



**DEPARTMENT OF THE ARMY**  
DEPUTY CHIEF OF STAFF, G-9  
600 ARMY PENTAGON  
WASHINGTON, DC 20310-0600

DAIN-ZA

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Army Standard for Aviation Maintenance Hangar Complex, TDA Fixed Wing Aviation Units

1. The enclosed Army Standard (hereinafter 'standard') for the Aviation Maintenance Hangar Complex, TDA Fixed Wing Aviation Units is hereby approved for implementation. It applies to Active Component facilities for TDA Fixed Wing aviation units on Army Installations. Waivers from the standard can only be approved by the DCS, G-9.
2. The standard is mandatory for Military Construction (MILCON) Army projects in the FY25 program and beyond. USACE Center of Standardization will develop and maintain Standard Designs consistent with this standard and MILCON business processes. This standard also applies to the maximum extent practical to projects that fall under authority of repair of facilities, United States code, Title 10, section 2811.
3. Installation Status Report-Infrastructure quality and functionality assessments and Real Property Planning and Analysis System methodologies will be updated to reflect the Army Standard in coordination with the POCs listed below.
4. The Maintenance Hangar Facility Design Team members are CW5 Scott Bostic, DCS, G-4, DALO-MPV, [scott.j.bostic.mil@army.mil](mailto:scott.j.bostic.mil@army.mil); LTC Charlton J. Mosley, DCS, G-9, DAIN-ODR, [charlton.j.mosley.mil@army.mil](mailto:charlton.j.mosley.mil@army.mil) and Ms. Susan Nachtigall, USACE/Combat Readiness Support Team, CEMP-CI, [susan.d.nachtigall@usace.army.mil](mailto:susan.d.nachtigall@usace.army.mil). The USACE Center of Standardization FDT Representative is Mr. Daniel Bush, CESAM, [daniel.e.bush@usace.army.mil](mailto:daniel.e.bush@usace.army.mil).

Encl

EVANS.JASON.TE  
RENCE.10182516  
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Digitally signed by  
EVANS.JASON.TERRENCE.101  
8251651  
Date: 2022.05.11 06:49:37 -0400

JASON T. EVANS  
Lieutenant General, GS  
Deputy Chief of Staff, G-9

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## **Army Standard for Aviation Maintenance Hangar Complex: Fixed-Wing Aviation Units**

**Description:** The Aviation Maintenance Hangar Complex supports the maintenance, repair, and sustainment of manned and unmanned aircraft and associated equipment as well as the planning and conduct of flight operations, aircrew and maintainer training, and the deployment and redeployment of aviation units. While the Fixed-Wing Aviation Unit is part of the overall Airfield Complex, not all portions of the airfield are covered under this standard. The four individual standards identified below collectively address the scope of the rescinded 2013 Aircraft Maintenance Hangar Complex standard.

### **Applicability:**

- The Hangar Complex is covered under multiple Army standards, based on the type of unit (Table of Organization and Equipment or TOE vs. Table of Distribution and Allowances or TDA) and type of assigned aircraft.
- The **Fixed Wing Aviation Maintenance Hangar Army Standard** applies to the planning, design, and construction of aviation maintenance facilities for organizations or portions of organizations that operate manned and unmanned Fixed Wing aircraft. The **TDA Rotary Wing Aviation Maintenance Army Standard** applies to Active Army TDA organizations operating and/or maintaining Rotary Wing manned aircraft. The **TOE Rotary Wing Aviation Maintenance Hangar Army Standard** applies to TOE manned Rotary Wing aviation units. Facilities supporting small Unmanned Aerial Systems (UAS) the size of the Shadow or Hunter are addressed under the **Tactical Unmanned Aircraft System (TUAS) Unmanned Aircraft (UA) Maintenance Hangar Army Standard**.
- Architectural criteria of this Army Standard (module sizes, dimensions of aircraft circulation corridors, blade tip separation, telecom requirements, etc.) apply to Reserve Component aviation maintenance facilities. Planning criteria for sizing these facilities do not apply to Reserve Component aviation maintenance facilities. Instead, planning criteria are governed by the current versions of NG PAM 415-12 and AR 140-483 or successor publications.
- While criteria in this Army Standard (architectural and planning) may inform facility decisions within Army Special Operations, plans for facilities supporting the U.S. Army Special Operations Aviation Command and other special operations aviation elements are controlled and approved by the Headquarters, Army Special Operations Command and the command's Deputy Chief of Staff – Engineering. Due to their unique mission and equipment, there are significant differences from the level of the flight units to the level of depot maintenance and research and development, much of which is accomplished within the Special Operations community.

- Also, while criteria in this Standard may inform facility decisions within Army Test and Evaluation Command (ATEC), plans for facilities supporting ATEC are controlled and approved by ATEC. Note that, in addition to hangars, there are a variety of facility types specially designed to support Research & Development (R&D). These include Aircraft and Flight Equipment (R&D) Building, Astronautical and Geophysical (R&D) Building, Guided Missile (R&D) Building, Detection Equipment (R&D) Building, Electrical Equipment (R&D) Building, and Electronic Equipment (R&D) Building.
- The primary source for determining unit allowances is the Real Property Planning and Analysis System (RPLANS).

**Waivers:**

- Approval exceptions and waivers from Army Standards must be requested in accordance with AR 420-1. As the proponent, DCS G4 must validate and approve the request.
- Garrison Army Standard waiver request submissions must be received in sufficient time to allow the Facility Design Team to complete review and development of recommendations or courses of action for the Army Facilities Standardization Committee to consider prior to implementation into project design.
- All waivers approved by Headquarters, Department of the Army (HQDA) shall be documented in installation master plans and, as applicable, must serve as the installation's modified standards for the facility type and unit type affected.
- Late submissions and/or project delays are NOT sufficient stand-alone justification for accelerated review or other dispensation to meeting the Army Standard contained herein.

