being is focused toward the browns and greens of natural form, particularly in his movements between structures.

These three orientations are combined into carefully controlled interlocking vistas, which are the essence of the campus plan presented here. It is a pattern of free foliage mixed with geometry of construction; a pattern or motion and changing views; a pattern designed to give the human the maximum of educational experience, both in and out of the classroom.

For the sternly practical mind, this approach to the planning of a campus has fully as many economies as does the compact planning of a "concrete campus". These economies, as pointed out later, will be considerable in construction and maintenance.

Entrances

The roads leading into the campus from Highways 5 and 5A rim the northeast edge of the campus. North Gate and South Gate intercept the traffic of visitors and tradesmen, directing them to their destinations within the campus. The speed limit in the campus will be 15 m.p.h., thus preventing the use of the road as a "cut-off" for private traffic. Visitors will be directed to the northeast edge of the campus, to visit the institution through a prescribed and controlled route.

Automobile Parking and Circulation

The famous Case of the Automobile v.s. the American College Campus is easily resolved in the Air Academy situation: the largest problem, that of student vehicles, is non-existant! (Cadets are not permitted to have autos.) The faculty cars, visitor's cars, and service vehicles are the only ones that require special parking lots. Faculty cars, a daily and year-round problem, must be provided with fixed areas near (not at) the buildings in which the faculty members work. To be consistent with the philosophy of preserving nature, we must re-examine the parking situation in terms of the site.

To preserve the beauty of the campus, both from the air and from the ground, the trees will not be leveled only to house rows of vehicles; instead they will be occasionally thinned, and the spaces between them will be floored with a well-drained gravel carpet. These areas will not be mass lots for 100 cars, but will be intimate groupings of from 20 to 30 spaces, blending into the woods. To protect the vehicles, and their spaces, from snow and tree sap, modular plastic covers will be erected for groups of 10 autos, undulating through the woods in white or yellow waves, tensioned between poles. These will provide human scale parking facilities for personnel who use the same spaces each day. Visitors will park in similar spaces, parallel. Their numbers will be small on a daily basis, and should be adequately handled by this method, but for the occassional games and programs bringing large crowds into the campus, large lots are provided among the trees near the athletic field and the auditorium. Those lots will not be shielded, since the visitors will only remain for a few hours. The shielding of the lots by the trees will eliminate much of the snow removal problem. This type of parking area has proven very effective in the Northwest; even in areas of much greater snows east of the Cascades.

The single road that circles the campus permits any vehicle to reach any parking lot serving the buildings, without dissecting the site into dozens of isolated segments.

Human Circulation

Human motion is organic, and as such can be accurately predicted only when two elements on a path of travel are in a straight line. Most of our Universities have gone to great expense creating geometrical concrete sidewalks, only to find in following months that students had worn paths at right angles to the carefully calculated walks. The design of the Air Academy incorporates the unpredictability of the cadet by providing straight walks only between points of maximum and predictable traffic.

As we know, new materials must be accepted when they prove to be superior to conventional materials, and in the Air Academy, polyester fiberglas is substituted for concrete as a sidewalk material. The walks will be laid in 7'6" square panels of slightly corrugated, perforated fiberglas of a type being used for aircraft landing fields in military situations. By laying these on a gravel base and anchoring them to blocks at their intersections, we may lay a really

simple, self-drained, non-slip walkway, capable of being replaced in sections. When changes become necessary, the shrill rattle of the jack-hammer will never be heard. By running the entire campus may be joined with a weather-proof system of human circulation. By omitting or coloring some of these panels, accents may be achieved in the squares and walks to highlight trophys and statues (nourishing tradition). These formal walks serve a nightly function as roads for janitorial and service vehicles. During the day, they provide roadways directly to all structures for the fire control apparatus. Snow-removal is eliminated for the walks, leaving only the roads to be cared for. The economy of this system of walks cannot be over-emphasized.

But what of this unpredictability of student travel? The cadet's schedule will require him to hurry from one building to another, taking him away from the walks in good weather. These impulses will not be fought with signs and the installing of a cobweb of walks: the only geometrical walks on campus will be those first constructed, and the cadet will create the remainder of the walks!

After only a year of activity at the Air Academy, student paths will appear across the "Lea" and through the trees.

These will be graveled and will become a permanent part of the campus ..... organic spontaniety and beauty, harmonizing with the beauty of the site. After several years, these paths will be as important to the efficient circulation of the cadets as any drawing-board pattern of walks.

The Buildings and Areas

(The following discussion of the grouping and inter-relations of the Academy facilities should be accompanied with an inspection of Drawing No. 4. The reader is again requested to refer to both text and drawings in order to better understand philosophies of design and their reflection in the final product.)

A. Academic Facilities

In general, the instructional areas are on the north side of the campus, separated from the noisy activity areas by the expanse of "The Lea". Seven structures house separate phases of the curriculum, each requiring a different educational environment for effective instruction. Perhaps of the greatest importance to a rounded education for the cadet, the Humanities are taught in a three-story structure connected with a lecture hall, and fronting directly onto "The Lea". This position of importance reflects the part played by the humanities in

education, and the frequency with which students will have instruction in the building. (The Humanities Building has been developed into a final design as presented later.)

The Sciences Building, housing many delicate instruments and a great deal of laboratory apparatus, is placed completely in the woods, guarding against shocks and noise that might disturb equipment. It is near the Technical center for economies of services, and is nearest of all the academic facilities to the dormitories. (The cadet may spend the entire morning or afternoon in the laboratories.) The Technical Center, housing the heavy equipment of the sciences and aeronautics, is broken into four buildings, further guarding the delicate work from the heavy machines.

Library and Administration facilities are grouped into one structure dominating the north edge of "The Lea". This will be on the path of travel during the typical student day, particularly in the winter. The cadet will be encouraged to use the Library intelligently, and to meet the administration on an informal basis. The Library will be devoted to the housing of literature, with the majority of the study areas located in the various educational buildings.

Of the 9000 acres that make up the Academy site, over half of it is devoted to field training areas, where the cadet will be instructed in military technique. The summers will be occupies by this type of activity.

B. Physical Training and Sports Facilities

As the base of activity in sports, the Gymnasium and Field-house structure is incorporated into the pattern of the campus proper, with the playing fields fanning out to the south away from the campus, removing the noisy games and drills from the academic area. This permits the cadet to have ready access to the Gymnasium with travel to the fields during the P. E. period. By placing the Gymnasium on the entrance road, the crowds moving to and from large athletic events do not clog the campus. The satelite fields consist of a track and football scrimmage field, a baseball field, a general athletic field, a recreational field, and tennis courts. On Lake Sawyer the boathouse is the center of water sports.

C. Cadet Activity Facilities

Just as the Library is the dominant and central feature of the north half of the campus, the Cadet center dominates the south half. Central dining rooms serve the cadets with

cafeteria style meals or formal meals on occassion. The upper floor will house student offices and game rooms looking out toward the dormitories and the cove of Lake Sawyer, and the lower floor will have the Post Office, Post Exchange, and cadet services.

On "The Lea", three student activity structures are spaced on the soft open green. The Auditorium is a hall for weekend motion pictures, for visiting lecture celebrities, and for student programs; and its accessability to the main road encourages its use by outsiders for public programs. Contrastingly, the Cadet Chapel at the west end of "The Lea" is intimately associated with the dormitories, encouraging the cadet's acceptance of religion in his life. Between these rises the 20th Century Totem, symbol of the Academy and the exploration of the skies, and rallying point for Academy spirit. The Totem stands at the edge of the Formal Parade Green where the Saturday reviews will circle. This Green is defined by the Administration Building on the north, by the road on the south, and by a fiberglas walk on each side (which might hold reviewing stands.)

D. Academy Service Facilities

Though largely self-explanatory, the service facilities are briefly listed: the Fire Station and Laundry, operated by USAF personnel; the Infirmary and Clinic, carefully shielded with trees in a location readily accessable to cadets, faculty members and their families; the Northern Pacific Railroad spur and Station; the Academy Sub-station, receiving power from the Bonneville lines; and the Steam Heating Plant.

E. Air Gate Facilities

The organization and operation of flight facilities is a difficult task. The representation of Air Gate in the drawings is merely a symbol of a field that <u>might</u> be built, without pretending to be the field configuration that would be built. It was felt that the careful study of the conventional educational forms was more important to this thesis than the devotion of time to understanding the maze of flight operations detail. The "A" strip is a practical form, however, depending upon the frequency of traffic movements, wind constancy, etc. The listed facilities for maintenance and control are practical for a small installation, and the runway lengths have been taken from realistic figures. The <u>relationship</u>

of the Air Gate strip to the Academy is the important thing, just as in the long run the relationships between academy buildings prove to be more important than the building shapes.

F. Housing Facilities

The Cadet Dormitories occupy the choice spot of the site; a green-shrouded point jutting into the peace of Lake Sawyer. These Dormitories will be in living units of 100, separated vertically, and sometimes horizontally, with double-loaded corridors. The Faculty housing will be of the best quality through the incorporation of existing homes on the east shore into the campus complex. V. I. P. (Very Important Person) Housing also occupies a choice spot, (adjacent to the Officers Club and Dining facilities) and is in walking proximity of the Cadet Center. Needless to say, the handling of the V. I. P ranges from comradeship to kid gloves, but it exists in some form in every private and public institution in the world, and the better the provisions for the handling of this situation, the more natural and profitable it becomes. Other campus housing is varied, occuring where personnel must be available on a 24-hour basis.

G. Off-Campus and Miscellaneous Facilities

These are of considerable interest, since they often make or break the total operational success of an institution. Public relations often are affected greatly by the off-campus activities, and, particularly in a governmental institution, this can be all-important. Among these "borrowed" facilities, the University of W ashington Stadium will be in the public eye perhaps more than the Academy itself. Rather than developing a mammoth athletic arena in the intimacy of the Lake Sawyer region, it is proposed that the football games, and some other spectacles, take place in the huge double-deck U. W. Stadium on off-dates in their scheduling. The local railroad stations, airports, schools, and shops will all become a part of Academy life.

H. Future Facilities

Briefly, two unusual additions to the campus might prove desirable during the first decade of Academy operation. A Radio and Television station for at least closed-circuit operation might become almost an educational necessity, and, as will be noted in the design of the Humanities Building, Television services be incorporated into the original designs on an open-circuit basis. Also, within the decade, commercial atomic

energy may become a reality, suggesting conversion of the heating plant from coal to the atom.

Of this complex network of buildings and areas, three structures have been chosen to be presented in detail to illustrate the complete progression from a study of State History to a detailing of a classroom in establishing an architecture for an Air Academy in the Northwest. These structures, taken in order, are the 20th Century Totem Pole, The Humanities Building, and the Humanities Lecture Hall.

THE 20TH CENTURY TOTEM

Tradition plays an important part in student life in every educational institution in the world. It may manifest itself as an Oaken Bucket, a Tiger, a Yard, or a Hill; legends spin a web of tradition around buildings, topographical features, graduates, and symbols, and a portion student's pride in his alma mater stems from his contact with its trasition. In a military institution we find that tradition plays an even more important part, in that it will follow him for his entire military career. Thus, this question is raised: should the nourishing of tradition become a design element?

At the existing service academys we find traditions that have become so important that they are well-known even to one who has never visited the academies. The spectacle of the graduation ceremonies has become familiar to all of us, as have the more public spectacles of the Army-Navy athletic contests. The John Paul Jones sarcophagus in the Chapel at Annapolis is a revered spot, and the campus is sprinkled with symbols of the accomplishments of the Naval Forces and the Academy graduates. At West Point there are 10 major monuments symbolizing

milestones in the military progress of America. Trophy Point is a storehouse of Revolutionary War relics, and "The Plain" is the remembered scene of many parades. The Gothic and Georgian halls of the academies bear names familiar to all graduates.

We find, then, that tradition affects the plan of the campus, and becomes almost a visable element. In the design for an Air Academy, it is proposed to design facilities to nourish tradition.

These will provide both formal and informal settings for monuments, symbols, and relics of aviation. Formally, the Air Museum would be a focus for the thousands of visitors that must be expected annually. In the museum, the smaller and more valuable of the symbols of history will invite public relations benefit of a museum of this type would be immense.

Informally, larger trophies would be placed on the campus at strategic points of cadet travel and in commanding visual locations. Through the years, the addition of statues and inscriptions will enhance the charm of the paths. Large memorials of major interest will be in relaxed locations on

the fiberglas walkways that join the major structures; the memorials might be accentuated with foliage, with the color of the ground pattern, or by raising them a few feet above the walks. This type of tradition will build through the years. By providing the atmosphere and systems of display for trophies, it is hoped that the eventual traditions will be enhanced and will be more controlled.

An immediate symbol of the campus is also necessary, and for this it is suggested to use a "20th Century Totem Pole". This totem will serve as a physical expression of the spirit of the young men who will attend the Air Academy and will go on to pilot the aircraft that daily brush the rim of infinite space and that will some day leave the Earth for other systems.

The "Totem", as illustrated in the drawings, is a vertical element of aluminum framework containing multi-colored symbols of the academy in its web of metal. While it suggests the old Haidan totem pole in its verticality and colorfulness, it also suggests the poised expectancy of a stratosphere rocket. It suggests the lightness of flight; the delicacy of aircraft construction; the streamlined form of a missle and the complexity of forces that affect heavier-than-air flying machines. The "Totem", which serves as a visual focus for the Academy,

might soon become as famous a symbol as the M. I. T. dome or the Harvard Yard. The probability is that it would become famous much faster since it is designed purely as a symbol.

The representations of events and people that form the color pattern of the "Totem" would be of porcelain-enamel, and the addition of a facet to the design might become a service honor of the highest order.

The "Totem" becomes as easily-recognizable correlation of past history and culture with modern methods and materials: a logical sequence in the development of an architecture inherent with a region.

