AN OPERATIONS FACILITY FOR A NAVAL AIR FIELD

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Thesis Submitted to the Graduate Faculty of the

Virginia Polytechnic Institute

in Candidacy for the Degree of

MASTER OF SCIENCE

in

ARCHITECTURE

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January, 1955

Blacksburg, Virginia

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ACKNOWLEDGEMENTS

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To the professors, critics, instructors, students and employees at V.P.I.; to my friends, acquaintances, well and not so well wishers; to the service and civilian personnel in the various Departments and Bureaus within the Department of Defense; to all the above who instructed, threatened, cajoled, counseled, admonished, encouraged and/or deterred--my sincerest thanks for your part in the attainment of this goal.

To my wife, children and relatives who suffered my every trial and tribulation, real or imaginary, whose sacrifices were so often forgotten in my moments of success and happiness, words cannot express my inner feelings. Suffice it to say: I could not have attained this goal without them.

INTRODUCTION

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Rapidly changing developments in the realm of civil, naval, and military aviation have made existing airfields and their facilities either partially or wholly obsolescent.

As a result, constant research by the Department of the Navy, as well as civil and military authorities, is being carried on to provide for present and future needs.

For the purposes of clarity, the author will use the term Naval Air Field throughout this work to designate Naval Air Station, Marine Air Station, Naval Air Base, Naval Air Facility or any other official designation that may be used by the U. S. Navy.

Probably the most important structure located at any Naval Air Field is the Operations Building and Control Tower. It will be the purpose of this thesis, therefore, to offer a design for a standard structure which may be adopted, with modifications, at any specific air field.

INTRODUCTION

Navy Department personnel welcomed the author into undertaking this problem, consideration being given to security regulations regarding classified equipment and functions to be housed in this structure. It is because of the foregoing that the author requests your indulgences when seemingly blatant omissions or statements without basis appear within the text of this thesis.

HISTORY OF MAN'S ATTEMPT AT FLIGHT

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Dreamers and Theorists

Man's attempt to solve the problems of flight date back to the pre-Christian era. Fragmentary reports from about 400 B.C. note the experiments of a learned geometer, Archytes, with his "wooden doves". One may take this inconclusive incident lightly, remembering only that it was the first emergence from sheer mythology of anything even remotely resembling a practical experiment in flight with a model.

To take off into space was so revolutionary an idea that through the years it not only has stimulated man to heroic experiments and practical efforts, but has excited his imagination to make prophecies, many of which have yet to be realized.

Historians through the ages have set down and passed on the reports, theories, beliefs, and exploits of honest experimentors and charlatans alike. Many of these have taken centuries to be either proven or disproven. The misconception that man could, by the unaided power of his own muscles, lift himself into the air provided that to his legs were attached proper sustaining plane surfaces is one that, despite many rigid proofs to the contrary, seems destined to linger with man for many years to come.

Leonardo Da Vinci, credited by the Western World as having been the inventor of the helicopter and the aerial screw, whence came the marine screw, was a firm believer in this misconception of man's unaided power to fly.

Too numerous to list are the names of all who made large contributions to man's studies of aerial flight.

Success

Following Montgolfier's first ascension with a passenger in 1783, near Paris, it was predicted that the air would soon be black with baloons. More than a century passed before the Wright brothers made those historic flights at Kitty Hawk. Thus, finally, man had accomplished heavier-than-air powered flight.

After their flight of 1903 the Wrights offered their invention to the United States Government at a very modest price, but the bureaucratic minds were not interested. In contrast to the apathy with which America received the airplane it was enthusiastically received in Europe, especially France, where Wilbur Wright worked out some of his ideas under the patronage of the French government.

With the outbreak of the World War in 1914, technical improvements were stimulated so that new standards of performance developed. By 1918, the airplane had been developed from a box kite structure with a speed slower than a motorcycle or a fast racing car to a more streamlined aircraft capable of speeds up to 130 miles per hour. Propellors were placed ahead of the wing to pull the plane, instead of pushing from the rear. Weak sputtering motors gave way to engines which could run for some hours without faltering.

Since the end of World War I the rise and improvement in technical aspects and phases of aircraft design, speeds, and so forth has been meteoric. The visions of the air age contrast sharply with aviation's story of growth over the early years. Until the 1920's the shout "aeroplane" was enough to make people stop and point in the sky as they marveled at the exhibition of courage, skill, and science which had made flight possible. Since the early 1920's an astounding change has come over man. The air age after a slow start rushed in to his mind and thoughts as air would rush in to fill a vacuum. Today the 300-plus miles per hour commercial aircraft have become commonplace and man now speaks in terms of jets, rocket power, and supersonic speeds.

PROBLEMS IN LOGISTICS AND

SUPPORT FOR THE "IRON BIRD"

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As the airplane grew so did the problems of its logistics support and safety. Communications (ground to air and ground to ground), weather hazards and flight (instrument flight and aids), weather reporting (aerology), navigation (airway ranges and aids), airports (runways and buildings thereon), and their sites all were without criteria on which to design.

Airports

Airplanes, like ships, require a harbor or dock. Therefore, the start or finish of the journey must be provided for (airports, etc.) Yet the planners and designers of many of our "modern" airports of the late 1920's and early 1930's did not use any forethought in their designs in considering what would possibly come with the expanding air age. Their designs were virtually static and did not or could not envision the necessity for accomodating faster, larger aircraft and the resulting problems in airport design. Seemingly they accepted what was then in existence as sufficient and the following quotation, both literally and figuratively:

> "The administration or terminal buildings do not present any unusual structures; the layout and plan follow the same general principles as those of railroad terminals".*

A great number of airports in this country subsequently have or are rapidly becoming obsolete because of inadequate size or capacity. Generally they suffer from one or more of the following:

(1) The buildings were erected as civic monuments with little regard as to function or economics.

(2) Site location was made without consideration being given to function and/or limitation of aircraft and the resulting traffic generating centers.

(3) Further expansion is prohibitive except at high cost of property acquisition.

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* Airport Engineering, p.117--Sharp,Shaw, & Dunlop, 1944.

PROBLEMS IN LOGISTICS AND SUPPORT FOR THE "IRON BIRD"

Safety

It is truly unfortunate that many of these airports were conceived and constructed to preclude little possibility of satisfactory modernization at reasonable cost. There is no known panacea which can be prescribed for these problems. However, they must be met and surmounted if the most important phase of the aviation age is to be aided--safety of life and property.

Further in line with the change of aviation from that of "sport" and "military" to"commercial" and "military" it was inevitable that rules, regulations, and other aids were promulgated or introduced with but one thought in mind--safety.

Although declining in influence through the years, fear is still an important deterrent to the complete acceptance of air travel and, in retrospect, the air age (witness the public reaction to the Elizabeth, N.J. crashes.) Complete safety, per se, can probably never be achieved. To have "absolute" safety would mean that the amount of flying would have to be regulated to an undesirable extreme.

Flight from point to point involves four basic actions:

1. The aircraft must take off from an airport and later land at an airport.
2. The aircraft must, in flight, be maintained in the proper attitude(s) and altitude(s).
3. The aircraft must be navigated from point to point.
4. The aircraft must be kept from colliding with other aircraft in flight as well as with natural or man-made obstructions in the flight path.

The second action is solvable by properly training personnel, in excellent physical condition, to perform their duties under idoneous conditions.