The Guidance section provides instructions and definitions necessary for the mandatory requirements contained in the tabular section of the Army Standard. As such, they are used in conjunction with the Army Standard to ensure the intent and embedded functionality contained herein will meet the Army's mandatory requirements set forth by this standard.

**Planning Criteria:**

Army Standards are not intended to provide broader design criteria such as space allocation, functional layouts, or basic layouts more appropriately contained in the supporting and conforming Standard Design/Criteria. Nor are they intended to rigidly define collective facility authorizations more appropriately adjudicated by the Army Requirements.

This Army Standard, associated Standard Designs, and approved Army space criteria are applied together in an iterative and co-dependent way to provide a standardized but adaptable approach to facility standardization. Each serves a different purpose to ensure mandatory functions and operability are provided uniformly and at the right size.

The primary source for determining authorized allowances, in every instance is the Real Property Planning and Analysis System (RPLANS) which incorporates current criteria approved by the Army Requirements Group.

Item	Mandatory Criteria
<p>Site Selection &amp; Planning</p>	<ol style="list-style-type: none"> <li data-bbox="537 453 1338 611">1. Aircraft maintenance bays of the hangars shall be sited with direct access to aircraft mass parking apron on Army Airfields (AAF) or Army Heliports (AHP) without physical penetration of controlled airspace or obstruction clearances.</li> <li data-bbox="537 653 1338 915">2. Hover / taxilanes will be provided with direct access from the hangar access apron to the mass parking apron, to allow power-on operations. Hangar access to parking will be through peripheral taxilanes, or interior taxilanes to the parking spots. Movement from hangar to parking spot (including maintenance apron parking spots) will not need to cross taxiways (as separate from taxilanes) or runways.</li> </ol> <p data-bbox="594 957 967 989"><i>See Guidance Section below</i></p>
<p>Physical Security and Safety Zone</p>	<p data-bbox="594 1041 1338 1461">All operational areas of an AAF / AHP are a Restricted Area. The hangar buildings serve as an outer boundary for the AAF / AHP Restricted Area. Entry into the Hangar buildings or any other portion of the AAF / AHP [operational area] by anyone other than assigned personnel requires prior authorization by airfield operations. Authorization for these personnel will be confined to specific areas. Movement from the privately operated vehicle parking lot to the unit hangars and the aircraft parking apron will be controlled by the aviation units. Movement from aircraft parking aprons to taxiways and runways is monitored and controlled by Air Traffic Control.</p> <p data-bbox="594 1503 1338 1797">Hangars and fences shall be combined to provide a physical barrier controlling access to aircraft and flight operations areas. This barrier shall preclude unauthorized pedestrian and vehicular traffic from gaining access to the flight line. There should be a continuous Security Line composed of either building walls or fencing that provides a continuous physical barrier controlling access to parking apron, circulation and hover taxilanes, taxiways, and landing surfaces.</p>

	<p>Fences will include a 20-foot-wide vehicle gate with separate pedestrian gate as stipulated by the AAF / AHP master plan.</p> <p><i>See Guidance Section below</i></p>
<p>Hangar Functions and Types</p>	<ol style="list-style-type: none"> <li>1. Aircraft hangars (facility Category Code or CC 21110 when many functional areas are present) are composed of CC 21114 aircraft maintenance bays, CC 21116 hangar shop space with maintenance administration area and back shops, CC 21113 Aircraft Parts Storage for storage of aircraft repair parts and associated aircraft equipment, CC 14112 Aviation Unit Operations with company operations for flight and aviation maintenance companies, and flight ops planning and briefing areas.</li>   <li>2. Aviation maintenance has two echelons: Field and Sustainment. This Army Standard deals with Field and limited Sustainment Maintenance for Flight TOEs and TDAs with assigned pilots and fixed-wing aircraft. Note that Army maintenance of fixed-wing aircraft depends, in large part, on contractors. These contractors both work in Army hangars located where fixed-wing aircraft are assigned and perform component and sustainment maintenance in contractor facilities not located on Army bases.</li>   <li>3. TOE and TDA fixed-wing flight organizations will be facilitated to perform Light and Heavy Field Maintenance on assigned aircraft. Facilities for FW flight organizations are planned to be occupied by those organizations, irrespective of the actual contractual arrangements between the unit, the unit's higher headquarters, and Aviation Missile Command. If a TOE flight unit or a TDA flight organization has a mix of fixed-wing and rotary-wing aircraft, it will be handled on a case-by-case basis without the need for a waiver of either the TDA rotary-wing standard or the fixed-wing standard.</li>   <li>4. Fixed-wing organizations are not provided Sustainment Maintenance through the Army system; LRC-As are not planned and sized to perform Sustainment Maintenance on fixed-wing Aircraft. Instead, their Sustainment Maintenance is handled by Original Equipment Manufacturers (OEM) and other contractor arrangements. These functions can either be performed within the Field Maintenance Hangar, or components of the aircraft or entire aircraft can be sent to non-Army locations.</li> </ol>

	<ol style="list-style-type: none"> <li>5. Maintenance facilities for rotary-wing aircraft assigned to TOE organizations, rotary-wing aircraft assigned to TDA organizations, and for Tactical Unmanned Aerial Vehicles (TUAV's) are covered under separate standards.</li> <li>6. No aircraft hangar shall take up more than 850' of flight line frontage.</li> </ol> <p style="text-align: center;"><i>See Guidance Section below</i></p>
<p>Primary Facility Scope and Capacity</p>	<ol style="list-style-type: none"> <li>1. A separate hangar is allowed for every fixed-wing TOE flight battalion, fixed-wing TOE separate company, or fixed-wing flight TDA. If a unit is deployed across more than one site, a hangar is authorized for each site that has aircraft. Note that in a situation where a unit is split across two locations, the distribution of aircraft may not be established within the organizational documents. In this case, planners are authorized to make an assumption to establish this distribution.</li> <li>2. A Gray Eagle Company is authorized a hangar NTE 52,100 GSF. All following information relative to sizing hangar functional areas applies to manned fixed-wing organizations, not Gray Eagle.</li> <li>3. Allowance for hangars for a fixed-wing Flight Organization is a function of the sum of the allowances for aircraft hangar bays, shop areas (including shop admin space), aircraft parts storage, and aviation unit operations. The following provides more detail on how these hangars are sized.</li> </ol> <p style="text-align: center;"><i>See Guidance Section below</i></p>