THE HUMANITIES BUILDING AND LECTURE HALL

THE HUMANITIES BUILDING AND LECTURE HALL

Preface:

In a complex of facilities such as has been described for the Air Academy, it would be difficult for one person to design in detail many specialized facilities of a widely varying nature without a great deal of research, time, and money. Therefore, I have chosen to develop a general purpose classroom building to fit the needs and philosophies of the Air Force in the Air Academy situation. The requirements for this structure were carefully developed from the information available to me concerning the proposed Academy curriculum, and has been treated as a realistic result of a theoretical program. While each campus structures would vary in purpose and equipment, it is suggested that much of the architectural philosophy and structural system developed for the Humanities Building would continue through the campus as a guide to design and construction. Stress must be laid on the fact that even though it is a classroom building, it is designed for a specific educational situation and must be studied in terms of that situation.

THE HUMANITIES BUILDING

Philosophy of Building

The Air Academy offers the cadet a great variety of instructional courses intended not only to prepare him to fly, but to prepare him for a full life, whether in the capacity of a military man or a civilian. In this program, the instruction in the humanities plays a major role. This, together with the fact that more cadets will use this building than any other, accounts for the central location given to the Humanities Building.

Listed by the Air Force in their proposed curriculum were eleven specific courses of instruction termed as Humanities, and choosing from these the more general courses we find five courses that are commonly included in the term "humanities" in the typical educational institution: English, Geography, Philosophy, History, and Law. The other listed courses in the proposed schedule - Psychology and Leadership,, American and Comparative Governments, Economics and Comparative Systems, International Relations, Military Art and Foreign Languages - are to be taught in the Military Building. However, there is little in their approaches to study that

would prevent them from being taught in the Humanities Building. It is anticipated that before the institution is constructed, the scheduling of classes will change, but by planning the Humanities Building and the Military Building to be readily adaptable to varied scheduling, these changes will be more naturally completed. Thus, the Military Building is indicated to be almost identical in construction and classroom size to the Humanities Building. This results in a sizable economy since the incorporation of similar materials and methods greatly reduces material and labor costs on such a large project.

Contemporary educational methods, and particularly Air Force educational methods, rely heavily on the use of instructional aids and student participation; the planning of educational facilities that are to be of service for many years must be of a sort that welcomes changes in presentation technology. Educational television, open or closed circuit, is finding increasing acceptance with America's educators (as demonstrated by current experiments at the University of Southern California, The University of Houston, Yale, and Iowa State College). Courses that incorporate current events could visit the United Nations, or the Congress on open circuit, and could fly

through the sound barrier on closed circuit; and regardless of the fact that educational Television is an experiment in 1953, it should be a necessity by 1963. Therefore Television becomes a design element in the Academy classroom.

Motion pictures have been an instructional aid for many years, but it must again be pointed out that their span of influence in education is minute compared with the history of education. The Military has proven that motion pictures are one of the most effective methods of teaching. They will continue to rely on "movies" in their present form, and will search for applications of new techniques. So the symbols of motion pictures - the projector, the screen, and the loudspeaker - demand a prepared place in the modern classroom. We find that the personal contact of the instructor has dominated the instructional atmosphere since man first taught skills to his children and his neighbors, so, even with these advances in technology, the instructor and the delivery of his message must continue to influence classroom design.

In line with this, we also find that the use of spontaneous visual symbols by the instructor and the student has also continued through the years. The methods of the 4th Century B. C. Greek Philosophers are well known. They taught by

scratching diagrams in the sand, and 2300 years later we find few media as satisfactory as demonstration with the drawn symbol (in our age with chalk on a blackboard).

The use of these educational methods suggests the need for adequate storage facilities in each classroom. We recognize the more obvious requirements of education such as adequate heat, light, seating, ventilation, proper acoustics, and color harmony; all of which recognize the student as a design element by providing him with a vigorous atmosphere for learning.

There are many nebulous requirements which are often overlooked in higher education (such as the control of student attention in class) and which may be among the most important and least investigated. The overall college atmosphere is neither that of a prison nor that of a summer resort, and care must be taken to segregate the learning process from the recreative process. The problem of a military school is unusual, and must be carefully considered in all design phases.

The determination of the number of rooms and the amount of facilities in a structure for a given curriculum is a diffi-

cult and vital problem. There are few sources of information as to the correlation between enrollment and instructional space in higher education. One advantage of the Air Academy is that the enrollment is comparatively fixed though a proportional selection system. There should be enough instructional rooms of a size to fit the occupancy criteria and to provide the curricula with a minimum of inconvenience to faculty and students, with a minimum of waste building space. Concerning the proposed Albert Einstein College of Medicine of Yeshiva University, New York, Mr. B. Summer Gruzen states that it will have "multi-purpose home rooms" with the faculty moving and not the students. This thesis differs sharply with Mr. Gruzen's philosophy, which conjures a portrait of bleached-skinned doctors who find it difficult to focus their eyes in sunlight. It is necessary that <u>both</u> faculty and students move from class to class and from structure to structure to relieve the mental and physical fatigue that results from hour-long immobility. The <u>specialized classroom</u> still seems to be an economical solution, as opposed to equipping each room with facilities to handle all subjects. The time spent moving between classes may be held to a minimum, but cannot be termed a "Waste" when it alerts and refreshes.

Any determination of the number of classroom units should make it possible to care for the following variables:

1. Number of periods during the day
2. Length of period
3. Average class size
4. Number of times a class meets per week
5. Length of week
6. Total enrollment in academic division

Any exact determination of room size and number depends upon a detailed breakdown of cadet activity by the Air Force, but, at this early stage in planning, complete information is not available. The following Proposed Curriculum was forwarded by the Air Force for incorporation into the planning of this thesis. The reader is cautioned that this curriculum is <u>for planning purposes only</u> and must be treated as such.

18 October 1951

AIR FORCE ACADEMY

(Proposed Curriculum)
(Planning only)

	Hours				
	1st Year	2nd Year	3rd Year	4th Year	Total
Science Courses					
Mathematics	153	153			306
Chemistry and Physics	153	153			306
Engineering Drawing	127				127
Mechanics and Materials			153		153
Electrical Engineering			153		
Thermodynamics				136	136
Aerodynamics				136	136
*Aircraft Design				*221	221
	433	306	306	272	1317
				or	or
Sub Total				493	1538
Humanities					
English	102	102	102		306
Geography	51				51
Philosophy	51				51
History	85	102	85		272
Psychology and leadership		85			85
Law		85			85
American & Comparative Governments			85		85
Economics & Comparative Systems			102		102
International Relations				102	102
Military Art				102	102
*Foreign Languages				*221	221
Sub Total	289	374	374	425	1462
				or	or
				204	1241
Military					
Tactics	102	102	102	102	408
Physical Education	102	102	102	75	381
Physical Training	77				77
Flying Training				112	112
Sub Total	281	204	204	289	978
TOTAL					3757

*Elective

18 October 1951

AIR FORCE ACADEMY
(Proposed Curriculum)
(Planning only)

Freshman	Sci.	Hum.	Mil.	G9, G 10
0800 to 1500				
1. Mathematics	153			3 pds of 1½ hrs
2. Chemistry & Physics	153			3 pds of 1½ hrs
3. Engineering Drawing	127			3 (2) pds of 1½ hrs
4. English I		102		3 pds of 1 hr
a. Literature (34)				(1) pd of 1 hr
b. Grammar (34)				(1) pd of 1 hr
c. Composition (34)				(1) pd of 1 hr
5. World History I		85		3 (2) pds of 1 hr
6. (Philosophy (Logic)		51		(3 pds of 1 hr (1 sem)
7. (Geography		51		(3 pds of 1 hr (1 sem)
8. Physical Training			77	3 pds of 3/4 hr
				17
1500 to 1630				
9. Tactics			102	2 pds of 1½ hrs
10. Physical Education			102	2 pds of 1½ hrs
	453	289	281	

Sophomore	Sci.	Hum.	Mil.	G9, G 10
0800 to 1500				
1. Mathematics	153			3 pds of 1½ hrs
2. Physics	153			3 pds of 1½ hrs
3. English II		102		3 pds of 1 hr
a. Literature (68)				(2) pds of 1 hr
b. Composition (34)				(1) pds of 1 hr
4. World History II		102		3 pds of 1 hr
5. Psychology & Leadership		85		3 (2) pds of 1 hr
6. Law		85		3 (2) pds of 1 hr
				17
1500 to 1630				
7. Tactics			102	2 pds of 1½ hrs
8. Physical Education			102	2 pds of 1½ hrs
	306	374	204	

AIR FORCE ACADEMY
(Proposed Curriculum)
(Planning only)

Continued

Junior		Sci.	Hum.	Mil.	
	0800 to 1500				
1.	Mechanics	153			3 pds of 1½ hrs
2.	Electrical Engineering	153			3 pds of 1½ hrs
3.	World History III		85		3 (2) pds of 1 hr
4.	American & Comparative Systems		85		3 (2) pds of 1 hr
5.	Economics & Comparative Systems		102		3 pds of 1 hr
6.	English III		102		3 pds of 1 hr
	a. Literature (51)				17
	b. Speech (51)				
	1500 to 1630				
7.	Tactics			102	2 pds of 1½ hrs
8.	Physical Education			102	2 pds of 1½ hrs
		306	374	204	
Senior					
	0800 to 1500				
1.	Thermodynamics	136			(2 pds of 1 hr ea.
2.	Aerodynamics	136			(1 pd of 2 hrs ea.
3.	Intern'l Rel. (Practice Speech)		102		3 pds of 1 hr
4.	Military Art		102		3 pds of 1 hr
*5.	Language or Aircraft Design	*221	*221		(3 pds of 1 5/6 hrs
	Between 0800 and 1700				(1 pd of 1 hr
6.	Flying Training			112	1 pd of 4 hrs (28 wks)
					17
	1500 to 1630				
7.	Tactics			102	2 pds of 1½ hrs
8.	Physical Education			75	3 pds of 1½ hrs every 2 wks
		272 or 493	425 or 204	289	
	TOTAL	1317 or 1538	1462 or 1241	978	GRAND TOTAL: 3757

*Elective

From this tentative Air Academy schedule we can estimate the numerical equivalents for the criteria listed on page 78.

1. Number of periods during the day: The daily cadet schedule runs from 0800 to 1630 (8:00 AM to 4:30 PM) of which the last hour and a half are devoted to Tactics and Physical Training. Anticipating the necessity to stagger lunch hours for more orderly serving of meals, it would seem that there are a full seven hours per day which may be used for instruction in the Humanities Building.

2. Length of period: The one hour breakdown of classes seems to be a convenient term such as "one hour's credit". In actuality, the Academy classes might begin on the hour and run for 50 minutes, allowing 10 minutes for class changes, as is customary in most institutions.

3. Average class size: The information forwarded by the Air Force indicates that, in contrast with some public opinion, the military is very concerned with instructor-student contact as an effective educational technique. For the Air Academy, the Air Force is planning an average class size of 12 to 15 cadets;

much to the credit of the service in this age of mass-producted college graduates. There will be larger lecture courses and smaller seminars, but the benefit of the small average class size will manifest itself in the quality of the graduate. Self-expression and individual help will increase the student's interest immeasurably. Too frequently in higher education today the student sees his instructor as an untouchable, a figurehead, an oracle; and too frequently the instructor is forced to act the same way.

4. Number of times a class meets per week: This varies with the classes, ranging from one hour per week to three periods of one hour per week in the Humanities. In science courses, laboratory work will require up to three periods of two hours per week.

5. Length of week: The academic week will run for five days Monday through Friday, but Saturday mornings might occasionally be scheduled for classes, as well as for parades, field exercises, athletic events and other organized non-scholastic activities. It is safe to assume that the number or hours available for

classes per week ranges from 35 to 40 hours.

6. Total enrollment in academic division: The Humanities Building will be used primarily by First, Second, and Third Year Men, with the Fourth Year Men devoting their time to more specialized phases of education. The average total enrollment in the division should be about 1900 cadets.

For the theoretical purposes of this thesis, a formula devised by Mr. P. C. Packer of the Teacher's College, Columbia University, New York, will be utilized for an indication of the necessary space:

$$\frac{\text{*The number of students registered in any instructional division}}{\text{Average size of classes in that division}} \times \frac{\text{Average number of hours per week for each student}}{\text{Number of available hours per week}} = \text{Number of rooms needed for that division}$$

or expressed symbolically:

$$\frac{St \times Hs}{Sc \times Ht} = \text{Number of Rooms}$$

St = 1900 students (approx.)
Sc = 15 students (approx.)
Hs = 7.6 hours per week per student (approx.)
Ht = 37 hours per week (approx.)

$$\frac{1900 \times 7.6}{15 \times 37} = 26 \text{ Classrooms}$$

*Evenden, Strayer, and Engelhardt. Standards For College Buildings

By the formula, from 25 to 28 classroom are required to effectively handle the student load, and a Humanities Building with 24 classrooms has been designed. The same structural system and classroom design would be equally adaptable to a structure containing 40 or 50 classrooms. If the entire campus were to be planned, it would require a detailed schedule breakdown and activity schedule for each course; work beyond the present scope of this thesis. (Extra allowance would be made in the space requirements for specialized classrooms since it is difficult to have them in use more than 50 per cent to 70 per cent of the time.)

All buildings on the campus have been limited to three stories, which is the maximum comfortable height for walking, thus removing the necessity for elevator service for students. This would be costly and inefficient, since there would be a peak load every hour, and little traffic between peaks. Elevators are included for the convenience of faculty members and for janitorial maintenance; these elevators are to be keyed to insure privacy of use.

The roofs of the Academy buildings become of vital aesthetic importance, since this is a complex of structures that will frequently be seen from the air, and in many cases, by the

most important personages. In contemporary architecture, the roof is seldom considered of sufficient importance to be designed (with the possible exception of some famous tortured forms that have been alled roofs). The building services that manifest themselves on the roof are usually written off as unavoidable, and are blamed on the mechanical engineer when they happen to appear at unsightly locations. Their appearance can only be blamed on the architect who fails to design them properly into the building mass. This includes elevator housings, vents, fans, TV antenna and many more minor items. In the Humanities Building, these are carefully incorporated into the design. No amount of planting and clever fenestration can overcome the shock of seeing an uncontrolled roof.

The philosophy of the Humanities Building incorporates these factors: design for the Air Force and their proposed curricula; design for educational environment; design for educational technology; design for economy; design for adaptability (not "flexibility"); and design for aesthetic harmony.