The primary functions of Air Traffic Control deals with the first, third, and fourth actions as follows:

1. Regulates the movement of aircraft in flight.
2. Disseminates weather and airport information to aircraft in flight.
3. Maintains airways and airport navigation aids and ground communications facilities in working order.
4. Regulates the movement of aircraft not flying the airways to prevent interference with airways traffic.
5. Directs aircraft desiring to take off or land and controls the taxiing of arriving and departing aircraft on the field between the runway and apron; this function being delegated specifically to the Airport Traffic Control (Tower).

THE U. S. NAVY'S ROLE

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In order to forestall the duplication of facilities and rules and regulations, the military and naval air forces work closely with the civil air authorities to make air safety an accomplished fact.

The correlation and dissemination of all information pertaining to Airways Safety Control, local regulations in reference to restricted areas (gunnery, bombing), air-sea rescue, specific naval aircraft fleet-missions; notices to airmen (NOTAMS), local field patterns and regulations, etc., are all concentrated in one unit at a Naval Air Field--namely, the Operations Building and Control Tower.

The Job

At any Naval Air Field there may be based temporarily or permanently autonomous units carrying out diverse missions and training duties. Squadrons and Groups from Fleet Air Wings, Aircraft Carriers, Air-Sea Rescue and other Special Mission Units may all have to be housed and their movements coordinated by the Operations Officer and Staff.

The Missions and training duties to be performed by the aircraft of these squadrons rests wholly with the decisions made by individual group and squadron commanding officers in carrying out the orders from higher authorities. However, permission for these missions to take off or land, use specific areas, etc., rests wholly with the Operations Officer.

Visiting transient Naval or other aircraft are normally spotted and serviced by the Operations Line Crew. The decision to plan a flight and to depart is the pilot's or plane commander's. Here again, however, permission to actually carry out the flight is subject to the approval of the flight plan by the Operations Officer's staff.

As may be seen, the main function of the subject structure is to house primarily the Operations Officer and his coordinating staff, and that all other functions to be housed shall be given secondary consideration.

The Site

The author studied and theorized as to the possibilities of complete remote operations control by the use of electronic and radio gear with the key personnel and "structure" being away from the field proper. Undoubtedly, such control is not beyond comprehension either today or in the immediate future. Because of the scarcity or classification of information, the thesis solution will not be based on a remote field control but on what is reasonably well known and possible of immediate accomplishment.

The vast project of analyzing the functions and design of all the facets (runways, hangars, personnel housing, etc.) of a Naval Air Field and encompassing area is beyond the scope of this thesis. The author, therefore, laid out a "typical" (non-existent) Naval

Air Field incorporating therein the latest (and some projected) thoughts as to clearances, distances, hangar units, etc., in order to bring the subject structure, the Operations Facility and Control Tower, into proper perspective.

May the author reiterate that the only design analysis and solution attempted is with the Operations Facility and Control Tower.

DESIGN REQUIREMENTS AND ANALYSIS

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The myriad of problems and related facets of aesthetics, function, economics, materials and their usage, etc., with which the designer has to cope in attempting to arrive at a reasonable decision as to the basic criteria which will govern the design of a particular structure will vary greatly with the site(s) of intended construction.

An infinite number of possible design solutions could result if only a small number of persons attempted solo problems of the same problem. As a consequence the author contends that there is as such, no one "good" or "bad" solution because, often as not, the "bad" solution may contain one or more salient features which far surpass or may even be non-existent in the "good" solution. He will concede that a particular design solution may, in the whole, be "better" or "worse" than another--dependent wholly on the relative importance that the individual judge may attach to varying aspects within the problem and the compromises that must be made in thought concept and design.

DESIGN REQUIREMENTS AND ANALYSIS

Spatial Requirements

I. Field Entrance:

Means of exit or entrance to the apron primarily for the use of transient, station operations and air-sea rescue personnel and passengers. Must adjoin the Operations and Clearance Desk and Lounge.

II. Station Entrance:

Primary means of ingress and egress to the station proper for personnel and the delivery of material, equipment, etc. Must be away from the loading apron.

III. Control Desk (60 sq. ft.):

Information and control point for personnel and material entering the Operations Building via the Station Entrance. Equipment--desk, two chairs and gun locker.

IV. Helium Storage (200 sq.ft.):

Helium delivered in bottles via the Station Entrance must be stored in a place where it is directly vented to the outside. Its control, by the Aerology Section for use in observations, dictates nearness to the Aerological area.

V. Flight Surgeon's Office (250 sq.ft.):

Office and first aid treatment area for the Flight Surgeon which will include a space for medical and narcotics storage. The location of this office should be such that it is readily accessible to and from all parts of the building.

VI. Aerology Section (1050 sq.ft.):

Into this section is funneled all aerological observations and reports, whatever the source, where they are compiled and necessary information distributed to interested parties and agencies, i.e., short or long range forecasts for local or distant areas, airways forecasts for pilots, etc.

Since no aircraft may take off without an aerological report, it should be in close proximity to the Operations and Clearance Desk.

Provisions should be made for the following:

1. Office
2. Teletype
3. Radio Sonde
4. Work Room
5. Counter and general work area
6. Storage

VII. Airway and/or Area Wall Map:

This map should be located near or between the Aerology Desk and the Operations Desk in order that it be readily available to pilots to determine primary and alternate routes and distances involved.

VIII. Operations (1200 sq.ft.):

As previously indicated, for all intents and purposes this particular area controls the field. At the direction of the Commanding Officer, it promulgates the use of the Naval Air Field and surrounding air zone including bombing and gunnery ranges.

Permission for aircraft to use the field for take-off or landing, to use specific areas, to clear for airways flight, special mission flights, the closing or opening of the field, etc., rests with the Operations

Officer and his staff. This department coordinates all the facilities of the Naval Air Field proper and outlying areas with other interested military and civil agencies. A record is kept of all aircraft that may use the field, be they transient, station operations, special missions, or squadron movements, their destinations, etc. It also has available to pilots special notices, memos, and reports to airmen from local and other aviation authorities. In theory, nothing can move within the station control zone without prior approval of this department.

Provisions should be made for an Operations Office and Clearance Desk located near the Aerology Desk and adjoining the Field Entrance.

IX. Lounge (8-10 persons):

The lounge area will be near the Operations and Clearance Desk and is for the benefit of personnel or passengers awaiting the arrival or departure of flights.

X. Pilots' Ready Room (725 sq.ft.):

The pilots' ready room is a combined locker, lounge and briefing room for the express use of pilots (normally officers.) No less than 35 locker spaces plus a nearby shower and toilet facility should be provided for.

XI. Crew Ready Room (700 sq.ft.):

Provisions shall be made for no less than 55 locker spaces, a small lounge area, a bulletin or blackboard for flight schedules and messages, and a nearby shower and toilet facility.

XII. Combined Map Room and Flight Gear Room (650 sq.ft.):

The Map area supplies aviation personnel with the latest airways, area, and navigation charts, NOTAMS, flight procedure charts, navigation aids, etc.

The Flight Gear area loans on a short time basis parachutes and/or flight gear and supplementary equipment as necessary to passengers and personnel.

Chart storage desks and bins, book shelves, drafting desk, map cases, parachute bins, flight gear bins and similar storage areas should be provided for.