Maintenance Operations -- Aircraft Maintenance Bays (facility CC 21114, also functional area within CC 21110)

1. Fixed-wing flight units are provided light and heavy field maintenance support in their unit hangar. Fixed-wing aircraft are allowed aircraft maintenance modules to support 30% of the assigned aircraft. This corresponds to the Light Field Maintenance function allowing maintenance modules for 20% of assigned aircraft, corresponding with the TOE unit allowance for Light Field Maintenance, plus additional aircraft maintenance modules to support another 10% of assigned aircraft to correspond to the Heavy Field Maintenance function from the Aviation Support Battalion. Plan maintenance modules for 30% of assigned aircraft. When this calculation leads to a fractional number of modules, the answer is rounded up. In addition to aircraft maintenance modules, select fixed-wing aircraft for missions such as Verify Important Person (VIP) transport or electronic intelligence gathering may be authorized overhead cover to keep them in the shade, on a case by case basis.
2. Units with a mix of large and small aircraft must always get large modules for a minimum of 30% of the large aircraft assigned, and the total unit gets modules (both large and small) for 30% of all aircraft. For example a unit with five large and five small aircraft need a total of three maintenance modules. The five large aircraft need 1.5 modules rounded up to 2, and since the unit needs a total of 3 modules, there is an additional requirement (1 ea.) for a third small module for a total of three.
3. Under this Army Standard, aircraft are allowed one of two module sizes for maintenance and repair of airframes. The large module is 117' deep and 106' wide. This size accommodates the C-37, C-31, EO-5 (RC-7), C-27, C-147, C-20, C-23, UV-18, and C-41A. The small module is 84' deep and 65' wide. This size module accommodates the UC-35, C-12, C-26, and UV-20.
4. Provide water, power, compressed air, drainage, and data connectivity to all aircraft maintenance module.
5. The large fixed-wing module size of 117' deep x 106' wide provides 5' to the right and left of the wingtips plus 10' to the front and back.



	<ol style="list-style-type: none"> <li>6. The small fixed-wing module size of 84' deep x 65' wide provides 5' to the right and left of the wingtips plus length sufficient to accommodate UH-60 and AH-64 helicopters.</li> <li>7. Provide a five foot (5') safety corridor around each contiguous group of aircraft maintenance modules. This area is to be kept clear of equipment and furniture.</li> <li>8. Provide another additional five foot (5') foot structural corridor around each group of contiguous maintenance modules. Miscellaneous items such as eye wash stations can be kept in the space between the columns in this area.</li> <li>9. Provide limited wash capability in each aircraft maintenance module with drainage into the interior maintenance bay trench drain and thence through an oil-water separator.</li> </ol>
<p>Overhead Lift in Aircraft Maintenance Bay Modules (facility CC 21114, functional area within CC 21110)</p>	<ol style="list-style-type: none"> <li>1. For Gray Eagle Hangars, provide overhead lift rated at 5 tons with access to all aircraft maintenance modules, through incorporating a bridge crane in the facility. All working maintenance modules across the entire facility must be provided with lift capability. The overhead lift hook height shall be a minimum of 20' to ensure the facility meets the minimum requirements to perform aircraft maintenance.</li> <li>2. For manned fixed-wing facilities, provide overhead lift rated at 10 tons with access to all aircraft maintenance modules, through incorporating a bridge crane in the facility. All working maintenance modules across the entire facility must be provided with lift capability. The overhead lift hook height shall be a minimum of 31' to ensure the facility meets the minimum requirements to perform aircraft maintenance.</li> <li>3. All hangars for manned fixed-wing aircraft get at least one 10-ton overhead bridge crane. In cases where hangars have &gt;4 aircraft maintenance bays, provide at least one crane for every four (4) aircraft maintenance modules, i.e., 5 - 8 modules get two (2) cranes, 9 - 12 modules get three (3) cranes, etc.</li> </ol>

<p>Maintenance Operations -- Shops (CC 21116, functional area within CC 21110)</p>	<ol style="list-style-type: none"> <li>1. The shop facilities include Shop Administration, Maintenance Support space, and Component Repair Shops (previously described in a variety of ways including Basic Shops, Special Shops, and Allied Shops), Aviation Life Support Equipment (ALSE) Shops, and Tech Supply.</li> </ol>
<p>Maint Ops -- Shops (CC 21116) -- Shop Administration</p>	<ol style="list-style-type: none"> <li>1. This space accommodates office space for contractor equivalents of Shop Section headquarters, Airframe Maintenance Platoon, Quality Control / Quality Assurance Sections, Production Control, and Logistics Information System (LIS) equipment room, etc.</li> <li>2. The allowance for admin and shop control in a manned fixed-wing Flight Organization will be based on an estimated 9 admin and shop control personnel per each aircraft maintenance module. The estimated number of admin and shop control personnel will be multiplied by 130 NSF / admin and shop control person.</li> <li>3. Add 1,000 NSF for Production Control</li> </ol> <p><i>See Guidance Section below</i></p>
<p>Maint Ops -- Shops (CC 21116) -- Maintenance Support</p>	<ol style="list-style-type: none"> <li>1. The maintenance support area of the shop is support space for types of maintenance typically performed in aircraft maintenance modules or on the hardstand. This includes support space for aircraft specific maintenance personnel, a tool room for special tools, and workrooms for crew chiefs.</li> <li>2. Provide 1,200 NSF for a unit that maintains a single type of airframe. If a hangar performs maintenance on more than one type of airframe each additional type of aircraft is allowed an additional 1,200 NSF.</li> <li>4. Provide a base tool room space of 300 NSF. Provide an additional 400 NSF for each different type of aircraft assigned or supported.</li> <li>5. Provide 1,000 NSF for crew chiefs for each fixed-wing company, with all hangars getting a minimum of one (1).</li> </ol> <p><i>See Guidance Section below</i></p>