Structural System

The use of modules in architecture has been an accepted method of framing structures for thousands of years, and has the

undeniable virtues of economy, simplicity and visual clarity. In the Humanities Building an equal vertical module is added to the horizontal modules to create a unit which might be termed a "cube of space". In the development of the structure, it was more convenient to consider the cube as purely independent of walls, floor, and ceiling, and, as a result, the structural system was developed in the form of a series of planes at right angles like an egg-crate. "The cubes of space" (cubes of occupancy) are enclosed in the egg-crate to form the habitable volumes that compose the structure.

This "cube of space" was derived from a combination of area requirements, equipment sizes, material sizes, door sizes, ceiling heights, and fenestration economies resulting in a volume that is 3' - 9" (45") on an edge. Multiples of this cube form the classroom, hallways, and equipment sizes, and three verticle modules determine a ceiling height of 11' - 3", of which approximately 1' - 3" is occupied with lighting, acoustic treatment, ventilation, and other services. These services are run against the ceiling above a translucent plastic sheet hung from the ceiling. Once the structural frame is erected, the walls are placed and the cubes of space are defined with standardized elements which may be doors,

windows, cabinets or other facilities. (This is illustrated more fully in the drawings and in following descriptions of the standard classrooms.)

The structural planes that form the matrix for the cubes of space are 1' - 0" thick horizontally and 9" thick vertically. The columns are fireproofed steel sections at 15' - 9" o.c. placed on the exterior of the structure; this permits the heating runs to travel the full length of the building — uninterrupted. This has proven to be a great economy in large horizontal structures where many small units must be heated. (i.e.: Women's Dormitory, Washington State College, Pullman, Washington. Paul Thiry, Architect) The columns are joined by a 1' - 0" channel section horizontally which recieves the floor plane.

Concrete blocks, 10" x 10" x 1' 0 9", joined into prestressed slab beams with double-tensioning cables, form the floor and roof planes and are bonded with a 2" concrete topping after modular electrical conduit patterns are laid. In a similar floor construction (Cumberland High School, Bordeaux, Tennessee, Billis, Macdonald-Johnson, Architect) using a slightly smaller block, the entire floor construction was $1.00 per square foot in place. Even more remarkable, approximately 6,600 square feet

of floor were laid by five men in ten hours at an average cost of $1.85 per beam. Each floor of the Humanities Building contains only 7,200 square feet.

Sketches of the floor construction will be found in the drawings, however, details should be re-emphasized here:

1. Each block unit has a $1\frac{1}{2}$" flange extending on both sides. Tension cables are positioned by lugs above these flanges, and are encased in concrete when the 2" topping is poured.
2. No form work is required since the flanges are set close enough together to prevent the topping concrete from seeping through.
3. Their underside forms a smooth, finished ceiling ready for painting or application of acoustic materials.
4. The beams are laid with the aid of a rigid assembly form. The blocks are assembled into beams by embedding them with high-strength mortar. While this mortar is still wet, a single cable is slung along one side of the line of blocks, around an end block and back along the other side. The two cable ends are threaded through an anchor block and some

tension is applied until initial morter set. Then the cables are fully tensioned and the load transfered to a steel plate in the anchor block by screwing down the tension nuts. The actual tensioning is done by two men in 15 minutes.

5. Cables are greased and wrapped to prevent bonding with the concrete.

6. Each beam spans 30' - 0" free of support, facilitating the adaptability (not flexibility) of the floor area.

7. Necessary passage of exhaust ducts through the floor slab is accomplished through the substitution of a welded I-beam box for two blocks; this box serves both as structural continuity and as a form for the 2" concrete topping. (The 1' - 0" edge channel also serves as a form.)

8. Passage of electrical conduit through the slab is accomplished by sleeving sections of the flange. The electrical and heat services will be brought to floor levels through the concrete walls backing the stairs and elevators. The ventilation will come vertically from the roof through the Instructional Walls and will sleeve the slab beams as noted above.

With this method, the entire floor may be laid, concrete poured, concrete finished, and asphalt tile laid in a production-line process, unobstructed by vertical elements other than the two elevator shafts. Fenestration may be installed for the entire floor without complicated struggling, because the interior walls and storage elements are the last to be installed.

Classroom Unit

Adaptability of the classroom to changing instructional techniques and changing curricula is one of the prime considerations in the design of the Humanities Building. This implies the ability to expand and contract the classroom areas, and the ability to change equipment without undue commotion. Experiments such as the Hillsdale High School, San Mateo, California (John Lyon Reid, Architect) have perhaps gone too far with "flexibility" by enclosing the entire academic area, including sciences and home economics, in a shell with every wall capable of being moved. The frequency of changes does not seem to warrant great expense for classroom revision.

1. Classroom Orientation

   It will be noted from the drawings that the axis of the typical classroom runs at right angles to the

axis of the building mass. This orientation of the classrooms into the building stems from an architectural development of the philosophies listed from Pages 73 to 77.

The atmosphere of the college classroom need not be that of the kindergarten where stimulation of interest may come from many sources; the college class should encourage complete attention from the students whether that is directed towards the lecturer, toward a presentation medium, or toward personal paper work. Therefore in the Humanities Building the cadet is oriented toward what is refered to as the "instructional wall", to control his attention. This might sound to some like a rather regimented atmosphere; if so, it is appropriate in an Air Academy, and would be desirable in most civilian institutions, where students frequently learn more about people walking by the class than they do about the subject matter.

Visual relief is still necessary, and this will come from the different and interesting patterns of the units which create the instructional wall. (During the 10 minute class change the cadet's object of

attention will be the soft colors of forest and sky --- an important deviation in daily visual routine.) The classroom axis runs north-northwest by south-southeast, with the student facing south toward the instructional wall which is pierced by two 3' - 9" x 3' - 9" high windows, of patterned glass, shaded by the corridor ceiling. These windows, and the fact that the majority of the wall behind the class is glazed, prevent any feeling of claustraphobia on the part of the student. The instructor looks north toward a light that is very gentle at the latitude of the Pacific Northwest.

The fact that the natural light is coming from behind the student is a small consideration in this technical age. Even today there are relatively no classes held in rooms without supplimenting natural light with artificial illumination. The Humanities Building is designed on the philosophy that it is better to embrace illumination technology to advantage than to design torturous and costly schemes to bring natural light to each student's desk. Technology permits us to orient classrooms in any position, as long as the human's psychological requirements are met.

An aesthetic advantage achieved by placing the classroom axis at right angles to the building mass is that it permits an economical single-loaded corridor. This corridor, on the south side, commands a panoramic sweep across the Academy grounds to the dormitories and Lake Sawyer, to Mount Rainier, the visual focus of the entire campus. The feeling of moving in the air along a brilliantly lighted corridor opening onto all of the granduer of the woods, waters, and mountains conveys some of the thrill of flight. The economy of the scheme is proven by demonstrating that no more volume or perimeter is occupies by this scheme than by placing the classrooms parallel to the building mass on each side of a double-loaded corridor.

2. Classroom Dimensions

With the floor area free to adapt as schedules require, a standard classroom size of 90 "cubes of space" was chosen; this includes all services, storage, and equipment. The area of this room is about 310 square feet of seating space, or 21 square feet per cadet; adequate for lecture and seminar courses.

3. Classroom Division Walls

The side walls are of cement asbestos board mounted on staggered steel studs forming a 6" wall secured in channels at each end. This wall will be readily demountable, and the classrooms may be varied in size by 3' - 9" modules. It might be asked why a native product such as plywood is not used in this demountable wall, but the necessary hourly fire ratings make cement asbestos a more practical material. Since electrical services, ventilation, and plumbing are necessary only at the instructional wall, with some electricity and heating at the window wall, the side walls will be un-cluttered with electrical outlets, piping, and other unmovable elements.

4. The Instructional Wall

The primary need for adaptability is found in the fluctuation of techniques and subjects of instruction. To facilitate this adaptation, the fundamental instructional and operative devices of a general college classroom are grouped in the instructional wall (the south wall) of the classroom.

This instructional wall is made up of elements occupying one-half cube of space, and, being modular, they may be mass-produced in a factory, installed, and changed with great ease through the use of a simple sliding metal joints. The following units are typical of the variations that could be achieved. Some have multiple functions by also forming niches for equipment in the corridor.

MODULAR INSTRUCTIONAL WALL UNITS

Unit No.	Classroom Function	Corridor Function
A.	Door (covers two modules)	
B.	Motion Picture Screen (Covers four modules)	
C.	Exhaust Grille	
D.	Loudspeaker (Television, motion picture, P. A. system)	1. Hinged Service Door
E.	Blank Panel (Cement asbestos-colored or plain)	1. Clock cabinet 2. Fire Extinguisher Recess 3. Drinking Fountain Recess 4. Display Case 5. Services Panel
F.	Television	1. Hinged Service Door
G.	Blackboard	1. Fire Extinguisher Recess 2. Drinking Fountain Recess 3. Display Case 4. Wall Section 5. Services Panel
H.	Window (Patterned Glass)	
I.	Storage Cabinet	1. Bulletin Board 2. Wall Section 3. Glazed Picture Display

The advantages of this modular system of instructional equipment are more evident in the illustrations. Lengthy descriptions of the combinations would be superfluous here, but some explanation of two units is necessary.

Classroom doors in a school structure usually impose conditions that restrict the designer and add to the volume of the building. The required width of opening forces the designer to widen corridors, conceal swings with lockers, or take other circuitous routes to prevent the door from interfering with the traffic in the hallway. In the Humanities Building it would be necessary to widen the structure approximately 1' - 10" to accomodate a single swing door of the full width of the opening. This is an unnecessary addition to the building volume, and in the interest of economy, other methods of handling door swings must be sought.

Two solutions present themselves: the use of a slightly wider opening with two smaller leaves, or the use of a sliding door (solid or of the accordian type). An accordian door has been chosen here for simplicity of

operation and installation. This door unit would be hung in a prefabricated frame capable of slight dimensional adjustments and would be as easily interchangeable as any of the other units.

There are advantages in having the door in the instructional wall of the classroom: in the military situation, attendance is carefully recorded. It is customary for the instructor to record all absences and late arrivals, so the placing of the door near the instructor simplifies his control of attendance.

Another standard piece of equipment for the classroom serves a double purpose. The motion picture screen, overall size 7' - 6" x 7' - 6", also acts as a light shade by covering the two "psychological windows" in the instructional wall. Drapes will cut out or dim the light coming from the rear windows in the classroom.

5. Classroom Utilities

a. Light

Having established that the supplimentation of natural light is always necessary in the educational

situation, it is important that the artificial light be adequate and evenly distributed. The spotty naked illumination of individual light fixtures is rarely soothing to the eye, and the addition of diffusing materials has been accepted as being worth-while.

Often these materials are incorporated into the individual fixtures, thereby increasing the fixture and maintenance cost. For the Humanities classroom, the diffusing elements and the lighting elements will be installed separately, permitting replacement of each without lengthly un-screwing operations. The lights (a combination of fluorescent (types) will be mounted directly on the concrete block ceiling, and the translucent diffusing plastic will be hung in a modular framework of metal 1' - 3" below the block ceiling, giving the room a 10' - 0" ceiling. The hung framework will always be a minimum of 1' - 10" from the walls, leaving a ceiling space usable for acoustical treatment and facilitating replacement of the lighting fixtures. At the instructional

wall, several incadescent fixtures will be run on the ceiling and focused on the instructional wall. This lights the blackboard, preventing glare and accenting the wall.

b. Acoustics

Acoustic materials necessary to control any excess of noise in the small classrooms will be placed on the perimeter of the room against the ceiling. This occupies the area left exposed at the edges of the diffusing panel, and thus the entire ceiling is covered without the necessity for plastering, painting, or complicated suspension systems. The walls of the classrooms (of cement asbestos and staggered studs) deaden noises from adjoining spaces. It must be pointed out that the placing of the blackboard, loudspeaker, etc., on the thick corridor wall serves double duty by removing noise-producing elements from common classroom walls and by reducing infiltration of corridor noise.

c. Heat

Steam, the selected heating media for the entire campus, enters the structure from the central

steam-distribution system and is controlled for the structure from a basement utility room. It rises to the three floors and is distributed through long horizontal convector runs uninterrupted by vertical members, tapped at intervals by fin convectors, thermostatically controlled.

d. Ventilation

Exhaust fans located in the penthouses draw from each classroom through a modular ductwork system. Fresh air is drawn from the windows (above the convectors) to the instructional wall grilles at each end of the wall. By bringing the ducts out at the classroom division walls, each duct serves two rooms producing a more even distribution of air in the small rooms.

e. Electricity

As mentioned earlier, the electrical service will be distributed on each floor in conduit poured into the 2" concrete topping. Convenience outlets will be provided at the instructional wall and near the outside wall (for projection equipment). A modular system of boxed electrical outlets will run the length of the structure at

the position of the instructional wall to accomodate existing television, radio, and loudspeakers and to anticipate changes. A modular service for lighting will occupy each bay; switching to be done at a hall panel.

The Corridors

Psychologically, the Humanities Building corridors have only two dimensions: length and height, with the width visually infinite.

The fenestration on the south is of D. S. glass, broken with operating sash and colored porcelain enamel insulating panels, with all glazing in the lower row either of wire glass or protected with railings. A transparent blue-green line of heat-absorbing glass is mounted on the face of the columns 1' - 3" out from the building face. This controls the heat loss and bathes the corridor with the same soft hues of blue and green that dominate the site. These planes of heat control wrap around the ends of the building to shield the offices from direct rays of early morning and late afternoon sun. The inside wall is then patterned with light and shadow; reflecting the atmosphere of the sun-lit forest.

The corridor floors, as in the classrooms, are of servicable asphalt tile. The interior wall repeats the module of the instructional wall, broken occasionally with the necessary fountains, service fountains, and fire extinguisher recesses, but with all of this equipment, the corridor lines remain

smooth and clean.

The ceiling is dropped with a single strip of plastic in metal frame, concealing light fixtures, ducts, and other services, with the acoustical treatment again applied to the block on each side of the plastic.