XIII. Station and Operations Radio and Communications (1175 sq.ft.):

As implied by the title, this is the communications nerve center for the Naval Air Field and Station, and includes the following:

A. Cryptographic Room

B. Teletype Room

C. Communications Office

D. Operations Radio

E. Cypher Room

XIV. Ground Control Intercept including Problem Room and Radar Transmitter Room (1500 sq.ft.)

XV. Snack Bar

A. General service area and counter

B. Storage Area

C. To serve a minimum of 15 persons

This snack bar would best serve its purpose if it be located so that only those in the Operations Building would have easy access to this area.

XVI. Women's Lounge (200 sq.ft.)

XVII. Undesignated Office Space (200 sq.ft.):

Provisions must be made for the inclusion of at least two spare offices.

XVIII. Electronics Repair Room (220 sq.ft.):

The repair service group of all electronic gear will operate from, and make major repairs in, this room. It will be located accordingly and will provide for an Electronics Storage Room.

XIX. Enlisted Men's Bunk Room

Double deck bunks and lockers to serve eight men. Shower and toilet facility in close proximity.

Two rooms required.

XX. Officers' Bunk Room

Bunks and lockers for two officers. Shower and toilet facility nearby.

Two rooms required.

XXI. Fleet Air Wing Offices and Communications Facilities (1500 sq.ft.):

This is a Fleet Command and as such will require its own office space and self-supporting communications center. On smaller Naval Air Facilities where a Fleet Air Wing may not be located, this area will be used for station administrative office space.

XXII. Electronics Equipment for Control Cab, Radio and Radar Transmitter and Receiving Equipment, and Instrument Landing System Equipment (550 sq. ft.)

XXIII. Control Cab (300 sq.ft.):

The eyes and voice of the Operations Department at any Naval Air Field is its control tower. The safety of operations and effective use of any airfield depends to a large degree upon the personnel manning the Control Cab. They direct the movement of aircraft on the ground and in the air within the airfield zone either arriving or departing. To do this effectively, the control tower must be located so as to command an unobstructed view of the airport. The personnel further issues to pilots final information regarding airport conditions, airway traffic, speed and direction of ground winds, barometric pressure and other important information for the purposes of safety of operations.

Provisions shall be made for the installation of radio, radar, and specialized equipment necessary. Toilet facilities (no further than one floor distance) will be available for use of cab operators. A platform shall surround the control cab so that no portion of the glass area will be obstructed and yet can be used to wash windows in case of failure of the self-washing system. A basket safety ladder shall extend from this platform to another platform atop the control cab whereon specialized equipment will be fixed (whip antennas, obstruction lights, aerology equipment, etc.)

XXV. Miscellaneous:

Provisions will also be made for the following:

A. Transformer Vault - 350 sq.ft.

B. Emergency Generator (for Communications purposes only) - 200 sq.ft.

C. Heater and Air Conditioning

D. Storage - min. 200 sq.ft.

E. Gear Rooms and Service Sinks

F. Two Telephone Booths (either Public or Station Service)

G. Both Vertical and Horizontal Circulation Areas

H. Toilet and Shower Facilities

Water Table

By virtue of the type of using service (Naval and Marine forces), the majority of the Operations Facility structure(s) will be located at sites where a high water table exists. As a matter of necessity and economics, as much as possible of the structure should be built above ground.

DESIGN REQUIREMENTS AND ANALYSIS

Blast Effect and Lift

A short analysis of the effects of blast on structures at this time would not be amiss.

A frame for a building is a combination of columns, girders, beams and, if need be, trusses and/or arches. The members making up the frame are subjected to tension, compression, shear and bending or a combination of such stresses.

A column is primarily designed to carry compression loads. Because of their relatively small exposed areas, columns as separate units tend to be fairly resistant to blast effect. Most damage caused by blast pressures is its effect on adjacent monolithic areas (floor slabs, roof, wall, etc.), which produce torsional and tension (lift) stresses which the column (and its connections) cannot take. Beams and girders, as units, are also relatively highly resistant to blast effect.

Impact, blast and earth shock may directly destroy a bearing wall or may cause floors to collapse without destroying the walls if the floor system is pulled away from the walls.

Form

If the foregoing is understood, it is readily acceptable that slab sided type of structure lends itself poorly to the resistance of blast effect.

Aerodynamically, a sphere lends itself favorably to blast effect. However, lift effect on the sphere would make anchorage of such a form extremely difficult. The aerodynamic form of a hemisphere is just as resistant to blast effect as a total sphere and lends itself more readily to firm anchorage.

A study was made into the use of steel and reinforced concrete domes. However, the required weight and space allotment for the transportation of construction material, especially overseas, would make logistics and economics grave problems with which to contend. Further, the availability of construction personnel at various sites may well be critical, if not non-existent, thereby requiring the movement of large numbers of mechanics and highly trained technicians.

The Geodesic Dome

With permission of R. Buckminster Fuller, a solution was attempted using a Geodesic Dome.

After considerable study and deliberation of the problem, the following conclusions were reached:

1. That since a control tower was needed, why not use the supporting steel structure as a framework for a Mechanical Equipment Case within which will be located the Heat and Conditioning equipment, Transformer Vault, Emergency Generator Equipment, Blowers, Utility Services, Storage Areas, Gear and Service Sink Rooms and Vertical Circulation Areas.

Two other purposes would be served by putting the mechanical equipment in a central core:

A. That some of the heavier equipment would be afforded greater protection in case of attack. This is of great importance since even highly trained personnel lost through accident or attack may be replaced within 36 hours anywhere in the world whereas some of the equipment may not.

B. By stacking in a central area, extensive piping, wiring, ductwork, etc., can be drastically reduced and more easily serviced.

2. Vertical circulation would be supplied in the form of one stairwell for general usage and one self-supporting elevator (2000 pound capacity) for officials' use and equipment handling.

3. The central core would be immediately circumscribed by the horizontal circulation area affording short distances between the encircling occupancy

areas themselves and the vertical circulation areas.

4. The decking (geodesic truss) will be cantilevered from the central core with tension cables from the tower top to the outer perimeters of the cantilevered decks to the footers. The tower and decks will not depend on the dome for support.

5. The aluminum, fiberglass-covered geodesic dome, being self-supporting, will be firmly attached to a massive footer to counteract the tremendous lift effect of blast.

Weight and Time are Money

It is estimated that the space and weight requirements for transportation of the dome and decking would be 65 per cent less than comparable domes and deckings of concrete or steel.

By use of the color code method of assembly (you cannot be color blind if you want to join the Navy or

Marines) "boots", "skinheads", or local untrained labor under the supervision of trained Construction Battalion personnel could be used for the assembly of the decking and the dome.

Construction Battalion trained units or construction contractors could handle the surveying, grading and placement of reinforced concrete footers, foundations and slab, structural steel and heavy mechanical equipment.

The rapidity of erection of the geodesic dome would render the Operations Building and Control Tower operable far sooner than if standard methods were to be used.

All basic units will be standardized and prefabricated of plastics, aluminum, and stainless steel. These basic units include aluminum dome and truss units, fiberglass skins, toilet and shower facilities, interior walls, cab walls, etc.

DESIGN REQUIREMENTS AND ANALYSIS

The "A" Bomb, "H" Bomb, Et. Al.

Undoubtedly the reader has pondered, "What about protection in case of an Atom or Hydrogen Bomb attack? Or Guided Missiles? Or direct hit by "Old Fashioned" conventional bombs?"

It must be appreciated that the subject structures will be located at hundreds of Naval Air Fields in this country and abroad. It would, therefore, be reasonable to assume that the vast majority of these Naval Air Fields would have ample warning of an impending attack and that conventional measures would be implemented to secure protection from these or future attacks. The conventional means would include Radar Screen, Air Cover, Anti-sub Patrols, Guided Missiles, Barricades, concentrated anti-aircraft fire, etc.