<p>Maint Ops -- Shops (CC 21116) -- Component Repair Shops</p>	<ol style="list-style-type: none"> <li>1. The basic format for sizing most shop areas are an allocation for a base quantity, plus some number of square feet times the aircraft maintenance capacity, with a final check that the shop is at least as big as a minimum factor. The aircraft maintenance capacity is the number of aircraft maintenance modules in the hangar.</li> <li>2. Structural Repair Shop (used by 15G personnel, or civilian equivalent) is authorized a base quantity of 1,150 NSF and 75 NSF / aircraft maintenance module, with a minimum of 1,650 NSF. The 1,650 NSF minimum includes 500 NSF of composite repair space and 1,000 NSF of sheet metal repair space plus an area for robing and disrobing for technicians wearing protective equipment. These areas may be separated by walls in the Standard Design.</li> <li>3. While rotary-wing maintenance activities include component repair functions (such as powerplant, powertrain, pneudraulics, electrical / avionics, machine shop, and welding), for fixed-wing these functions will be provided by off-base activities that maintain civilian Beechcraft, De Havilland, Fokker, Gulfstream, and other aircraft that are civilian designs.</li> </ol> <p><i>See Guidance Section below</i></p>
<p>Maint Ops -- Shops (CC 21116) -- Aviation Life Support Equipment (ALSE) Repair</p>	<ol style="list-style-type: none"> <li>1. Provide an ALSE shop for each fixed-wing flight organization.</li> <li>2. Provide a base area of 1,500 NSF for ALSE Shop.</li> <li>3. Provide an additional 120 NSF for units with over-water mission, documented on a case-by-case basis.</li> <li>4. Provide 5 NSF of ALSE locker space for each assigned pilot, by MOS.</li> <li>5. Provide 5 NSF of ALSE locker space for each assigned non-pilot member of aircrew, by MOS SQI "F" on the end of an enlisted MOS.</li> </ol> <p><i>See Guidance Section below</i></p>
<p>Maint Ops - Acft Parts Storage (CC 21113) Tech Supply &amp; Contractor</p>	<ol style="list-style-type: none"> <li>1. Each hangar for fixed-wing flight operations unit will be authorized 2,600 NSF of Aircraft Parts Supply inside the hangar.</li> </ol>

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<p>Logistics Support (CLS)</p>	<p>2. Special requirements for humidity control IAW AR 710-2 will be addressed in the standard design.</p> <p><i>See Guidance Section below</i></p>
<p>Maintenance Ops-Overhead Protection (CC 14179) Aviation Ground Support Equipment (AGSE) and Associated Items of Equipment (ASIOE)</p>	<ol style="list-style-type: none"> <li>1. Each fixed-wing flight organization hangar (Gray Eagle and manned fixed-wing) will be allowed a base area of 2,000 SF of covered storage for storage of aircraft components: pods, tanks, boxed aircraft, etc.</li> <li>2. Every fixed-wing organizational hangar (Gray Eagle and manned fixed-wing) will be authorized 3,000 SF of covered storage for AGSE for each hangar.</li> <li>3. Select manned fixed-wing aircraft may be provided overhead protection if they have VIP airlift paint jobs, electronic gear that may be harmed by storing the aircraft in direct sunlight, or other factors. Such cases will be adjudicated on a case-by-case basis.</li> </ol>
<p>Aviation Unit Ops (CC 14112) Flight Ops &amp; Pilot Work Areas</p>	<ol style="list-style-type: none"> <li>1. Flight operations area for Gray Eagle is included in the 52,100 GSF authorization.</li> <li>2. The number of pilots is the total of 15A, 15B, &amp; 15C commissioned officers in grades O1 – O6 and 155x in grades W1 – W5.</li> <li>3. Pilot workroom will be provided at 21.0 NSF/pilot assigned.</li> <li>4. Flight planning rooms will be provided at 10.5 NSF/pilot assigned.</li> <li>5. A secure planning room will be provided at 6.0 NSF/pilot</li> <li>6. Conference rooms will be provided at 6.0 NSF/pilot</li> <li>7. A pilot briefing room will be provided at 15 NSF/seat plus an additional 25% of in-room circulation for a total of 19.0 NSF/seat. One seat is provided for each pilot assigned to the organization.</li> <li>8. Permanent workspace is also included for designated flight operations personnel with a high administrative</li> </ol>

	<p>workload. Each soldier matching these criteria is allotted 110 NSF of office space.</p> <p><i>See Guidance Section below</i></p>
<p>Aviation Unit Ops (CC 14112) Company Headquarters</p>	<ol style="list-style-type: none"> <li>1. Provide each manned fixed-wing company 220 NSF for 2 ea. 110 NSF offices for Commander, and First Sergeant.</li> <li>2. Provide each manned fixed-wing flight company 400 NSF for an Arms Vault</li> <li>3. Provide each manned fixed-wing flight company 400 NSF of Unit Storage (Supply Room)</li> <li>4. Provide each manned fixed-wing flight company 180 NSF of Secure Storage.</li> <li>5. Provide each manned fixed-wing flight company 100 NSF of Chemical Biological Radiological Nuclear (CBRN) Storage</li> <li>6. Provide each manned fixed-wing flight company 100 NSF of communications storage</li> <li>7. Provide each manned fixed-wing flight company 150 NSF training office.</li> </ol> <p><i>See Guidance Section below</i></p>
<p>Fire Suppression (CC's 21110 / 21114 / 21116 / 21113 / 14112)</p>	<ol style="list-style-type: none"> <li>1. Aircraft hangars shall use a fire suppression design, UFC 3-600-01, which the Army adapted from NFPA 409. It will also meet the requirements of UFC 4-211-01 for fire suppression.</li> <li>2. Aircraft maintenance modules will not use water systems as the primary suppression system without waiver approval.</li> <li>3. Maximize protecting of personnel, minimizing risk to personnel within hangars during dispensing.</li> <li>4. Maximize protection of airframes, trying to minimize loss of airframes resulting from dispensing and cleanup.</li> <li>5. Design system to provide fastest return of airframes to a mission ready status after discharge.</li> </ol>