The Study Areas

Some of the cadets may spend as much as three hours each day in classes in the Humanities Building. Before, after, and between these classes the cadet may have scholastic obligations that make it necessary for him to study his texts or discuss problems with his classmates. The U. S. Military Academy curriculum specifically states that hours between classes are to be devoted to study.*

The college library has always proven a relatively poor place for concentrated study; for many students it proves impossible, and the same might be said of the typical college dormitory. The atmosphere of study is as delicate and complex as the atmosphere of instruction, and must be provided for with equal care. It is estimated that approximately three hours of

*Catalogue of the United States Military Academy, 1953-54, United States Government Printing Office, Washington, D. C. 1953

preparation and study are required for each hour spent in class.

Some students will choose not to take full advantage of study facilities, even if meticulously provided, but the majority of students would welcome an intimate environment for concentration. Therefore in this plan for an Air Academy, the great populous echoing halls of the typical library are dissected into usable units and distrivuted among the buildings where the cadets spend their day. The library is restored to its function as a dispensary and storehouse of literature, and as a sanctuary in which to study reserve information.

The study areas take two forms in the Humanities Building: rooms and alcoves.

1. The Study Rooms

   On the first floor a careful indoor - outdoor study environment has been created. Indoors for study, and outdoors for visual relief. Four separate rooms face south toward a ceramic mosaic wall across a fern-coated court. Shocking as it may be to some, this court has been created only to be looked at. It is not for sun-bathing, handball, croquet, or tete'-a-tete's. The ceramic wall, an abstract design in small square tiles, serves both as a visual focus and

as a shield for the study rooms, cutting out disturbing activity on the walks and greens of the campus.

In these well-lighted and residentially furnished rooms the cadet may study intimately and carefully, preparing for the day's activity or reviewing recent classes. With the honor system guarding against misuse of these rooms (just as it guards all other campus activity) they will become a cherished haven for the assignment-oppressed cadet.

2. The Study Alcoves

The upper floors of the structure house several small areas off the stair hall devoted to relaxation, and last-minute cramming. This is the home of the cadet who arrives 10 minutes early for class and discovers he hasn't reviewed the 5th chapter. The alcoves are simply places to sit and perhaps speculate with classmates; a convenience, anticipating the actions of the cadets, for whom the structure is designed.

Miscellaneous Facilities

Primary among these are the instructor's offices; each office is designed to accomodate four to eight instructors in an academic division.

They are placed at the ends of the structure to take advantage of the 270° orientation and to remove them from corridor traffic. Yet with the proximity of the offices to the vertical traffic, the instructors are readily available to the cadels for consultation when the cadet is moving to and from class.

The proportion of the instructors to be housed in the same building that will contain their classes is not known, however, the indicated offices will house from 24 to 48 instructors. As with the problem of the required number of classrooms, further detailed planning by the future administrators of the Academy would establish more exact figures on the number of rooms required for offices. The adding of one or two bays to the designed structure would accomodate any variations.

Toilet rooms are provided on each floor, adequate for an occupancy of approximately 400 persons; and one toilet room for women is included on the first floor to serve the occasional women visitors and secretaries. These rooms are tiled, with visual screens located at the doorway and obscure glass provided for the windows.

Janitorial services are housed in the basement, with ready access to the elevator for night maintenance. Several storage

rooms for texts, furniture, instructional units, projection equipment, mimeograph equipment, etc., are in the basement and in the penthouses. The flat roofs without parapets allow snow to blow off; center down spouts are sheltered within the warmth of the building. The penthouses of concrete houses many building services and is designed to harmonize with the structure rather than repel the eye. All fans, vents, etc. are concealed and operate through louvers at the ends of the penthouses.

Counterpoint to the multi-colored sweep of the Humanities Building is the mystery and solidness of the Lecture Hall. Why the addition of this hall? and why the resulting form?

Every school in the world has, from time to time, found it necessary to gather large groups of students for lectures or special events not of interest to the entire enrollment. This is particularly true of higher education where the courses of instruction vary widely, and where many class sections in the same course must be brought together to benefit from a presentation that can not be repeated. Therefore, the need for a lecture hall: larger than a classroom, but smaller than a major auditorium. On the Air Academy campus there will be several such lecture halls; perhaps one for each major instructional division, each equipped with the apparatus required for that topic.

The Lecture Hall is designed to seat 189 cadets maximum, approximately twice the capacity of the Humanities Building for one hour. It will seldom be required to seat that many. With the need for a lecture hall established, we must again examine

the philosophy of "lecture", just as we examined the philosophy of "classroom".

As with a classroom presentation, the essential of a large lecture is the convenience of a message to a group, whether it is by a person or a media. It can be said that the Lecture Hall is a large classroom, but with this supposition we add situations not found in the smaller classroom. The control of student interest in a large crowd depends more upon the quality of the lecture than upon any personal instructor-student contact. The natural reaction of a crowd to a situation can not be averted.

The lecture is a one-time event rather than an episode in a carefully build-up chain of thought; to present a lecture, a careful preparation and complete apparatus is necessary. The Lecture Hall must be well-provided with presentation materials and areas in which to assemble them.

As an event witnessed by 150 or 200 persons, the lecture hall requires a large seating area with provisions made for good vision from each seat.

Again, with the Lecture Hall requiring a large area, a special structure, often expensive structure, must be erected.

With the more planned, precise programing of a lecture, control of the crowd entering the hall is as important as control exiting. The first 15 minutes of an hour-long presentation may contain the outline of thought; this important phase is frequently ruined by thoughtless persons arriving late.

Careful acoustical control, adequate lighting, good ventilation and controlled heat are requirements for any educational situation; in the lecture they are magnified to fit the larger situation. The Lecture Hall demands all of the elements of the small classroom, combined differently to aid the transmission of a message to a larger audience.

Philosophy of the Lecture Hall

Mood and economy dictate the form of the Lecture Hall. Economically, auditoriums and halls are expensive if the architect runs amuck designing beautiful forms that are nearly impossible to construct within our technology. Some "contemporary" auditoriums will never become the classic examples of waste that they should be, for the trade magazines seldom publish pictures of scaffolding. On one building, three months were devoted to the erection of tortured arches and warped surfaces, none of which are now part of the final building.

Concrete was poured over this gleaming woodwork, and then three month's work was torn down and cast away. It is difficult to justify the many fan-shaped, oval, and hexagonal lecture halls that dot the nation when we are told that acoustically, visually, and economically it is hard to improve on the simple rectangle. This is the form that the Humanities Lecture Hall has taken.

Within this rectangle, all things are possible, but a further economical consideration affects the placing of the rectangle: the Lecture Hall is a volume, not a two-dimensional drawing. The satisfactory plan arrangement places the lecturer at a position where he can be seen from every seat, suggesting that he be at a low point with the seats placed on a slope. The construction of this slope might be compared to the construction of the roof. Fantastically expensive systems of elevating the seating into the air have been employed, perhaps only to make the building monumental, perhaps to create lobbies; again necessitating monstrous preparation of forms and scaffolding.

The scaffolding for a ramped seating plan is already there; it is simply "too near to be seen". In the Northwest it is common to employ the earth itself as a form, even for vertical foundations, and in the well-drained, sandy soil at the high elevation

of the Humanities Building, it is only practical to use the earth as a bottom form for the Lecture Hall. So we find that the rectangular volume of the hall is "lowered into the earth". The floor is poured on the readily-molded ground, a waterproof membrane is mopped in place, and the final stepped floor is upon this base in sections, covering a radiant heat network. As with the modular concrete block construction, forms are all but eliminated.

Aesthetic critics might comment that the resulting low rectangular surface structure doesn't "reflect the function", but any such criticisms are made only in the light of 50 years of exposure to lecture halls cascading into the air. Man's history records many examples of his desire for secrecy and underground enclosure when meeting with his kind. From the security of the cave to the dimness of Egyptian Temples to the mystery of the catacombs to the underground churches of the Southwest Indian, humans have sought occasional security in complete enclosure, often to join his fellows in teaching or learning. So, the chosen mood of the Lecture Hall, that of a cave, has its precedent in history and not in the architectural publications.

Structural System

The simple, fast prestressed concrete block system of construction is repeated in the Lecture Hall and combines with the earth-form floor and wall method to produce a large havitable volume at small cost in time and labor.

The floors and side walls are poured against the earth and moisture-proofed as described, with battered concrete walls (reflecting the stress pattern), formed up approximately 11' - 0" above the ground. The roof is spanned with precast concrete beams which are tapered from the center to the ends to produce a slight slope for drainage. A thin slab of prestressed block spans between the beams and all members become monolithic with the walls when the 2" concrete topping is poured, exactly as was done in the Humanities Building. The membrane will be continued up the walls, and a roofing of 30-year mothballing plastic laps down the walls.

Entrances

Sinking of the Lecture Hall into the ground aids the circulation pattern. Since the Hall seats twice the capacity of the Humanities Building, it will be entered more frequently from outdoors. This is facilitated by having the main entrance at ground level. For the persons entering through the Humanities

Building there are secondary entrances on each side of the podium from a basement lobby. These are the required secondary exits, too, making a total of four exits from the hall, but these will be closed to entrance at the beginning of the lecture. This serves as a measure of control, protecting the lecturer from the annoyance late arrivals who might interrupt the continuity of thought by distracting the audience. Center and side aisles split the seating into comfortable banks.

The outdoor entrance (main entrance) is from a slightly elevated steel grille porch (which guards against the accumulation of ice or snow in inclement weather) opening into a small lobby. This lobby, patterned with light filtering through the entrance screen in the daytime, and dimly lit at night, is a buffer for the seating area. Drafts and light are trapped here, and the lecturer is further protected against the late arrivals.

Secondary Rooms

The lecturer requires additional space for preparation and storage of equipment, and this is provided in the basement of the Humanities Building, adjacent to the utility room. To guard against fire and audience disturbances, the projection booth is placed slightly off-center at the rear wall of the

seating area. Because of the slope of the auditorium floor, it is possible to put the projection booth floor a few feet above the level of the lobby floor and project films without having the light beam interrupted, by the passage of people. To install an adequate projection booth in a low structure without complications provides an opportunity to install professional equipment economically and safely.

Lecture Hall Utilities

1. Instructional Equipment

   Generally the equipment required in this Lecture Hall is larger than in a classroom, but of the same type. Projection screens, blackboards, and charts are all interchangeable through the use of counterweighted vertically-sliding panels. The seats for students are provided with folding writing arms for note taking. The lecturer will have buzzer communication with the projection booth.

2. Acoustics

   The character of the hall interior comes from the acoustical control features. The ceiling is of cedar strips hung in rippling waves to reinforce the direct sound waves, and is held away from the walls leaving

a line of acoustic absorption on each side of the ceiling. The rear wall is slightly inclined and also of absorptive materials alternated with cedar strips. The walls are of angled plywood, decorated with painted patterns. The sound equipment is centered in the front wall above the screen, connected with the projection booth and a microphone at the podium.

3. Light

Individual spots in the cedar ceiling spray the seating with adequate light, controllable in banks from either the front wall or the projection booth, with special spots high-lighting the speaker. Small floor lights will softly illuminate the aisles and the lobby during projection of films; a complete reliance on artificial light eliminating the need for curtains.

4. Heating

As mentioned earlier, the heat will be from a radiant slab, using electrical elements for the off-and-on heating of the hall with supplimentary steam heat installed at the sides of the hall.

4. Ventilation

Fans housed in a small screened box on the top of the Lecture Hall draw the stale air from the hall and introduce a portion of the fresh air through a system of ducts above the cedar acoustic control. (Some air will be drawn in through the doors.) The fan housing on the roof is of extra aesthetic importance since the entire north facade of the Humanities Building looks onto the square and the Lecture Hall.

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APPENDIX

DEPARTMENT OF DEFENSE
OFFICE OF PUBLIC INFORMATION
Washington 25, D.C. NO. 290-51

IMMEDIATE RELEASE MARCH 1, 1951 LI 5-6700, Ext. 75131

LIST OF SITES NARROWED TO SEVEN FOR THE AIR FORCE ACADEMY

The Air Force Academy Site Selection Board has selected seven sites that will receive further consideration as the most suitable for the proposed Air Force Academy, Secretary of the Air Force Thomas K. Finletter announced today.

In accordance with previously announced plans, the architectural engineering firm of Holabird and Root and Burgee of Chicago, Illinois, will give six of these seven sites a detailed survey.

Complete information is available on Randolph Air Force Base, one of the seven sites, and a detailed survey of that location will not be required.

The sites are:

California - Camp Beale, near Marysville;
Colorado - site near Colorado Springs;
Indiana - site near Madison;
North Carolina - site near Charlotte;
Texas - (a) site near Grapevine;
(b) site in Grayson County;
(c) Randolph AFB.

Congressional approval will be the final authority for the establishment of the Air Force Academy.

The Board is headed by General Carl Spaatz, former Chief of Staff of the Air Force. The other members are Doctor Bruce Hopper, a special consultant, on loan from Harvard University as educational advisor; Lieutenant General Hubert R. Harmon, Senior Air Force Member of the Military Staff Committee of the United Nations, and Brigadier General Harold L. Clark. Board Secretary is Lieutenant Colonel Arthur E. Boudreau.

END

COPY

326 Harvard Street
Cambridge 39, Mass.
March 3, 1953

Mr. Charles E. Wilson
Secretary of Defense
Washington, D.C.

Dear Sir:

As a graduate student in Architecture at the Massachusetts Institute of Technology, I am embarking upon my thesis work, and I hope that your department will be able to aid me.

My specific topic is "The United States Air Force Air Academy", a study of educational requirements to culminate in a comprehensive design of an academy functioning for the Air Force as West Point and Annapolis do for their respective services.

As an Air Force reservist, I have come in contact with isolated references to the Air Academy, both as a future possibility and as a project that has been discussed in the past. Any information that your office might supply pertaining to the requirements and establishment of an Air Academy would be greatly appreciated.

My primary interest as an architect is in educational buildings and their relationship to a curriculum, both as individual structures and as an overall campus pattern. With the permission of the services, I hope that I may be permitted to visit West Point and Annapolis this spring and study their academic procedures.

Thank you.

Sincerely,

Robert E. McConnell

C O P Y

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
Washington 25, D.C.