It is not suggested that penetration and damage to a Naval Air Field would be completely prevented by the introduction of these conventional protective measures.

DESIGN REQUIREMENTS AND ANALYSIS

Complete prevention of penetration by enemy aircraft or guided missiles at some time or other has not to date been solved. Therefore, some damage to the Air Field and structures thereon will result. However, the following "tidbit" is presented for thought: A minimum depth of four feet of reinforced concrete is needed to prevent penetration of a 500-pound G.P. bomb. The author wishes to emphasize that to prevent penetration does not protect the equipment and personnel from damage and injuries (including death) as a result of concussion.

To construct even one structure to afford protection from a direct hit by and "old fashioned" 500-pound G.P. bomb would require staggering amounts of structural materials. Therefore, economics (including labor and time) and logistics voids any possibility of building hundreds of such structures throughout the world.

Taking into consideration the foregoing and the lack of public information on the defenses against all the effects of the Atom and Hydrogen Bombs, it seemed that any solution attempted by the author would be invalid.

Table I - Sequence of Movement by Flight Personnel in Originating or Terminating Flight Plans

CONDITIONS						
I	II	III	IV	V	VI	VII
A	A	A	-	A	0	0
0	0	0	-	-	A*	A*
-	RR	RR	RR	RR	-	RR
-	-	0	-	0	-	-
-	-	-	A	-	-	-
-	-	-	0	-	-	-

Legend:

Conditions I-V, Originating Flight Plans

Conditions VI-VII, Terminating Flight Plans

A - Aerology

O - Operations and Clearance

RR - Ready Rooms

A* - Optional, for Special Pilots' Weather Reports

DESIGN REQUIREMENTS AND ANALYSIS

The Public Area

Since one of the primary functions of the structure is to coordinate and quicken the smooth flow of air personnel and traffic, it may be logically surmised that those functions which deal directly with the "fluid public" should be located on the ground floor and that the remainder of the private or secondary functions should be housed higher up out of the way of this flow.

From Table I, "Sequence of Movement by Flight Personnel in Originating or Terminating Flight Plans", it is readily discernable that six of the seven conditions show that the flow between Aerology and Operations and Clearance is direct and should not be encumbered by unnecessary traffic. The Wall Map was therefore the only important necessary break in this traffic flow.

Since the Map and Flight Gear Room is a supporting function to both Crew and Pilot Ready Rooms, it is located between the two.

Because the Flight Surgeon may be needed immediately either within the building , out on the field, or in Air-Sea Rescue Missions, his office, of necessity, was located near the Operations-Aerology Area, Vertical Circulation Area, and near an exit to the outside.

The Control Desk is so located as to secure coverage of all flow of personnel and material to and from the station and structure. The Control Desk also affords security for the easily serviced Helium Room.

The Lounge is located across the entrance foyer.

The Other Areas

The Control Cab, or Tower, being located at the pinnacle of the structure would dictate that its Electronic Equipment, the Instrument Landing Equipment, and a small toilet facility be located immediately on the floor below.

Further study of the spatial requirement should logically group together as much as possible of the remaining electronics units, namely: (1) The Station and Operations Radio and Communications Group, (2) The Ground Control Intercept, and probably (3) The Electronics Equipment Repair Room and Electronics Storage Area. These three groups would occupy approximately 3,000 square feet.

Another large group which deserved deep thought was the Fleet Air Wing Offices and Communications Facility, approximately 1,500 square feet of floor area being needed.

The remaining units to be considered were the Snack Bar, Offices, Ladies' Lounge, Enlisted Men's and Officers' Bunk Rooms. These Enlisted Men's and Officers' Bunk Rooms are primarily for the night watches and, except in extreme cases, would be unoccupied from 8:00 A.M. to 4:00 P.M.

In order that the Fleet Air Wing Group be a unit wherein little of the Operations traffic will interfere or go through it, it was decided that the Fleet Air

Wing Group and Bunk Rooms should be located on the third floor.

The foregoing being true, the second floor occupancy would consist of the three Electronics groups, the Snack Bar, and the Ladies' Lounge. This arrangement puts the Ladies' Lounge and the Snack Bar midway to the main occupancy floors, easily accesible to, yet out of the direct flow of, the public traffic. The two undesignated offices would be placed on the second floor if possible.

CONSTRUCTION OUTLINE

CONSTRUCTION OUTLINE

Excavating and Forming

Transformer vault, foundations and footers will be excavated and formed. Reinforcing steel, mesh, conduits, anchor bolts, brackets, base course, waterproofing, etc. would be placed as determined by structural design.

Concrete Emplacement

Transformer vault, footers, and foundation and retaining walls and entrance steps would then be poured.

First deck; insulation layer of vermiculite concrete and final concrete wearing surface would then be placed.

Framing

Framing would be accomplished in three stages:

1. Six steel columns, framing, vertical circulation units (stairwell and self-supporting elevator including machinery) will be erected as a coordinated unit. The resulting tower will then serve as a platform to aid in the raising, lowering, and placing of other building and utility core elements.

2. Utility core equipment decks and ladders, six prefabricated aluminum walls, cab roof, deck and surround platform and glass will be placed. At this point, airfield control can be established by visual means (lights) and/or portable radio equipment.

3. During the period of placing the central tower two alternative methods of prefabrication and subsequent framing are envisioned by the writer:

A. The first method calls for the assembling and erection of the dome followed by the fabrication and raising into place the geodesic truss decks which will frame into the central tower and be cantilevered out and held by tension cables affixed to the top of the tower, and to the outer perimeter of the decks: top deck (fourth floor) first.

B. The second method is the reverse of that above in that the decks will be framed in first, fourth floor first and then the dome erected.

<u>CONSTRUCTION OUTLINE</u>

<u>Dome Covering</u>

Outside skin would be sandwich construction of two polyester sheets with fiberglass core, or stock fabricated fiberglass sheets.

Interior skin will be a sandwich of two polyester plastic sheets with aluminum sheet core.

<u>Interior Finishes</u>

<u>Ductwork</u>: plastic

<u>Conduits</u>: neoprene rubber

<u>Plumbing</u>: (Water and Sanitary Services) - plastic

<u>Flooring</u>: Navy special linoleum (MM) on cork on a sandwich deck consisting of fiberboard between plywood

<u>Hung Ceiling</u>: acoustical ceiling (board)

<u>Walls</u>: Aluminum with fiberglass core, movable sectional

<u>Doors</u>: Aluminum hollow core with fiberglass batfill and/or aluminum frame with corrugated polyester panels for light transmittal

<u>Glass</u>: Double strength plate for control cab. All other locations--polyester corrugated panels or Luminal sheet as dictated by requirements.