	<ol style="list-style-type: none"> <li>6. Minimize use of water in terms of total quantity and in terms of the percent of content of the agents used.</li> <li>7. Minimize infrastructure cost.</li> </ol>
<p>Power (CC's 21110 / 21114 / 21116 / 21113 / 14112)</p>	<ol style="list-style-type: none"> <li>1. Primary service to all hangars shall be 480v AC, three-phase, with Y-ground.</li> <li>2. Provide power for the type and quantity of aircraft supported or assigned.</li> </ol>
<p>Gross Square Feet of Building</p>	<ol style="list-style-type: none"> <li>1. Gray Eagle Companies will be authorized a hangar of 52,100 GSF.</li> <li>2. For manned fixed-wing hangars, NSF of CC 21114 Hangar Bay + NSF CC 21116 Shops + NSF 21113 Aircraft Parts Storage + NSF 14112 Aviation Unit Operations = Total NSF of Facility.</li> <li>3. This result is the target SF to support the unit mission under ideal conditions. This is also the target size of a corresponding standard design if the unit in question is common enough to be worthy of a standard design. Floor space at 80% of this number should be treated as the minimum space to accomplish the mission; a unit should get Not Less Than (NLT) this quantity of space. There is also a planned ceiling of 120% of this space. If a standard design provides over 120% of the calculated space for a unit, any planned construction for that unit should be based on either creating a new standard design (if the unit type is common enough for that to be worthwhile) or creating a design unique to the unit supported.</li> </ol>
<p>Aircraft Wash Apron (CC 11370)</p>	<ol style="list-style-type: none"> <li>1. Provide each manned fixed-wing aircraft hangar with an external wash apron or aprons. A wash apron isn't necessary for Gray Eagle hangars.</li> <li>2. This apron must be sized for the largest aircraft supported by the hangar, and need only provide access for non-power on operations (i.e., aircraft will be moved to the apron by a tug rather than under the aircraft's power.)</li> <li>3. A hangar supporting large fixed-wing aircraft will be allowed a single wash apron 115' wide and 110' long.</li> </ol>

	<ol style="list-style-type: none"> <li>4. A hangar supporting small fixed-wing aircraft will be allowed a wash apron 90' wide and 75' long.</li> <li>5. The wash apron will be provided with not only water but also power and compressed air service.</li> <li>6. At no time will the capacity for the Wash Apron be sized to serve as a recovery point (deployment, operation, or exercise) or Rinse Facility.</li> </ol> <p style="text-align: center;"><i>See Guidance Section below</i></p>
<p>Hangar Access Apron (CC 11340)</p>	<ol style="list-style-type: none"> <li>1. For Gray Eagle, provide a 100' long by 160' wide hangar access apron (1,777.78 SY) plus two 40' deep by 65' wide run-up stalls, one on each side of the access apron (577.78 SY total) for a total hangar access apron of 2,355.55 SY</li> <li>2. For manned fixed-wing aircraft hangars, provide a continuous concrete surface from parking apron or taxiway to the hangar door sized to be commensurate in width with the door and commensurate in depth with obstruction clearance factors from closest power-on activity, typically NLT 125' deep.</li> <li>3. For manned fixed-wing aircraft, when a hangar door does not have immediate access to the parking apron or a circulation taxilane, a circulation pathway (not for power-on) will be provided NLT 65' wide with a direct path to a hover / taxilane or an operational taxiway.</li> </ol>
<p>Telecommunications</p>	<ol style="list-style-type: none"> <li>1. Telecommunications infrastructure will meet the USAISEC Technical Guide for Installation Information Infrastructure Architecture (I3A) and ANSI/TIA/EIA 568 and 569 requirements.</li> <li>2. Telecommunications Room. A Telecommunications Room (TR) shall be provided for the voice and data network. There shall be a minimum of one TR on each floor and one (1) per 10,000SF area, designed in accordance with the I3A Guide and ANSI/EIA/TIA-569-8.</li> </ol>

	<ol style="list-style-type: none"> <li>3. Outside plant connectivity will be in accordance with Army I3A guidance. Telecommunications lines will be underground from the installation's telecommunications system to the main distribution equipment located in the telecommunications equipment room. Fiber optic cabling shall be sized to support the common user systems and hangar critical systems.</li> <li>4. All Computer Rooms are sized based on the building configuration and sized based on operational and security requirements as determined by the appropriate engineering and certification authority.</li> <li>5. Telecommunications outlets (voice and data) shall be provided in accordance with I3A technical guide based on functional purpose of the various spaces within the facility as modified by user special operational requirements.</li> </ol>
<p>Secret Internet Protocol Router Network (SIPRNET) Room</p>	<p>Provide a SIPRNET room in accordance with the USAISEC Technical Guide for the Integration of SIPRNET) and AR 380-5.</p>
<p>Energy Policy Act of 2005 / Executive Order 134323</p>	<p>Facilities shall be designed in compliance with requirements for federal facilities IAW the Energy Policy Act of 2005 and Executive Order 134323.</p>
<p>Sustainable Design Development</p>	<p>Facilities shall be designed to meet current sustainable development and design policy requirements as established by the Department of the Army.</p>
<p>Handicapped Accessibility</p>	<p>The Architectural Barriers Act, Americans with Disabilities Accessibility Guidelines (ADAAG) will be met. While soldiers occupying the facility are able bodied, some contractors providing maintenance support may not be.</p>

**Guidance Section**

**General:** The following guidance for application of the Aircraft Maintenance Hangar (HGR) Complex Army Standard is provided for design agent use in coordination with the Garrison DPW. All design agents shall incorporate the key mandatory design features described herein in close coordination with the USACE designated Center of Standardization for Aviation Facilities (Vertical) (AVN COS). All Army aviation facility projects must be reviewed by the AVN COS and Transportation Systems Mandatory Center of Expertise.