23 March 1953

Mr. Robert E. McConnell
326 Harvard Street
Cambridge 39, Massachusetts

Dear Mr. McConnell:

Your letter of March 3, addressed to the Honorable Charles E. Wilson, Secretary of Defense, has been referred to this office for reply.

Establishment of the proposed Air Academy is dependent upon enactment of appropriate legislation by the Congress. Such legislation, sponsored by the Department of Defense, was introduced in the 83d Congress on 29 January 1953 by the Honorable Dewey Short, Chairman of the House Armed Services Committee.

At the present time the Air Academy is only in a very limited planning status and all plans have not been finalized. It is highly possible, therefore, that some of the information which you would require in the development of your thesis would not be available. If you desire to submit a list of questions to this office relative to the proposed Air Academy, answers, where available, will be supplied.

With reference to your desire to visit the U. S. Military Academy and the U. S. Naval Academy, it is believed that the Superintendents of the respective institutions could advise you directly in this respect.

As a word of caution, Arthur G. Witters, Major USAF, developed a Masters thesis on your subject while majoring in Architecture at Iowa State College, Ames, Iowa in 1949.

Your interest in the proposed Air Academy is appreciated.

Sincerely,

THOMAS L. SHELDRAKE
Lt Colonel, USAF
Assistant Executive Officer
Office, Special Assistant for
A.F. Academy Matters

C O P Y

326 Harvard Street
Cambridge 39, Mass.
10 April 1953

Thomas L. Sheldrake, Lt. Col., USAF
Assistant Executive Officer
Office, Special Assistant for A.F. Academy Matters
Department of the Air Force
Headquarters, USAF
Washington 25, D.C.

Dear Colonel Sheldrake:

In reference to your letter of 23 March 1953, thank you very much for your interest in my thesis project in Architecture at M.I.T.: "The USAF Air Academy".

With your permission, I am submitting the following list of questions concerning this project:

1. Has the Air Force chosen a definite site for the Academy, and on what criteria will you make a choice? I am a native of the State of Washington familiar with conditions both in the Moses Lake-Spokane area and in the Puget Sound area. If the Northwest was considered, it might facilitate my work to use a theoretical site there.

2. What will be the estimated enrollment? What will be the estimated yearly breakdown of that enrollment?

3. I assume that, in general, the Academy will take the pattern of a four-year liberal arts institution, but what additions will be made to the curriculum for Air Force specilization?

4. Will provisions be made for flight training?

5. What will be the approximate size of the faculty? What housing provisions will be made for them on the campus? Again I assume that the students will be housed in dormitories as in a typical civilian school.

Any further descriptive literature that your office might forward would be appreciated. Also if you have any rough outline of the progressive yearly course of study, it would be most valuable in my work. Thank you.

Sincerely,

Robert E. McConnell
C O P Y

27 April 1953

Mr. Robert E. McConnell
326 Harvard Street
Cambridge 39, Massachusetts

Dear Mr. McConnell:

This is in reply to your letter of 10 April.

Establishment of the proposed Air Academy is dependent upon enactment of appropriate legislation by the Congress. The Department of Defense sponsored Air Academy bill was reintroduced in the House of Representatives as H. R. 2328 by the Honorable Dewey Short, Chairman of the House Armed Services Committee on 29 January 1953. This bill is identical to the Air Academy bill introduced in the 82d Congress on 22 June 1951 by the Honorable Carl Vinson, then Chairman of the House Armed Services Committee, and contains the following provision: "The Secretary of the Air Force is authorized to establish a commission, and to appoint the members thereof, to advise him in connection with the selection of a permanent location for the Academy."

On 25 November 1949 the then Secretary of the Air Force, W. Stuart Symington, appointed an Air Force Academy Site Selection Board to study the Air Academy site question and make appropriate recommendation. Approximately 354 separate site proposals were considered by this Board during 1950 and 1951. However, in view of the provision in the bill introduced by Mr. Vinson in June 1951, the Board did not submit a final report and was dissolved in December 1952. Inclosed is a copy of the last announcement made by the Air Force Academy Site Selection Board. At the beginning of its studies, the Air Force Academy Site Selection Board provided each interested agency with the inclosed listing of general criteria. The more detailed criteria used by the Board in its deliberations is not available. The Pacific Northwest area was considered. Two sites in the Seattle area, namely, a site in the vicinity of Beaver Lake and a site in the vicinity of Lake Samamish, were proposed.

In the event Air Academy legislation is enacted by the Congress, the Secretary of the Air Force plans to appoint a new commission to study the site problem in accordance with the

previously quoted provision in the Air Academy bill. In view of the status of the site question, it is the opinion of this office that you should base your studies on a purely hypothetical site in an area of the country with which you are familiar.

Under the provisions of the present Air Academy bill the maximum enrollment of the Air Academy at full strength would be 2,496 plus certain foreign students and sons of Congressional Medal of Honor winners. For planning purposes you might assume that the total maximum enrollment at a specific time would include 750 Freshmen, 615 Sophomores, 597 Juniors, and 585 Seniors, making a total of 2,547.

Present planning envisages that the Air Academy will be a four year college level institution granting the BS Degree. It should not be classed as a strictly liberal arts college nor as an engineering college. The curriculum would be tailored to the specific needs of the Air Force. The curriculum is still in the process of development and has not been finalized. Of course, it will never become static. Inclosed is an outline of a proposed curriculum. The Science and Social-Humanistic courses appearing on the outline are close to present thinking; however, the military (professional training) program being considered at the present time is quite different from that appearing on the outline. For the purposes of your study, you may assume that a comprehensive tactics and military training program will be interwoven throughout the four academic years and that the summer program will be composed of this type of instruction almost exclusively. The amount and type of flying training to be offered is still under discussion; however, it would be appropriate for you to assume that the cadets will participate in several aerial flights and will be given some type of flying training instruction, i.e., observer training.

It is anticipated that the academic section sizes would average approximately 14 students each. Of course, in certain laboratory and lecture courses this ratio may be increased. When the Academy reaches full strength, the education and training staff and faculty may include approximately 400 persons (Regular officers, Reserve officers and civilians).

Due to the nature of the institution, it would be highly desirable that the entire staff and faculty live on the campus. However, this may not be possible. The cadet will live in

dormitories. You could use the U. S. Military Academy as a guide in this matter.

We trust that the foregoing, though sketchy, will suffice for the purposes of your study. We emphasize that the Air Academy is in the planning stages only and that all of the foregoing should be considered in that light.

If you have any further questions, feel free to contact this office. If there is no additional expense to you involved, this office would be interested in receiving a copy of your thesis when completed.

Your interest in the proposed Air Academy is appreciated.

Sincerely,

THOMAS L. SHELDRAKE
Lt Colonel, USAF
Assistant Executive Officer
Office, Special Assistant for
A. F. Academy Matters

C O P Y

c/o Dept. of Architecture
Massachusetts Institute of
Technology
Cambridge 39, Massachusetts
30 April 53

The Library of Congress
Washington, D.C.

Gentlemen:

I would like to request two (2) copies of H. R. 2328, which was introduced in the House of Representatives by the Honorable Dewey Short, Chairman of the House Armed Services Committee, on January 29, 1953. This request is in connection with research being made for my Master's Thesis at the Massachusetts Institute of Technology.

Please advise if there is any charge for this service. Thank you.

Sincerely,

Robert E. McConnell

C O P Y

THE LIBRARY OF CONGRESS

Washington 25, D.C.

Reference Department
Serials Division

May 7, 1953

Dear Mr. McConnell:

Your letter of April 30, 1953, requesting copies of a House bill, has been referred to this Division for attention and reply.

The Library of Congress distributes only selected items of its own publication. Your letter will be referred to the House Document Room, United States Capitol, which is the customary distributing agency of House bills.

Very truly yours,

John H. Thaxter
Acting Chief
Serials Division

Mr. Robert E. McConnell
c/o Department of Architecture
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

C O P Y

c/o Department of Architecture
Massachusetts Institute
of Technology
Cambridge 39, Massachusetts
October 15, 1953

Commanding Officer
United States Naval Academy
Annapolis, Maryland

Dear Sir:

As a graduate student in the Department of Architecture at M.I.T., I am gathering research material for my thesis: "A Theoretical Design for the United States Air Force Academy". This thesis project has been approved by the Air Force through Lt. Col. Thomas L. Sheldrake, Headquarters, USAF, Washington, D.C.

As part of my studies for an Air Academy, I feel that I should understand the physical layouts and academic programs of those institutions already established by the various services to train their officers.

Any descriptive literature that you might send to me would be appreciated. A campus map of the Naval Academy would be of great value in my work, together with information on the curriculum, staff organization, and extra-curricular activities. Any photos or descriptions of the campus would be useful in the final report.

Sincerely,

Robert E. McConnell

C O P Y

UNITED STATES NAVAL ACADEMY

Annapolis, Maryland

In Reply Refer To:
7010
PIO-861-53

October 23,1953

Mr. Robert E. McConnell
c/o Department of Architecture
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

Dear Mr. McConnell,

Herewith is a collection of some of the material requested in your letter of October 15. I hope you will find it useful for your purpose. If you are interested in floor plans etc of various buildings, I suggest you write directly to the Public Works Officer U. S. Naval Academy. I am sure he will be glad to help you out with whatever he can.

Sincerely,

WALTER J. ELLIS
Lieutenant Commander, USN
Public Information Officer

Encl.

C O P Y

c/o Department of Architecture
Massachusetts Institute
of Technology
Cambridge 39, Massachusetts
October 15, 1953

Commanding Officer
United States Coast Guard Academy
New London, Connecticut

Dear Sir:

As a graduate student in the Department of Architecture at M.I.T., I am gathering research material for my thesis: "A Theoretical Design for the United States Air Force Academy". This thesis project has been approved by the Air Force through Lt. Col. Thomas L. Sheldrake, Headquarters, USAF, Washington, D.C.

As part of my studies for an Air Academy, I feel that I should understand the physical layouts and academic programs of those institutions already established by the various services to train their officers.

Any descriptive literature that you might send to me would be appreciated. A campus map of the Coast Guard Academy would be of great value in my work, together with information on the curriculum, staff organization, and extra-curricular activities. Any photos or descriptions of the campus would be useful in the final report.

Sincerely,

Robert E. McConnell

COPY

UNITED STATES COAST GUARD ACADEMY

Address reply to:

SUPERINTENDENT
U. S. Coast Guard Academy
New London, Connecticut

26 October 1953
File: OC/P11

Mr. Robert E. McConnell
c/o Department of Architecture
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

Dear Sir:

In reply to your letter of 15 October 1953 requesting certain information on the Coast Guard Academy, the enclosures are forwarded.

It is hoped the information contained herein will be sufficient for your needs.

Sincerely,

E. J. ROLAND
Captain, U. S. Coast Guard
Commandant of Cadets

Encls.
1. Catalogue of Courses
2. Academy Visitor's Guide
3. "Career for Tomorrow"
4. Diagram of Academy grounds

C O P Y

c/o Department of Architecture
Mass. Inst. of Technology
Cambridge 39, Massachusetts
October 15, 1953

Commanding Officer
United States Military Academy
West Point, New York

Dear Sir:

As a graduate student in the Department of Architecture at M.I.T., I am gathering research material for my thesis: "A Theoretical Design for the United States Air Force Academy". This thesis project has been approved by the Air Force through Lt. Col. Thomas L. Sheldrake, Headquarters, USAF, Washington, D.C.

As part of my studies for an Air Academy, I feel that I should understand the physical layouts and academic programs of those institutions already established by the various services to train their officers.

Any descriptive literature that you might send to me would be appreciated. A campus map of the Military Academy would be of great value in my work, together with information on the curriculum, staff organization, and extra-curricular activities. Any photos or descriptions of the physical campus would be useful in the final report.

Sincerely,

Robert E. McConnell

C O P Y

UNITED STATES AIR FORCE
Headquarters
AIR UNIVERSITY
Maxwell Air Force Base
Alabama

22 October 1953

2nd Lt. Robert E. McConnell, Jr., USAFR
55 Orchard Avenue
Cambridge, Massachusetts

Dear Lieutenant McConnell:

At a recent meeting in Washington of the American Council on Education your father told me about your thesis project for your masters degree. You are to be congratulated for selecting a realistic Air Force problem for your research, especially since you are pursuing your studies without financing from the Air Force.

As you may know, the Chairman of the Armed Services Committee of the House of Representatives has gone on record as promising to give high priority to the Air Academy bill when Congress reconvenes in January. We are naturally anxious that nothing shall jeopardize our hopes for Congressional approval of the proposed bill. Probably the most controversial point will be the actual location of the Academy.

When I returned from the Washington meeting I learned that some of our students here in the Air Command and Staff School were developing, as a school problem, a logistics plan for the proposed Academy. Some of these students had written Chambers of Commerce at various points in the country where tentative sites had been surveyed as proposed locations for the Air Academy. The nature of these unofficial inquiries was apparently misunderstood by these local communities and as a result local interest was over-stimulated to a point wholly unjustified. We were fearful that the Air Force might be misunderstood as anticipating Congressional actions.

Colonel Sheppard was asked to talk with you simply to be sure that you understood the situation. He reports that the topographic basis for your thesis is a plan already developed by the local people in King's County, and that you contemplate making no further inquiries of them. It is apparent, therefore, that you are completely aware of the factors discussed above.

Air University interest in the Air Academy stems from the fact that the original planning began here, that we are carefully watching the development of these plans and that ultimately we believe the Air Academy will be the undergraduate school of the Air University.

We will be interested in seeing the result of your research and wish you every success in your career.

Cordially yours,

LAURENCE S. KUTER
Lieutenant General, USAF
Commander

Copy to:
Pres. R. E. McConnell

C O P Y

55 Orchard Street
Cambridge 40, Massachusetts
5 November 1953

Lieutenant General Laurence S. Kuter
Headquarters, Air University
Maxwell Air Force Base, Alabama

Dear General Kuter:

Thank you for your letter of 22 October 1953 concerning the Air Academy. During the preliminary research work for my master's thesis on the architectural development of the Air Academy, I have been repeatedly impressed with the need for discretion in dealing with the public.