<u>Prefabricated Stairs</u>: fiberglass with abrasive non-skid tread surfacing

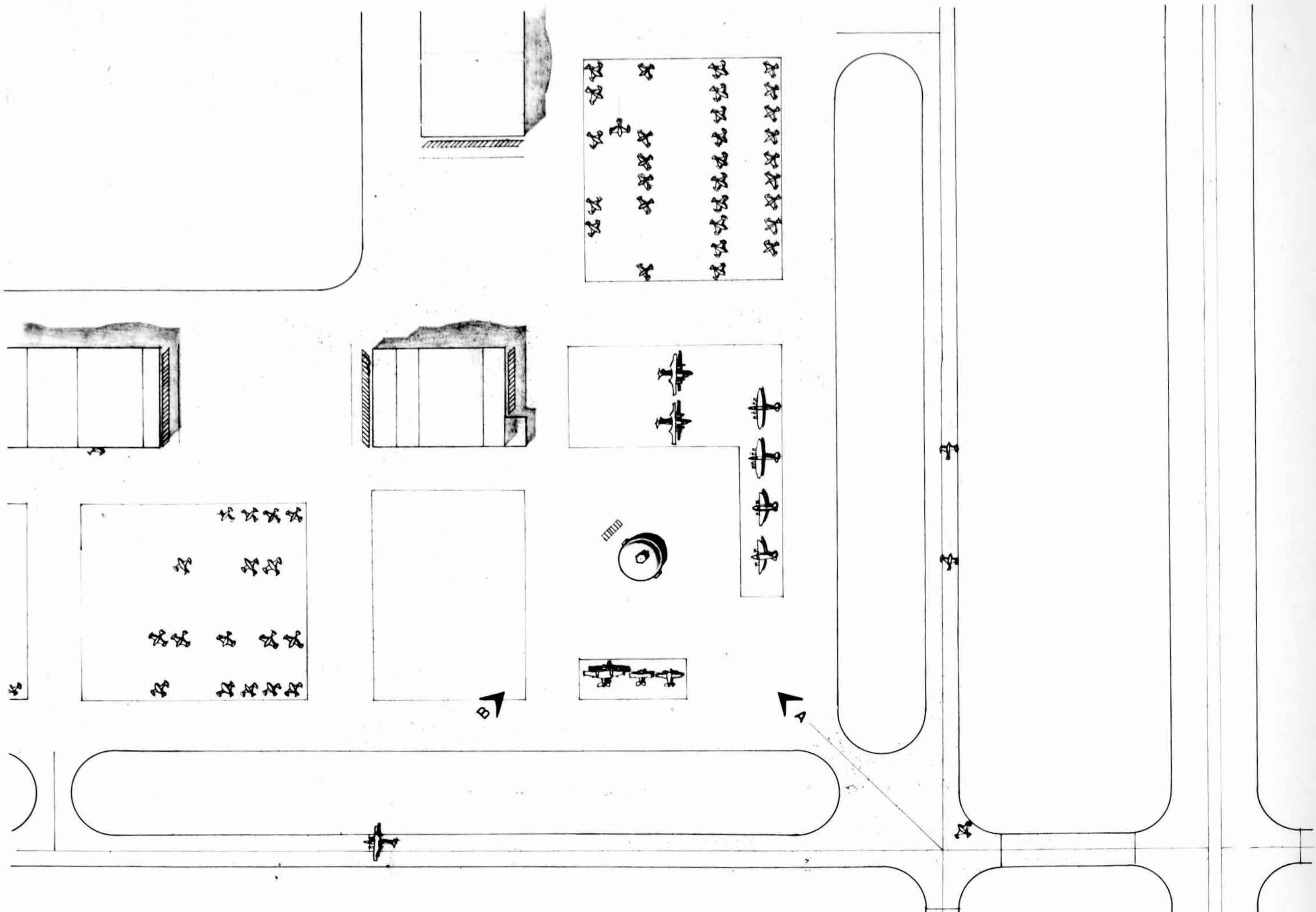
Elevator: Self-supporting with 2000 pound capacity

Toilets and Showers: Toilet fixtures are all wall mounted and made of plastics, shower units of stainless steel. Outer partitions in this area to have plastic fused to aluminum. Booth partitions to be plastic.

Illumination: Incandescent lighting throughout

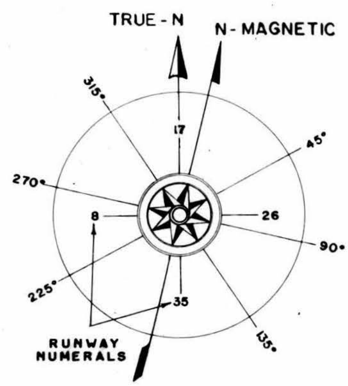
Heating and Cooling: Heat pump (air or water as location of facility provides most economically) with pumps for circulation. Supply ductwork between outer skin and exhaust through interior ceiling vents.