1. This section of the Army Standard is a necessary component for determining the application and implementation of this standard. The AVN COS, in coordination with the Aviation Facilities Design Team (FDT), is the final arbitrator for any conflicts or inconsistencies in the application of these standards as well as a mandatory reviewer prior to submission of any format waiver requests by the installation. Citing project execution delays is insufficient justification for expedited review or other accelerated dispensation for deviating from meeting the Army Standards contained herein. Late submissions must be substantiated by unforeseen and documented life safety, health and welfare, or compelling mission imperatives that cannot be met without an approved waiver.
2. The HGR Complex is a major reach operations facility with functional, operational, and spatial relationships critical to meeting mission planning, rehearsal, training, deployment, and operations that are embedded in the operational layout of the facility. When there is a critical need for spatial or land use consideration for siting and implementing this Army Standard, guidance is provided to minimize or preclude functional and operational impacts on the obstruction and safety requirements for Army Airfields and Heliports (AAF/AHP).
3. Aviation facilities need substantial airspace and land area for safe and efficient operation and to accommodate future growth or changes in mission support. Facilities in direct support of aircraft operations and maintenance should have sufficient land area for expansion as equipment and technology fielding are implemented for Future Force Structure changes.
4. The installation mission area proponent responsible for developing the scope and requirements for Army aviation facilities is usually assigned to the Aviation Division, Directorate of Plans, Training and Mobilization (DPTM) of the garrison staff or the Operations Section (G/S-3) of the senior aviation organization. At locations where there is no DPTM or G/S-3 office, facility planners must coordinate with the commander of the aviation unit(s) to be supported. The DPTEM, as primary mission area proponent, is responsible for integrating mission support requirements for aviation facilities, aircraft operations, aviation safety and air traffic control.
5. Where applicable, the minimum acceptable functional and operational capability is established by a Threshold requirement. The Army's maximum level of commitment to addressing the flexibility to adapt to future requirements is set by the Objective requirement. These same parameters are used by other Army activities in the doctrinal, organizational, training, and material domains and are adopted herein to simplify coordination and preclude misinterpretation when synchronizing requirements across the Army. The parameters also provide definition for design flexibility and achievement of MILCON (Military Construction) objectives and benefits when applying this standard.
6. Space modules, criteria, or components of the HGR Complex shall be used to develop space allowances and/or requirements before consideration for development of

unique or specialized space allowances from those set forth in this Army Standard. When space modules, criteria, and/or components are not used, the Functional Proponent, ICW the Aviation Facilities FDT and AVN COS, will review and validate functional or operational requirements prior to the development of any unique or specialized space allowance(s) and before incorporating into a project programming document or facility design.

**General Design Philosophy:** This standard aligns with the concept of Multi-Domain Operations to provide intelligent, robust and secure Multi-Domain Power Projection Capabilities. This 21st century facility approach provides continuity of operation under attack or disaster conditions and the ability to be rapidly restored to full operation following adverse events, as well as the capacity for cost-effective incorporation of emerging technologies.

1.The HGR Complex is a major component of the AAF/AHP. Functional, operational, and spatial relationships critical to meeting mission requirements are embedded in the layout and spatial relationships of the facilities that comprise an HGR Complex. By definition, the use of the term complex in this standard refers to multiple facility types that are "packaged" to meet the Warfighter mission objectives while optimizing the hangar footprint. When there is a critical need for spatial or land use consideration for siting and implementing this Army Standard, guidance is provided to minimize or preclude functional and operational impacts on the hangar complex and AAF/AHP operational safety and obstruction clearance requirements.

2.The HGR Complex represents a consolidation of multiple facility types or functional/mission areas: Aircraft hangars (facility Category Code or CC 21110 when many functional areas are present) are composed of CC 21114 aircraft maintenance modules, CC 21116 hangar shop space with maintenance administration area and back shops, CC 21113 Aircraft Parts Storage for storage of aircraft repair parts and CC 14179 Overhead Cover for Associated Items of Equipment (ASIOE) and Aviation Ground Support Equipment (AGSE), CC 14112 Aviation Unit Operations with company operations for flight and aviation maintenance companies, and flight ops planning and briefing areas. Associated facilities to the Hangar are Hangar Access Apron CC 11340 and Maintenance Apron Rotary Wing Aircraft Parking Apron FCC 11320, Hover / Taxi lanes FCC 11221, and Taxiways FCC 11231. The HGR maximizes and builds upon the increased connectivity being developed for battle command, collective training, situational awareness, and situational understanding as well as the embedded/distributed training architecture.

3.At the same time, technological insertions that will affect facility adequacy are pre-programmed at prescribed intervals. To reduce repetitive construction modification of facilities to accommodate change, the HGR adopts an adaptive, multipurpose design philosophy to reduce reliance on construction and the disruption to Soldier and unit training and readiness it entails.

4. The HGR Army Standard simultaneously resolves past issues, current needs, and the capability to accommodate future requirements. These facilities are critical elements for reducing the support footprint for deployed forces in the area of operations, enabling reach operations, implementing the Army's force design to provide intelligent, robust, and secure Multi-Domain Power Projection Capabilities.