The topographical maps and site data that I am using for my thesis were obtained from the King County Planning Commission, Seattle, Washington, and were studied by the Commission in 1950 as one of the 354 site proposals for an academy. When I obtained this data from the Planning Commission, I made it very clear to them that my use of their information was simply to make a theoretical problem more realistic. As you know, I will have no further contact with that agency.

I have taken the liberty of reading your letter to the thesis committee which is supervising my work at M.I.T. They understand the situation and will exercise the necessary caution in their capacity.

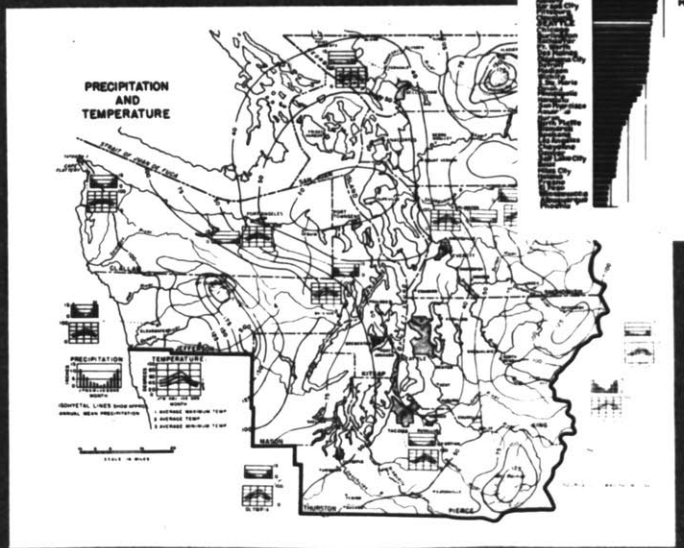
The Air Academy is proving to be an excellent problem for my study of educational architecture. I join you in hoping that the Air Force's plans for an academy will materialize in the near future.