ILLUSTRATIONS



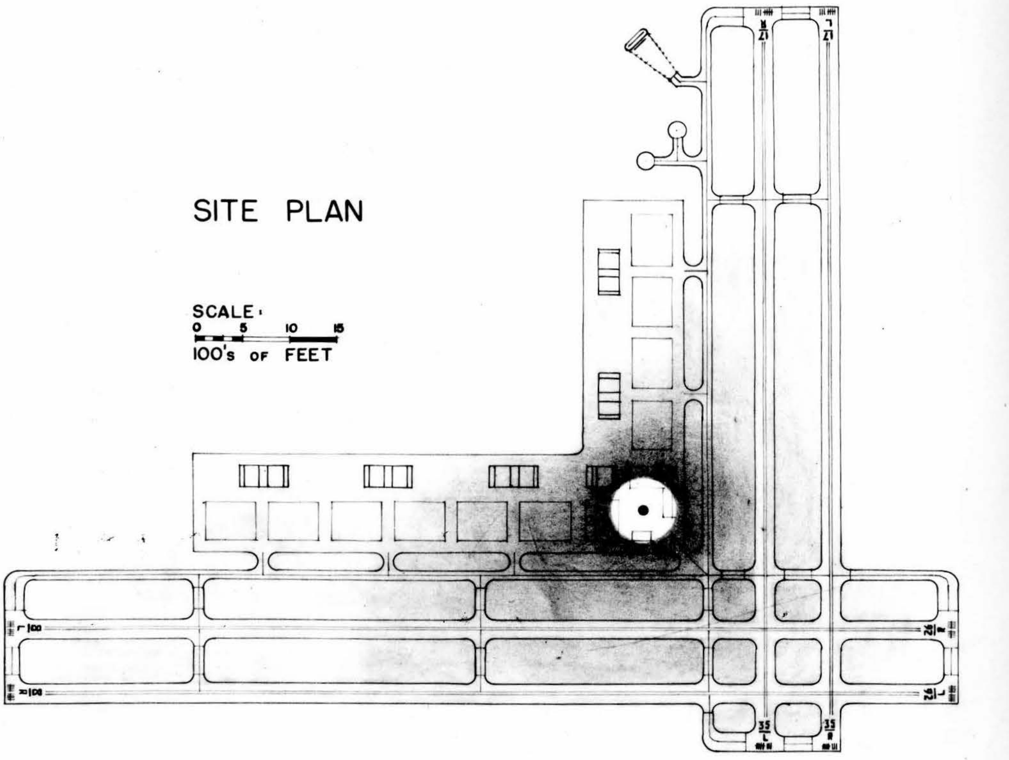
PLOT PLAN

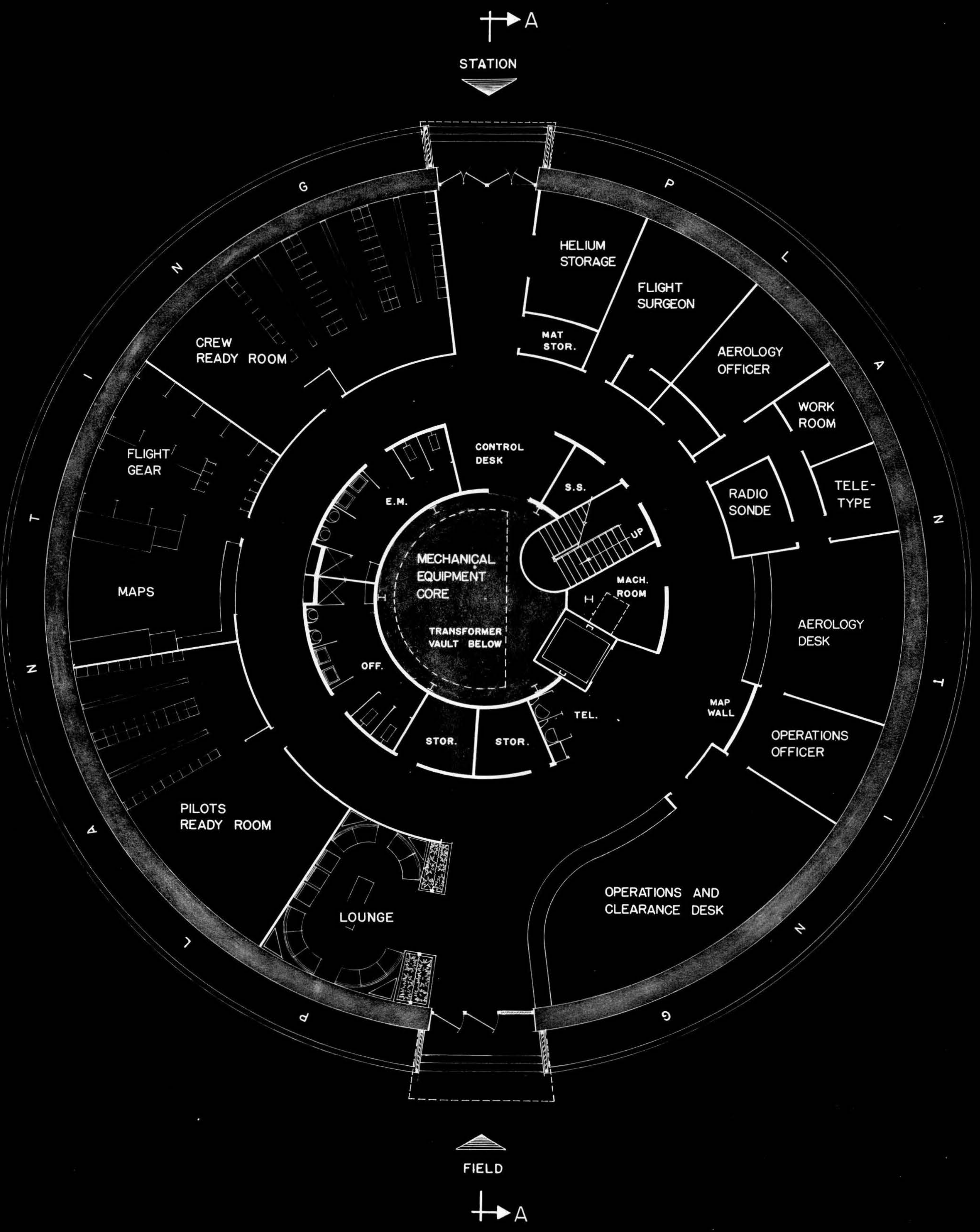
SCALE: 0 1 2 3 4 100's OF FEET



SITE PLAN