5. The HGR Army Standard represents a 21st Century facility standard to simultaneously address past issues, current needs, and future requirements. As such, there are instances where a band of acceptability is allowed in the application and implementation of these standards. However, the range of acceptability is determined through a Warfighter Review process and deviation from this standard will also consider implications on future requirements embedded herein, and the potential impact of follow-on or retrofit construction activities on readiness as well as current situation.

6. For the purposes of this Army Standard, the term TDA Flight Organization describes TDA organizations that have assigned pilots and aircraft, or have missions that require some mix of military, Army civilian, and contract pilots to fly some mix of Army or contractor provided aircraft.

7. Additional design considerations are:

- Make maximum use of natural light so that facilities remain usable during periods of lost utility support
- Economy of construction is a design prerequisite
- Facilities must be durable to withstand the rigors of multiple users
- Prefabricated construction components and/or modular construction is encouraged as long as facility durability requirements are satisfied

#### **Maintenance Echelons:**

- According to ATP 3-04.7 Army Aviation Maintenance Sep 2017, Section I-Two Level Maintenance 2-1, Army aviation maintenance has two echelons: Field and Sustainment.
- These two echelons define a spectrum of tasks to accomplish a wide variety of work, and sometimes an organization within one or the other echelon can conduct maintenance tasks at one end or the other of that spectrum.
- Field Maintenance includes Light Field Maintenance and Heavy Field Maintenance.
- Light field maintenance concentrates on tasks that take hours to days, that require little specialized equipment, that require only common Military Occupational Specialty (MOS) skills, and this type of maintenance includes a smaller quantity of component repair and a larger quantity of component

replacement. This level of maintenance can paint 12" x 12" areas. These tasks are mostly non-scheduled maintenance; some phase maintenance is conducted but this is done more for the purpose of maintaining MOS proficiency on component repair and less on maximizing the efficiency of maintenance accomplished. All parts, equipment, and personnel performing this type of maintenance must be transportable on vehicles organic to a TOE flight battalion. While TDA flight organizations don't have the same transportability constraints as TOE flight battalions, this is the type of maintenance that will be accomplished by TDA flight organizations, enabling a consistent "plug and play" capability for TDA units to "plug into" maintenance support.

- Heavy field maintenance concentrates on tasks that take days to weeks, or that require specialized equipment, or specialized skills, or some combination of these. This type of maintenance includes more component repair. This type of maintenance can also support painting entire rotor blade sets. This type of activity can own more equipment and spare parts than can Light field maintenance. Rather than being able to move their parts, equipment, and personnel by organic vehicles these organizations can expect additional transportation assets from outside the maintenance company of the support battalion of the aviation brigade and can therefore store larger quantities of repair parts, tools, etc. A typical example of this type of maintenance is that performed by an Aviation Support Battalion.
- Fixed wing aviation organizations (TOE and TDA) have their Field Maintenance support provided by contractors, not military personnel. The concept for fixed wing maintenance is that the unit will be allowed space in the unit hangar to support all Field Maintenance, both heavy and light. While Army-designed rotary wing aircraft have their component repair functions performed in Army facilities, Army fixed-wing aircraft are almost all civilian models, sometimes with some military modifications such as chaff / flare dispensers or with integration of sensors and signals intercept equipment onto the airframe. Maintenance support for these aircraft can be found at airfields around the world, so the Army depends on component repair and support from these civilian sources rather than performing this function in Army shops.
- Sustainment Maintenance for fixed wing aircraft will also be provided by civilian contractors, either using non-Army facilities (especially for component repair) or using.

**Concept for Supporting Maintenance with Facilities:**

- Fixed-wing Flight Organizations (TOE and TDA) will be provided with a single hangar for performing both Light and Heavy Field Maintenance.
- The hangar for a fixed-wing flight organization will be provided Aircraft Maintenance Modules for 30% of assigned aircraft.

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- This hangar also provides facility space for maintenance support teams to provide sustainment maintenance. Typically, this is maintenance on the airframe, and required component maintenance involves shipping the component to another location for maintenance or rebuild.
- TOE Rotary Wing organizations are not covered by this Standard; they are covered by the TOE Rotary Wing Standard. TOE Units with a mix of Fixed Wing and Rotary Wing Aircraft are not covered in this Standard and will be handled on a case by case basis.
- For TDA organizations, only Fixed Wing are covered by this Standard. TDA Rotary Wing flight or maintenance organizations are covered by the TDA Rotary Wing Standard.