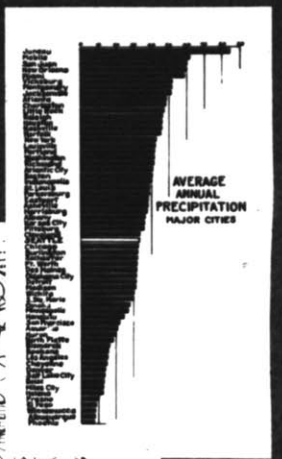
Sincerely,

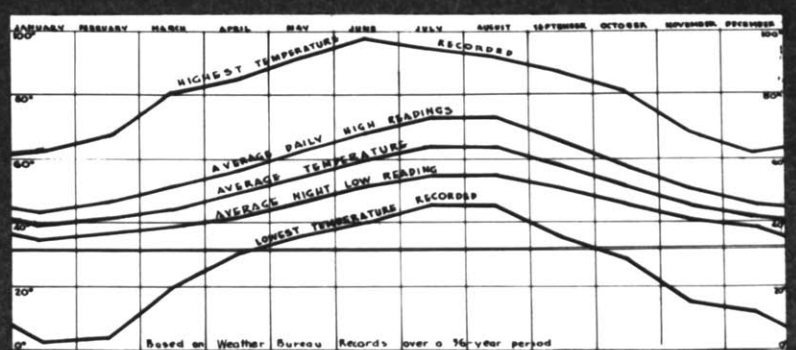
Robert E. McConnell
2nd Lt., USAFR

C O P Y

THE DRAWINGS



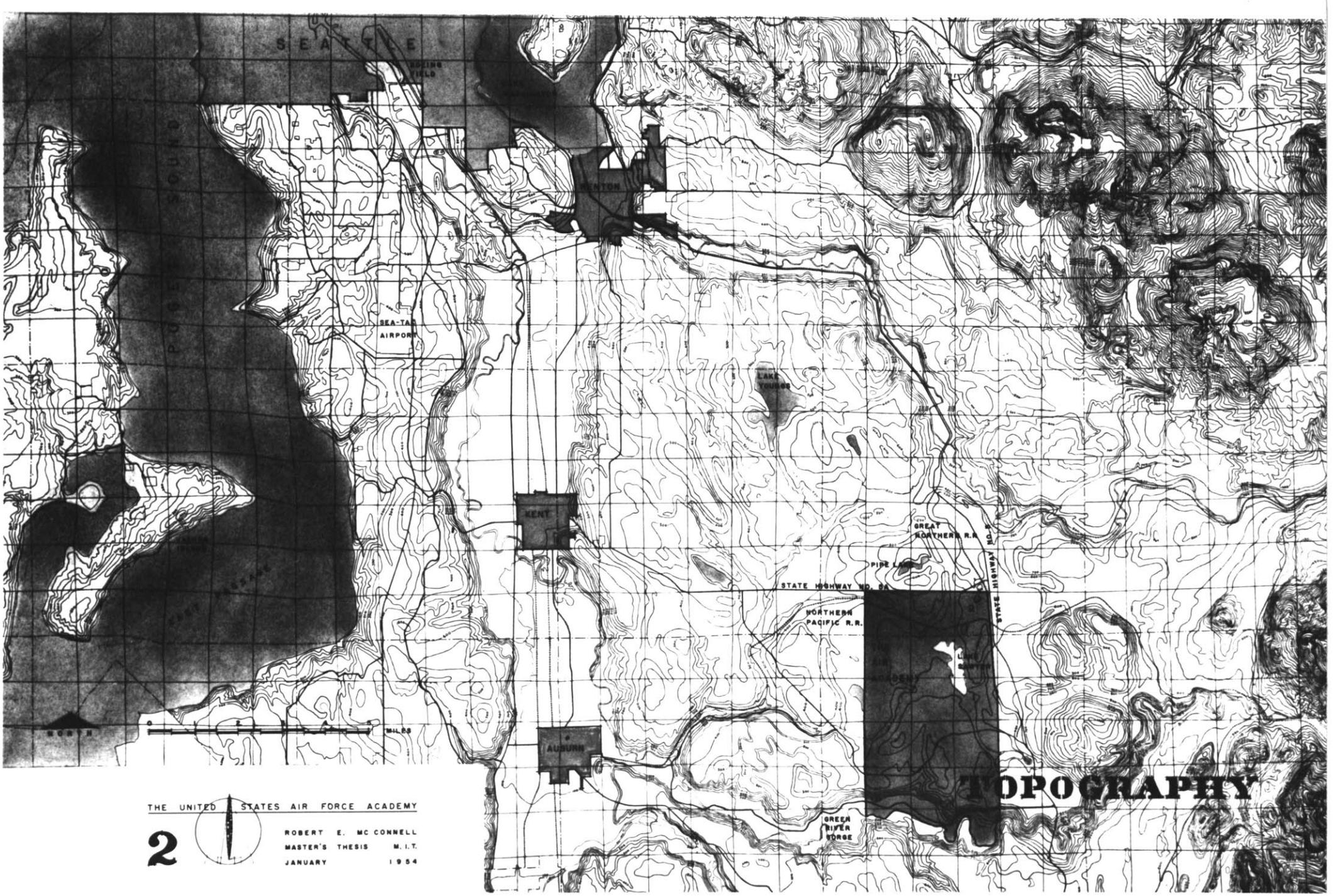




THE UNITED STATES AIR FORCE ACADEMY

1

ROBERT E. MC CONNELL
MASTER'S THESIS M. I. T.
JANUARY 1954



THE UNITED STATES AIR FORCE ACADEMY

2

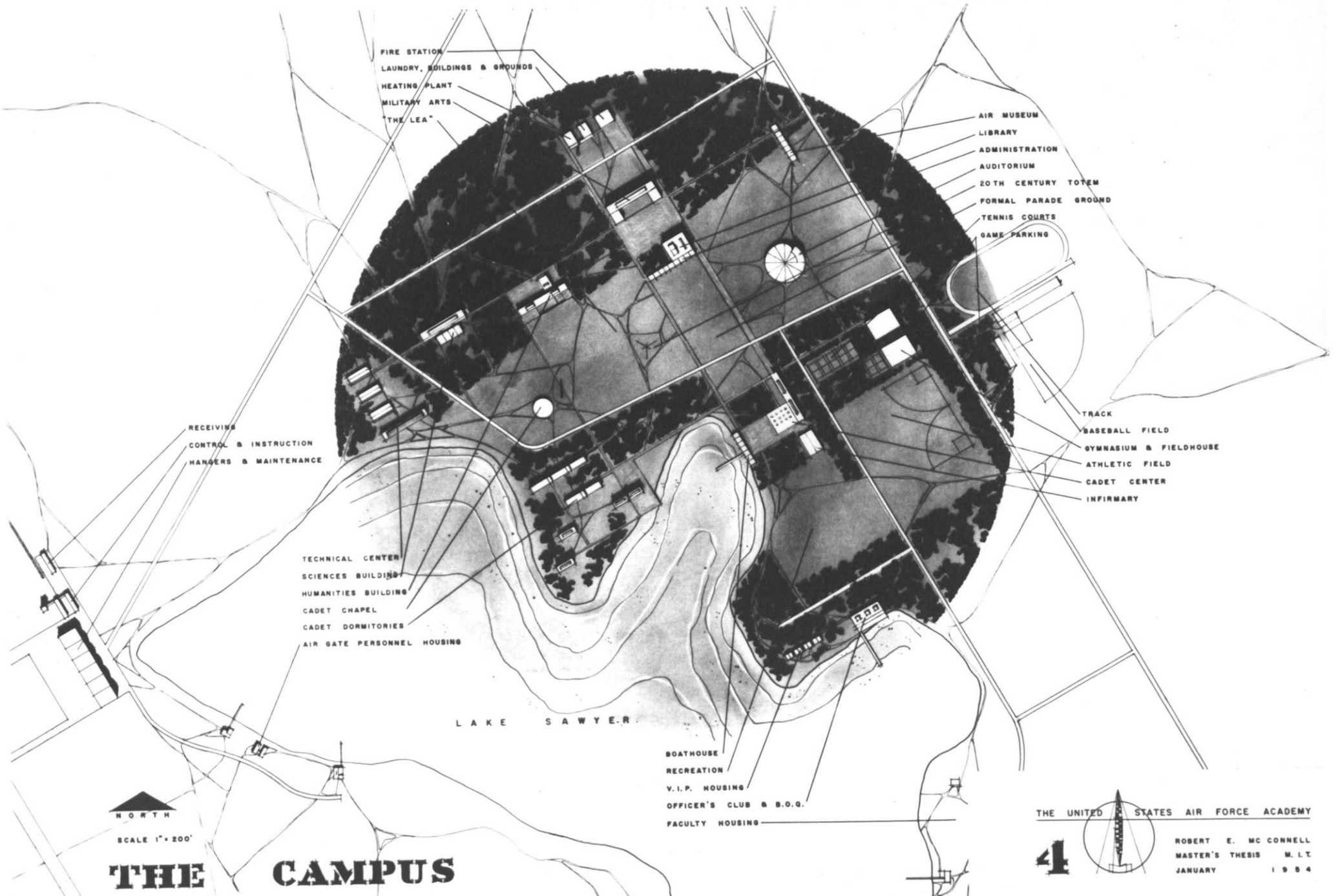
ROBERT E. MC CONNELL
MASTER'S THESIS M.I.T.
JANUARY 1954

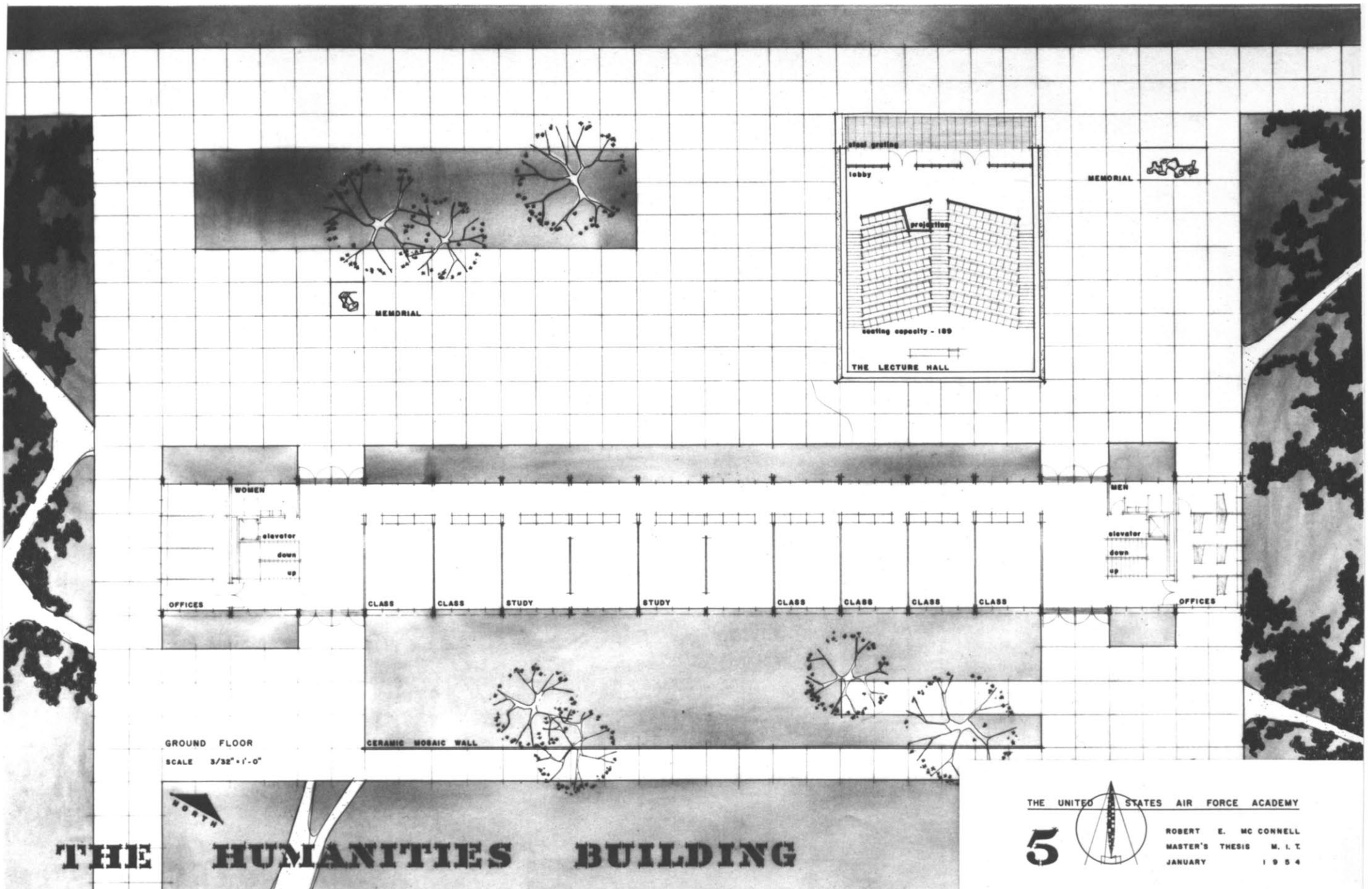
SITE PLAN

THE UNITED STATES AIR FORCE ACADEMY

3

ROBERT E. MC CONNELL
MASTER'S THESIS M. I. T.
JANUARY 1954


FIRE STATION
LAUNDRY, BUILDINGS & GROUNDS
HEATING PLANT
MILITARY ARTS
"THE LEA"
AIR MUSEUM
LIBRARY
ADMINISTRATION
AUDITORIUM
20TH CENTURY TOTEM
FORMAL PARADE GROUND
TENNIS COURTS
GAME PARKING
RECEIVING
CONTROL & INSTRUCTION
HANGERS & MAINTENANCE
TRACK
BASEBALL FIELD
GYMNASIUM & FIELDHOUSE
ATHLETIC FIELD
CADET CENTER
INFIRMARY
TECHNICAL CENTER
SCIENCES BUILDING
HUMANITIES BUILDING
CADET CHAPEL
CADET DORMITORIES
AIR GATE PERSONNEL HOUSING
LAKE SAWYER
BOATHOUSE
RECREATION
V.I.P. HOUSING
OFFICER'S CLUB & B.O.Q.
FACULTY HOUSING
NORTH
SCALE 1" = 200'
THE CAMPUS
THE UNITED STATES AIR FORCE ACADEMY
4
ROBERT E. MC CONNELL
MASTER'S THESIS M.I.T.
JANUARY 1954

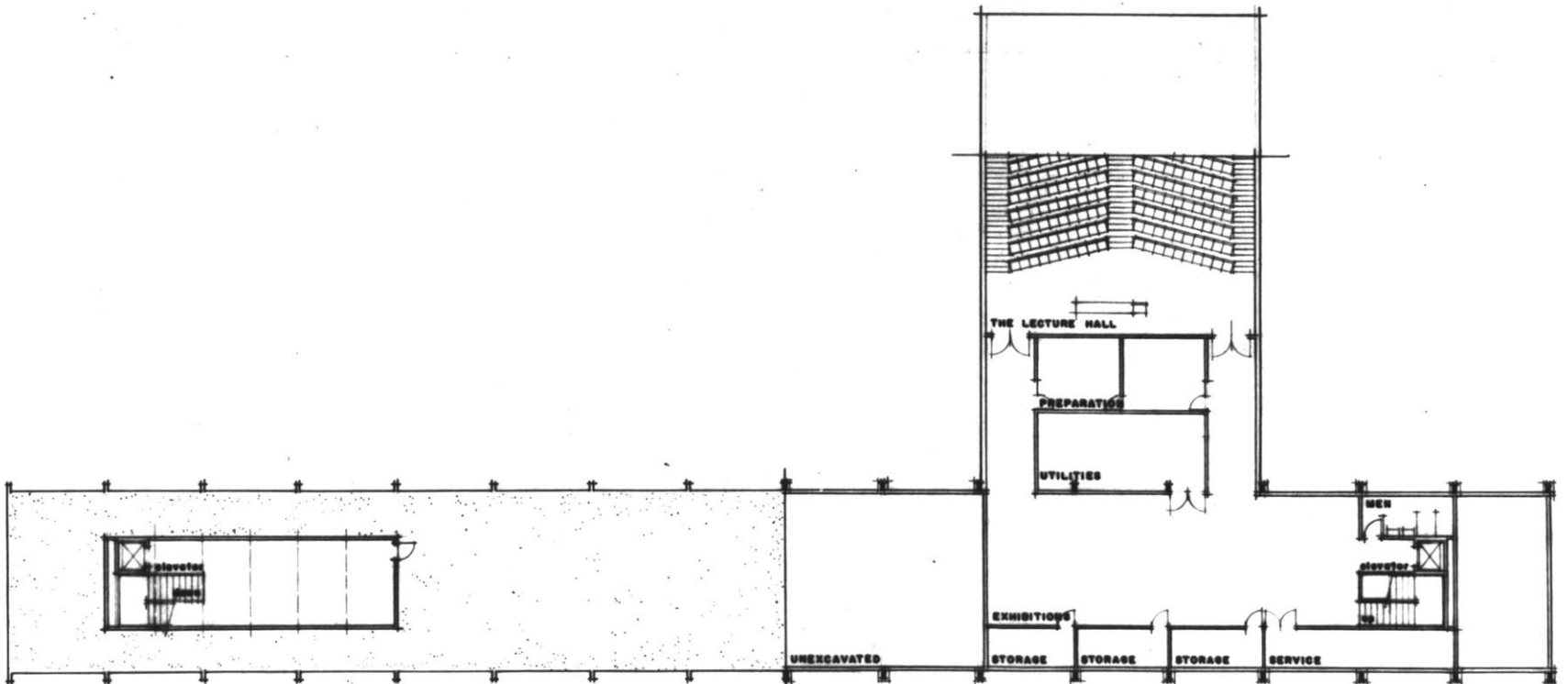


THE HUMANITIES BUILDING

THE UNITED STATES AIR FORCE ACADEMY

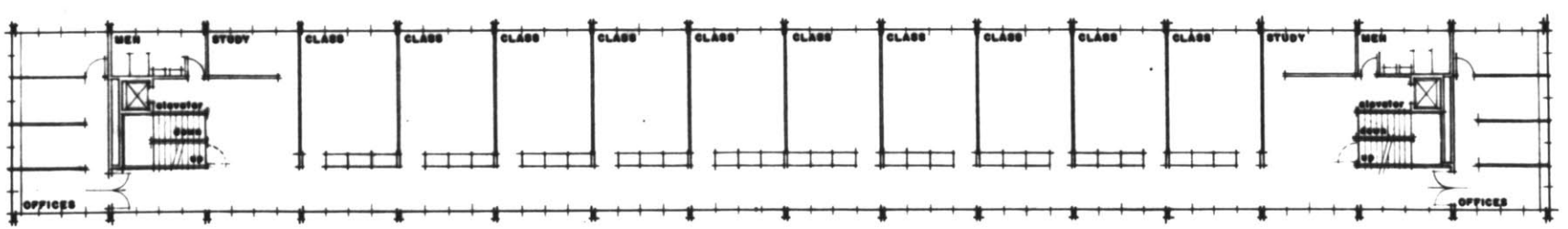
5

ROBERT E. MC CONNELL
MASTER'S THESIS M. I. T.
JANUARY 1954



TYPICAL PENTHOUSE PLAN

BASEMENT PLAN



SECOND & THIRD FLOOR PLAN
SCALE 3/32" = 1'-0"

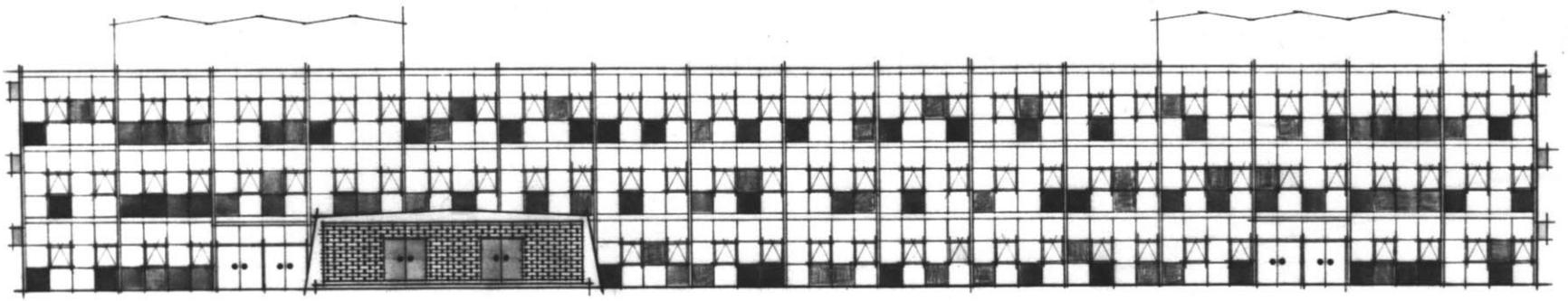
NORTH

THE HUMANITIES BUILDING

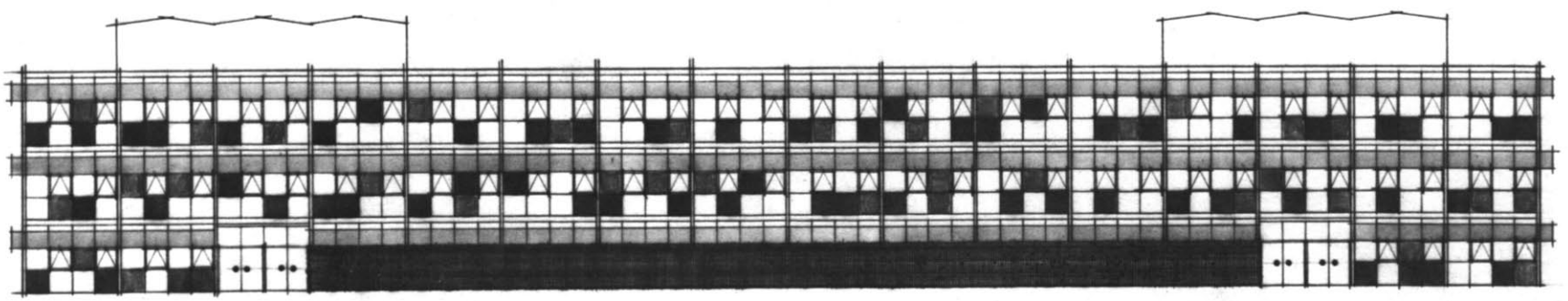
THE UNITED STATES AIR FORCE ACADEMY

6

ROBERT E. MC CONNELL
MASTER'S THESIS M. I. T.
JANUARY 1954



NORTH - NORTHWEST



SOUTH - SOUTHEAST

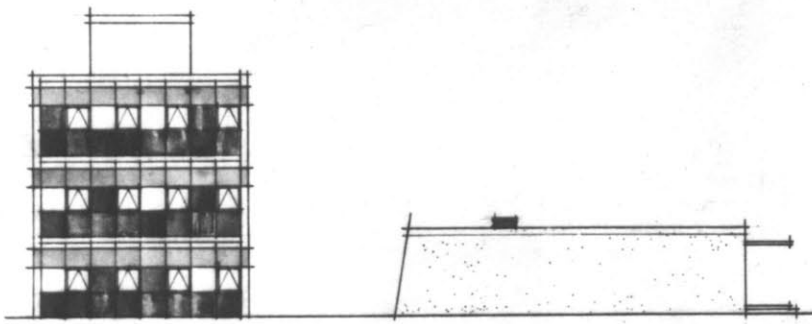
SCALE 3/32" = 1'-0"

THE HUMANITIES BUILDING

THE UNITED STATES AIR FORCE ACADEMY

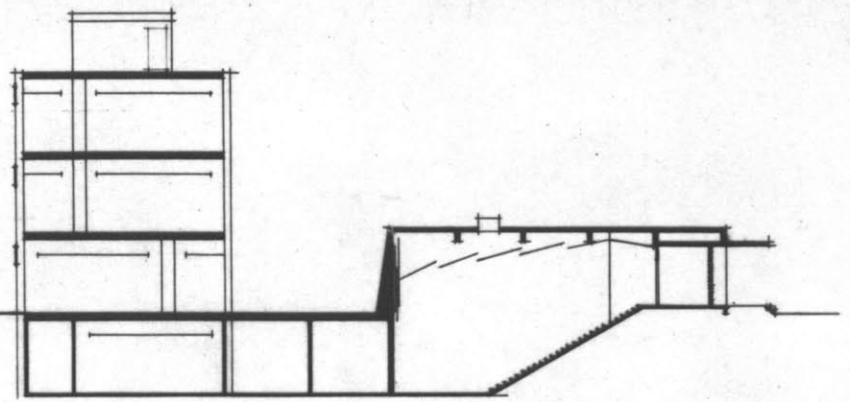
7

ROBERT E. MC CONNELL
MASTER'S THESIS M. I. T.
JANUARY 1954

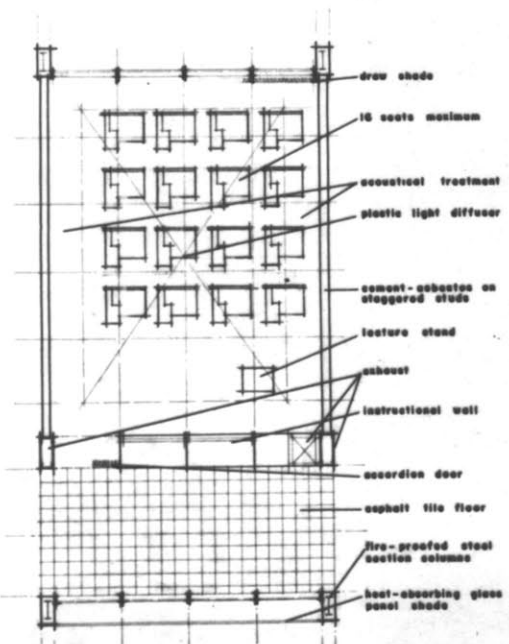


TYPICAL END ELEVATION

SCALE 3/32" = 1'-0"