SCALE: 0 5 10 15 100's OF FEET





FIRST FLOOR

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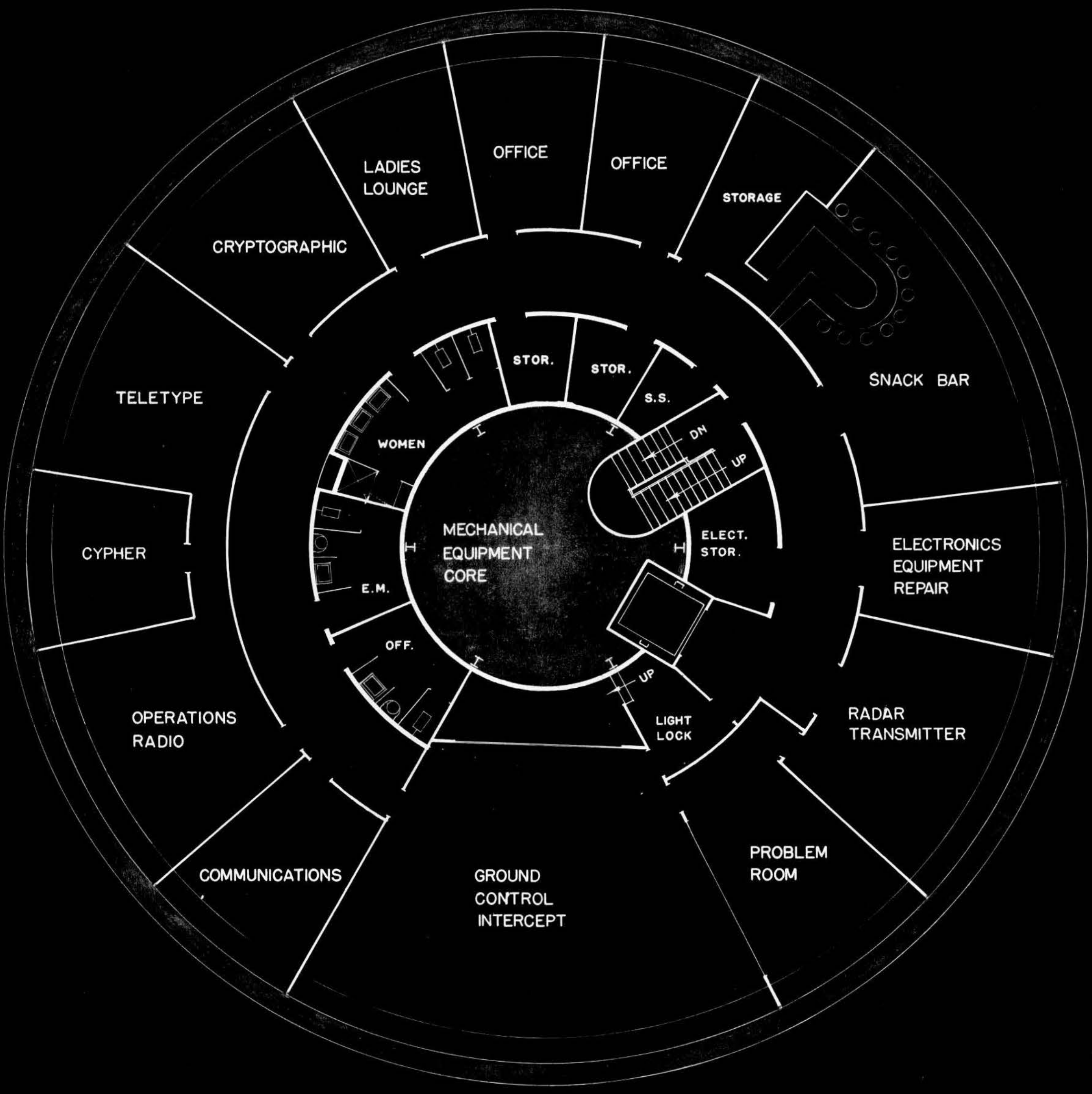
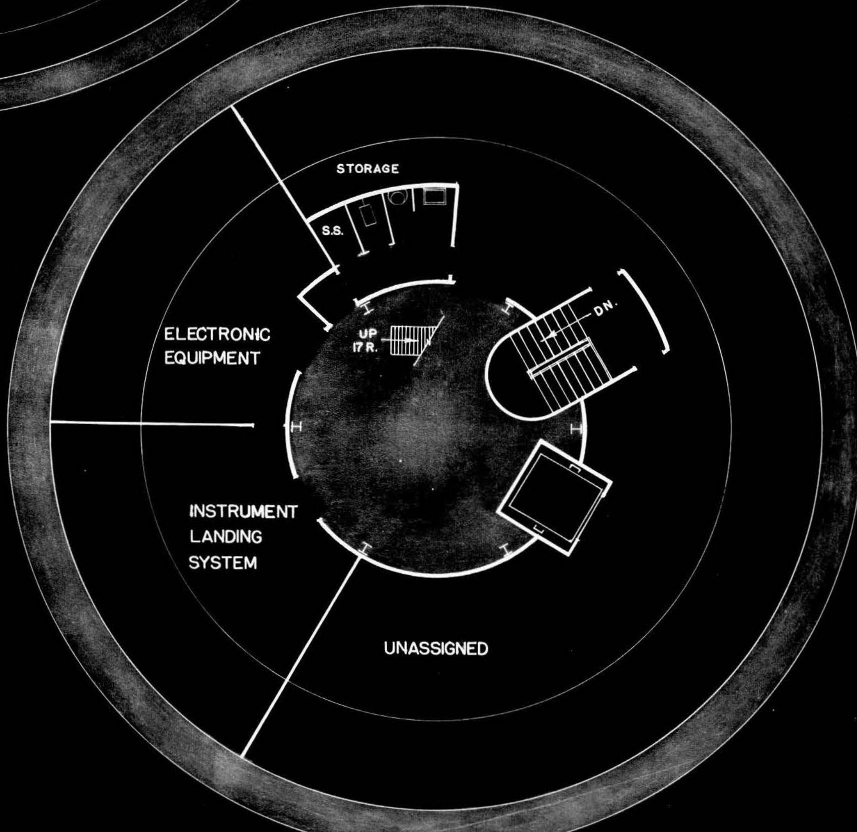


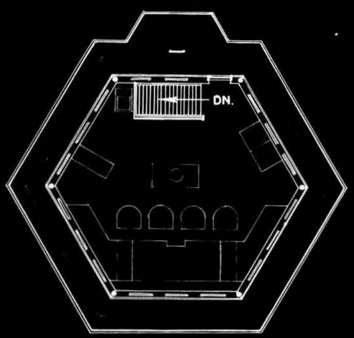
SECOND FLOOR

SCALE 0 5 10 15 FEET

THIRD FLOOR

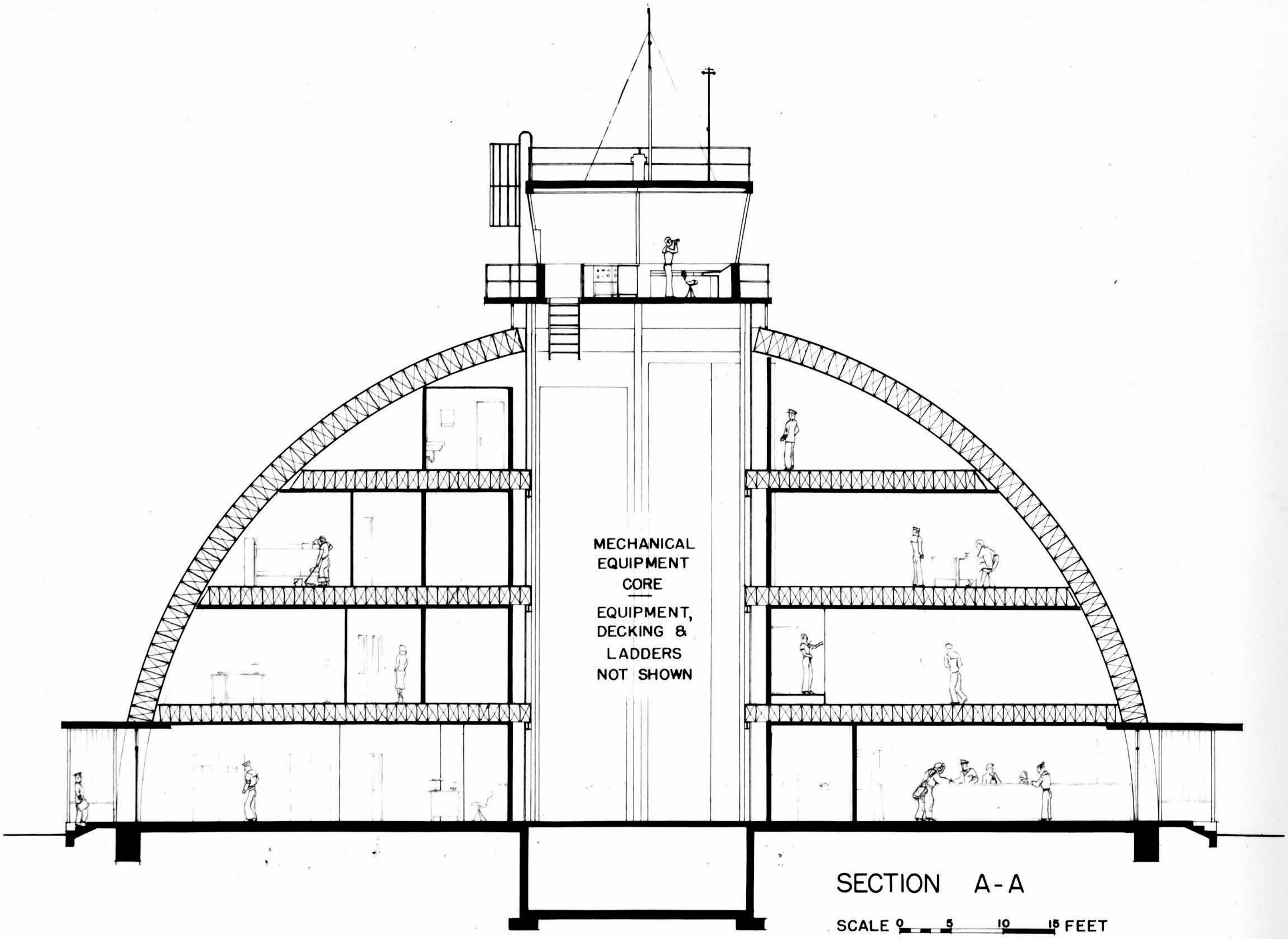
FOURTH FLOOR





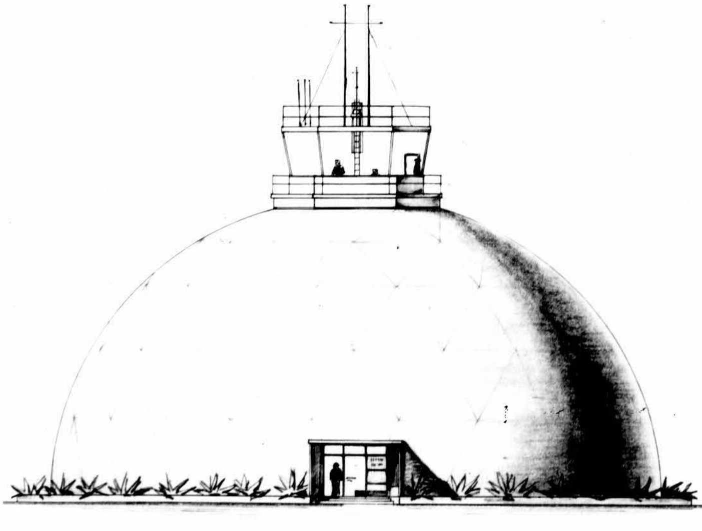
CONTROL
CAB

SCALE 0 5 10 15 FEET

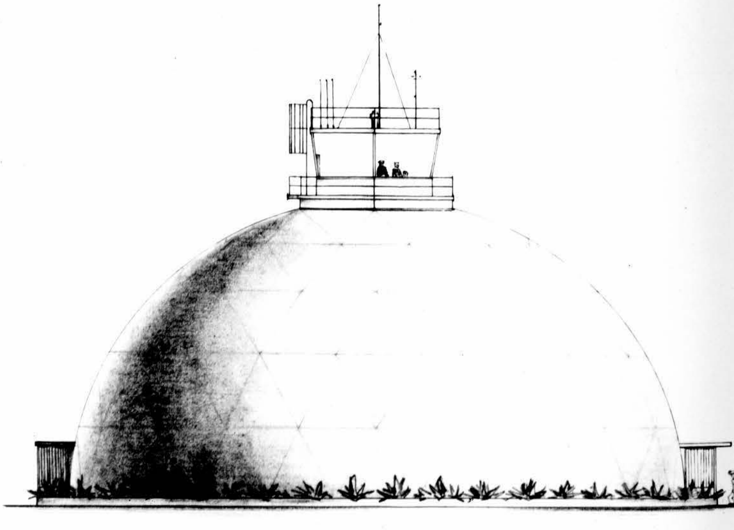


SECTION A-A

SCALE 0 5 10 15 FEET

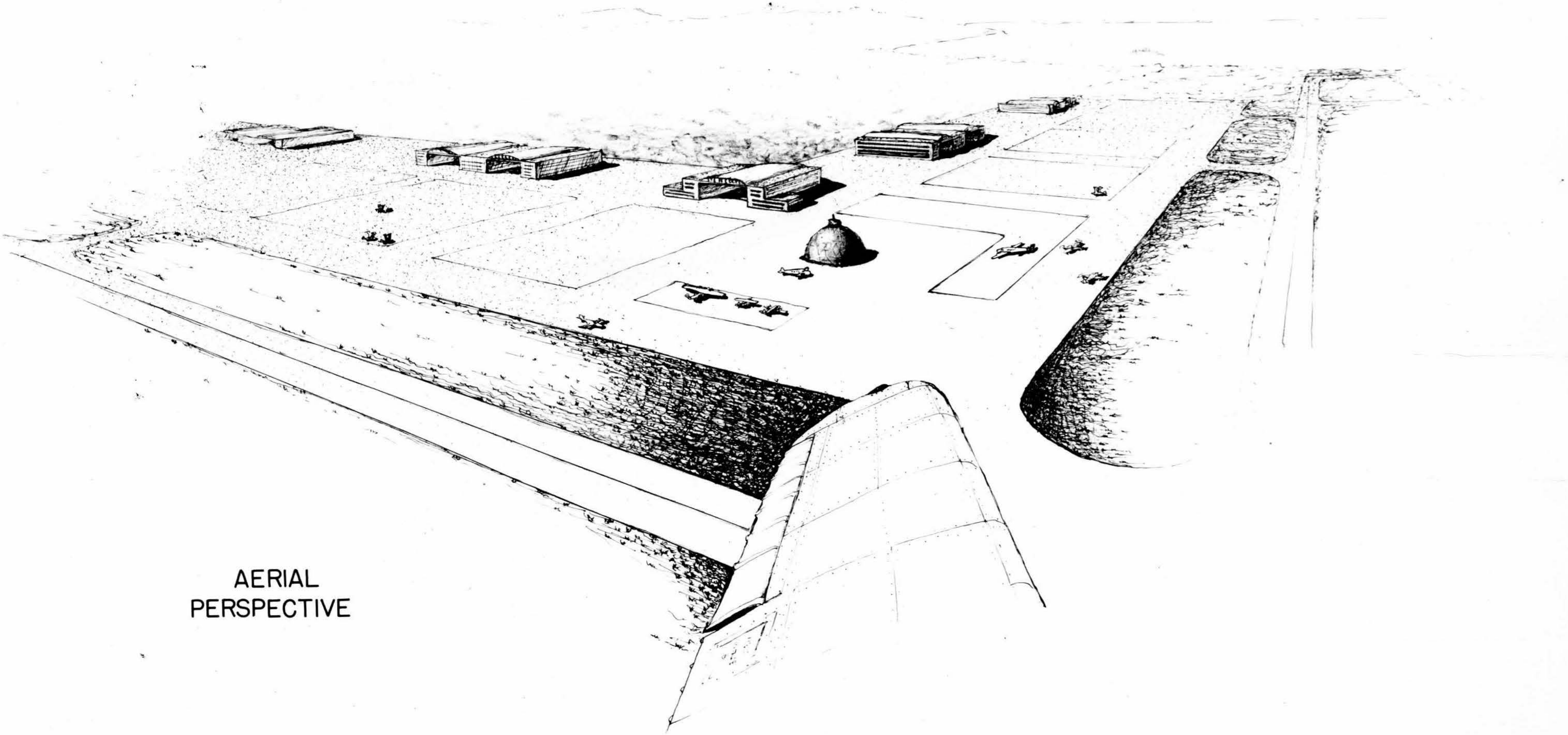


ELEVATION - A



ELEVATION - B

SCALE 0 5 10 15 20 25 FEET



AERIAL
PERSPECTIVE

CONCLUSION

CONCLUSION

The importance of the functions to be performed in the Operations Facility on a Naval Air Field are indeed great.

High water table and blast effect dictated the use of the hemispherical form of structure as opposed to the conventional slab-sided structure.

Buckminster Fuller's geodesic dome and deck trusses were accepted as the type of construction to be used over other structural materials and construction methods after a study was made of the economic, labor and logistic problems involved.

In the author's opinion the flow and separation of functions to be housed has been well solved. The relationship of the "fluid public" flow areas was confined and accomplished on the first floor with a minimum of obstruction.

In placing the electronics group back to back on the second floor, security is well afforded the units in that only those persons who have business in the area will use the corridors. With the Electronics Repair Room being located near the elevator, rapid servicing and movement of equipment is assured. The placing of the Snack Bar at the head of the stairwell will keep a minimum traffic on the second floor.

The third floor, as laid out, affords separate housing for the Fleet Air Wing Offices and Communication Facilities. The elevator affords direct access for the Fleet Air Wing, Commanding Officer, and other officials. The stairwell located immediately outside the facilities permits easy movement by the watches. The unassigned area may well be used for expansion of the Fleet Air Wing Offices or may be used for additional bunk rooms or as separate office space.

Storage facilities, slop sinks and protection of the mechanical equipment core is adequately provided for on all floors.

CONCLUSION

It is to be pointed out that the toilet and shower facilities on the first three decks stack one immediately above the other and, if need be, the standard (first and third floor) unit may be substituted for the second floor unit freeing the ladies' lounge for additional office space.

The author, not wishing to belabor the reader with details, firmly believes that a basically sound solution to the problem was arrived at and proferred to you, the reader, who stands as the final jury of his labors.

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VITA

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