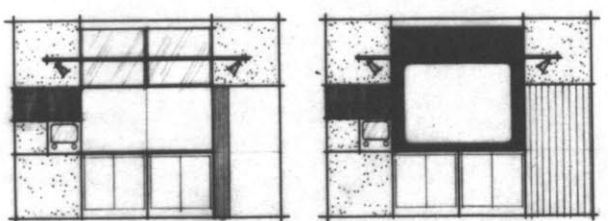


SECTION



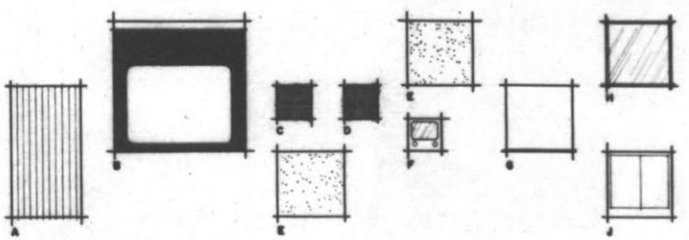
CLASSROOM PLAN

SCALE 1/4" = 1'-0"

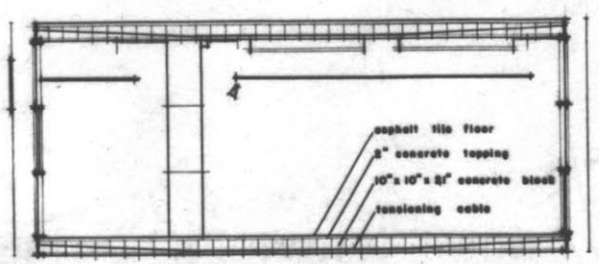


TYPICAL ARRANGEMENTS

INSTRUCTIONAL WALL



INSTRUCTIONAL UNITS



CLASSROOM SECTION

A. ACCORDION DOOR
B. PROJECTION SCREEN
C. EXHAUST GRILLE
D. LOUDSPEAKER
E. CEMENT - ASBESTOS PANEL
F. TELEVISION
G. BLACKBOARD
H. PATTERNED GLASS WINDOW
J. STORAGE CABINET

THE HUMANITIES BUILDING

THE UNITED STATES AIR FORCE ACADEMY

8

ROBERT E. MC CONNELL
MASTER'S THESIS M.I.T.
JANUARY 1954

THE LECTURE HALL

THE UNITED STATES AIR FORCE ACADEMY

9

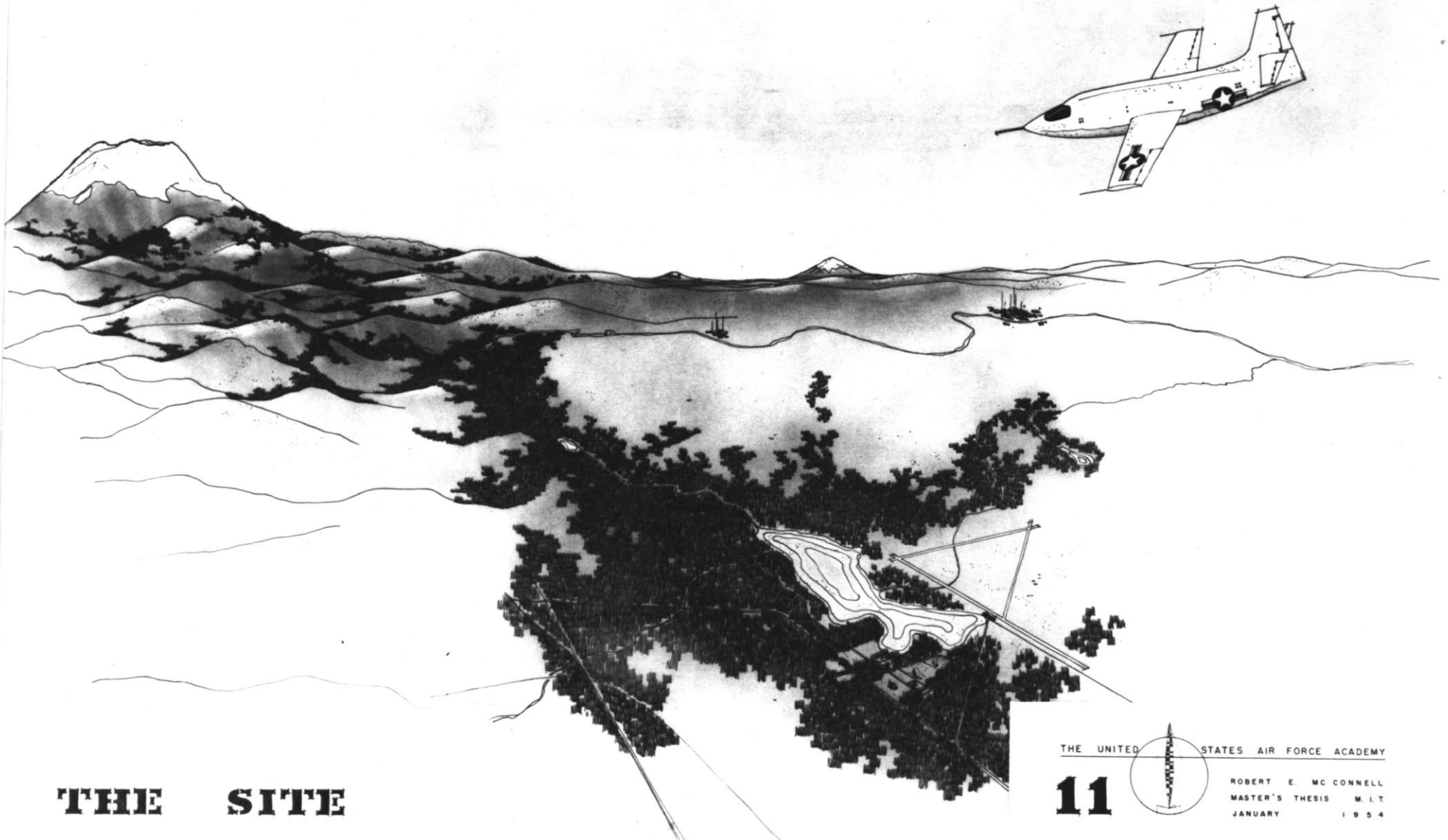
ROBERT E. MC CONNELL
MASTER'S THESIS M. I. T.
JANUARY 1954

THE TOTEM

THE UNITED STATES AIR FORCE ACADEMY

10

ROBERT E. MC CONNELL
MASTER'S THESIS M.I.T.
JANUARY 1954

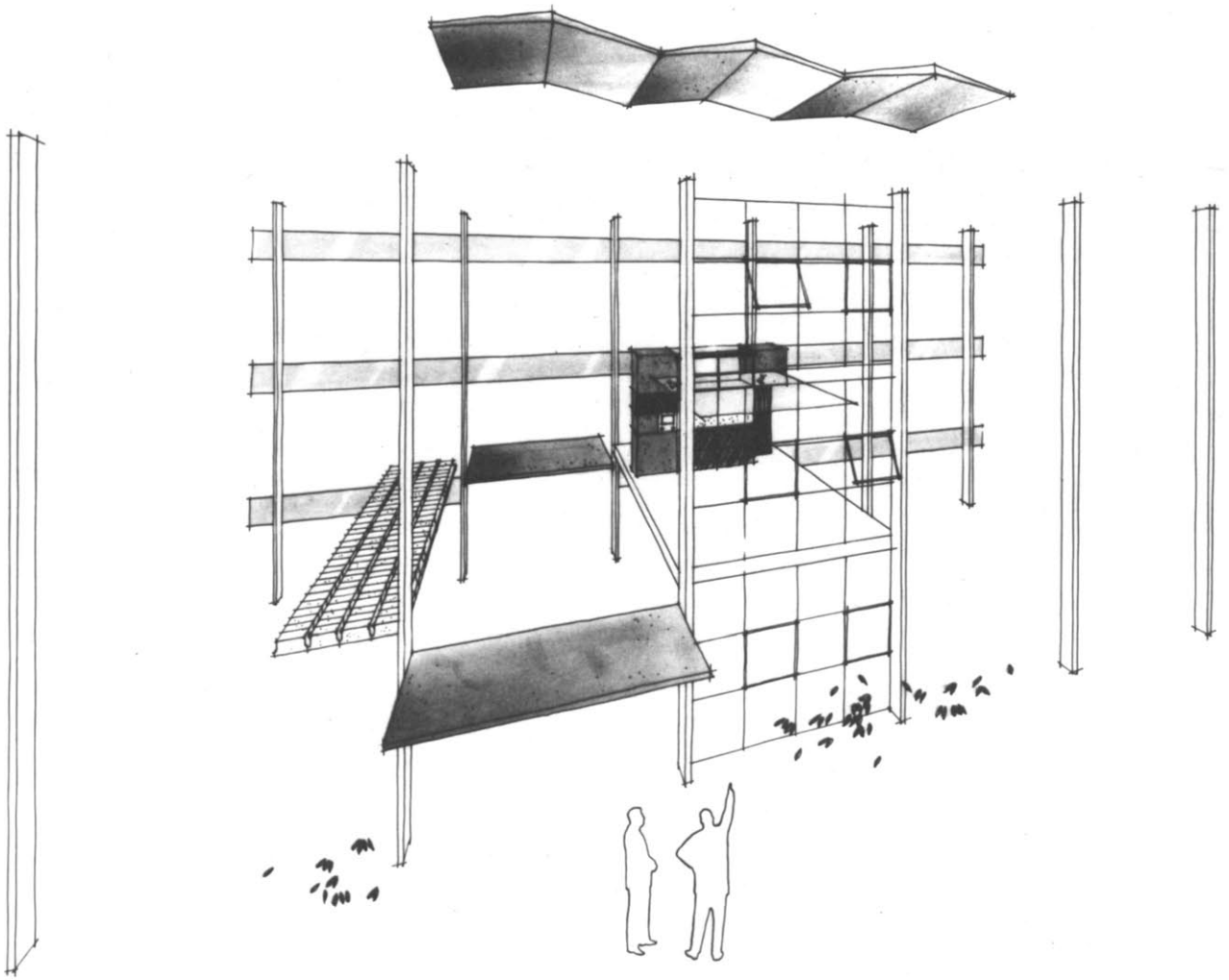


THE SITE

THE UNITED STATES AIR FORCE ACADEMY

11

ROBERT E. MC CONNELL
MASTER'S THESIS M.I.T.
JANUARY 1954

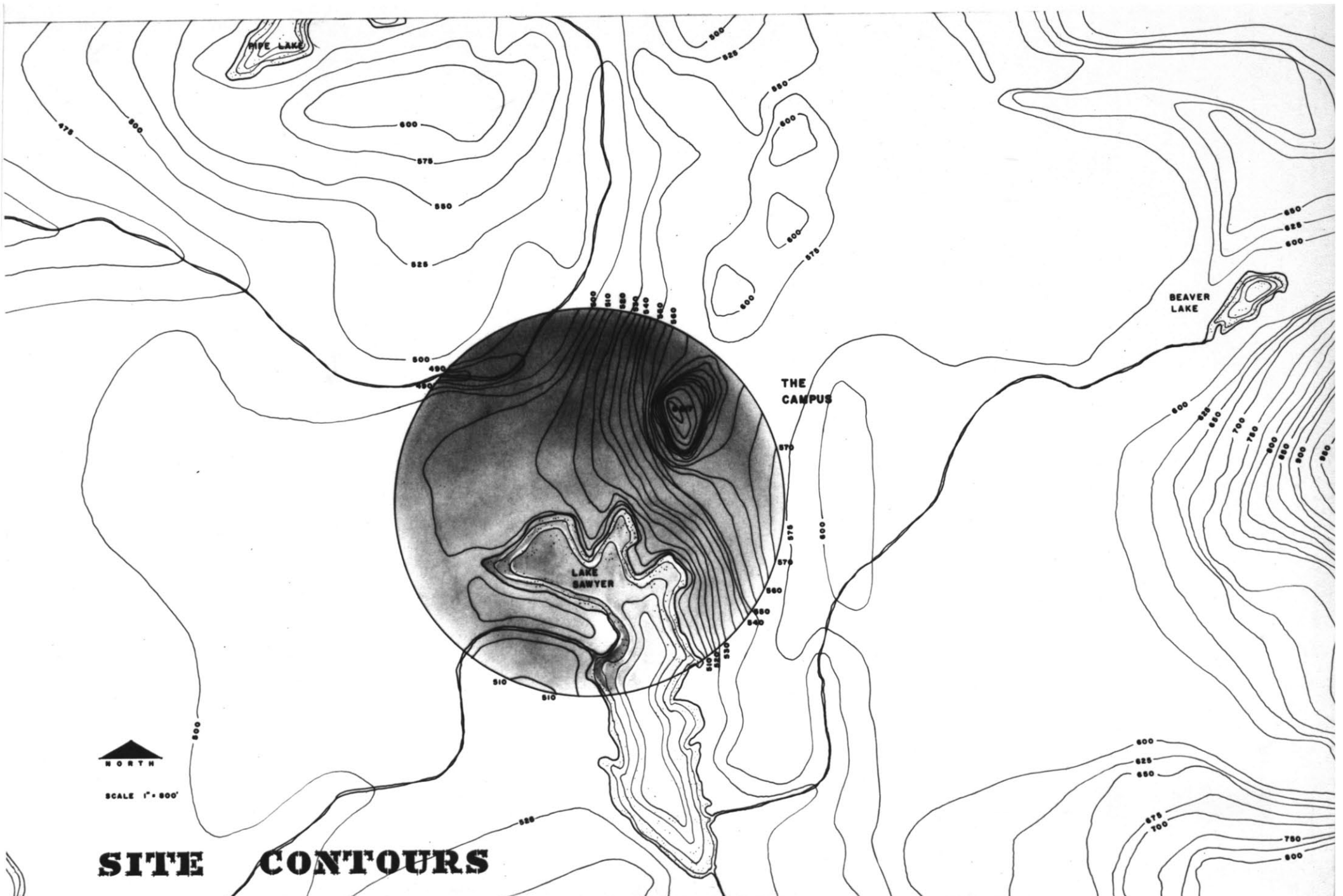


THE STRUCTURAL SYSTEM

THE UNITED STATES AIR FORCE ACADEMY

12

ROBERT E. MC CONNELL
MASTER'S THESIS M. I. T.
JANUARY 1954



SITE CONTOURS