## Aviation Maintenance Activity and Standards: Fixed Wing / UAS

Level	Maint Activity Type	Maintenance Activity Type	Painting & Engine Test	Non-CAB FW TOE		FW TDA	DoD Group 4, Former Army Tier III, Gray Eagle	DoD Group 3, Former Army Tier II, Hunter / Shadow
Sustainment	Sustainment Rear, aka Depot (CCAD)	<b>Sustainment Rear, aka Depot (CCAD)</b> -- Sustainment Rear: New Production, Modification to New Model Letter, Zero Hour Rebuild, use and retention of any fixed equipment which either is now or has in the past made work more efficient. Perform MWO & Reset if it maximizes efficiency or if Hubs and Spokes are not capable of providing support. Extra expertise in battle damage repair.	Paint Multiple Aircraft, Engine Test	Beechcraft / Gulfstream?	Beechcraft / Gulfstream?	Beechcraft / Gulfstream?	General Atomics?	AAI Corp?
	Sustainment Intermediate (Hub)	<b>Sustainment Intermediate (Hub):</b> Reset (main distinction), Back Up Heavy†, Back Up Phase, some fixed equipment too specialized to use efficiently at Sustainment Forward, Perform More Complex MWO. <b>Hangar 5% of Supported Aircraft at Home Station (Hub duplicates Spoke) and 10% of TOE without ASB on Base + Hangar 2.5% of TOE Aircraft in Supported Area;</b> reset averaging 90 days mean this provides space to reset of aircraft every year.	Paint 1 Aircraft per Process Station (3 Stations), Engine Test					
	Sustainment Forward (LRC-A)	<b>Sustainment Forward (LRC-A):</b> Back Up Heavy†, Back Up Phase, Perform simple MWO's to Maximize Efficiency Using Fixed Equipment with Efficient Workload. <b>Hangar 5% of all Supported Aircraft + Additional 10% of TOE Flight Bn / Co or TDA Flight Organization not supported by TOE Avn Spt Bn or Element.</b>	Paint Rotor Blade Set if no CAB, No Engine Test					
Field	Field Heavy (B Co ASB)	<b>Field Heavy (B Co ASB):</b> Back up Non-Scheduled Light *; Perform Non-Scheduled Heavy †; Perform Phase. <b>Hangar 10% Supported Aircraft.</b>	Paint 4 Rotor Blades + 12' x 12" Area, No Engine Test	Field Heavy FW TOE Avn Maint	Field Heavy FW TOE MI Avn Maint	Field Heavy TDA FW Avn Maint	Field Heavy Support Also Within UAS Co.	
	Field Light (D Co. Flt Bn)	<b>Field Light (D Co. Flt Bn):</b> Non-Scheduled Maintenance Light*, Perform Limited Phase for Individual Training. <b>Hangar 20% Assigned Aircraft.</b>	Paint 4 Rotor Blades + 12' x 12" Area, No Engine Test	TOE FW Avn Flight Bn / Co	TOE FW MI Flight Bn / Co	TDA FW Avn Flight Bn / Co	CAB UAS Company (Gray Eagle)	BCT / SOF / Atk Bn / TUAS Plt (Shadow)

\* Light = Tasks take hours to days, little specialized equipment, common MOS skills, little component repair, all parts and equipment can feasibly be moved by vehicles organic to a D Company.

† Heavy = Tasks take days to weeks, or require specialized equipment, or specialized skills, or a combination of these. Lots of component repair. Feasible to move equipment and parts by an ASB augmented with reasonable additional transportation assets. Augmenting transportation assets would not exceed the ASB's organic transportation assets.

Basic TOE Rotary Wing Standard	TDA Standard	Fixed Wing Standard	TUAS Standard
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### **Application Guidance**

1. **Site Selection and Planning.** Site selection and real property master planning for all Active Component HGR Complexes (and Reserve Component complexes when applicable) shall comply with all safety, obstruction, and airspace boundaries as stipulated by AR 95-2 and implemented by the Transportation Systems Mandatory Center of Expertise (TS MCX) for DCS G-3, HQDA. All spatial relationships between the landing surface and operational areas of the Army Airfield/Army Helicopter (AAF/AHP), and airspace boundaries of the domestic or host nation aviation authority will be met. These operational, safety, and environmental (noise) clearance areas or boundaries ensure that facility siting will not be in violation of clearance areas which could render the facility inoperable. Master planning of the land use areas must also ensure that expansions of operational capabilities are maintained while the encroachment from activities on and off post is minimized. The prescribed sequence of analyses for HGR Complex siting begins with primary and secondary landing surfaces to ensure horizontal and vertical operational clearances are applied. When installations are precluded from meeting these stipulations, alternatives considered, and their associated limitations shall be documented in the installation Real Property Master Plan with a summary forwarded to HQ IMCOM (IMAH-PW) for Army wide implications assessment. Ideally, other aviation maintenance and operations spaces such as flight and maintenance company headquarters, maintenance admin space, component repair and similar shop functions, and storage for parts and associated items of equipment should be provided in the same hangar as the aircraft maintenance modules. This may be impossible in some airfield configurations; in which case they should be very close to the maintenance hangar bays. If you have to move areas away from the hangar bay because of site limitations the aviation company headquarters should be the first you look at placing separate from the hangar bays. Next you can look at moving the aviation unit operations to a separate facility. It is most important that maintenance shops and maintenance shop admin be located integral with or adjacent to hangar maintenance bays building.

2. **Physical Security and Safety.** The HGR Complex is the outer boundary for the AAF/AHP Restricted Area. Personnel or vehicular traffic from other than assigned units on the AAF or AHP are not allowed entry to this area without express authorization from airfield operations. All pedestrian and vehicular traffic is under strict control and surveillance by Air Traffic Control when entering aircraft operational areas. Hence, a Security Line is established commencing from the hangar line and encompassing all operational areas of the AAF/AHP to include aircraft parking, navigational aids (NAVAIDS), and airfield service buildings and/or areas. This entire Restricted area is also designated a NO HAT area as well as a Foreign Object Debris (FOD) control area. Secondary consideration is for personnel safety and physical security of equipment commensurate with the increasing value of technology used by Soldiers and units.

3. **Hangar Functions and Types.** Aircraft hangars (facility Category Code or CC 21110 when many functional areas are present) are composed of CC 21114 aircraft maintenance modules, CC 21116 hangar shop space with maintenance administration area and back shops, CC 21113 Aircraft Parts Storage for storage of aircraft repair parts and associated aircraft equipment, CC 14112 Aviation Unit Operations with company operations for flight and aviation maintenance companies, and flight ops planning and briefing areas. Aviation maintenance has two echelons: Field and Sustainment. This Army Standard deals with both Field and Sustainment Maintenance. Different criteria are applied to light Field Maintenance vs. heavy Field Maintenance and Sustainment Maintenance.

4.Primary Facility Scope and Capacity (FCC 21110). Hangar allowances are calculated for TOE and TDA fixed wing organizations under this Army Standard. The allowance for a hangar for manned fixed wing aircraft is a function of the sum of the allowances for aircraft hangar modules, shop areas, aircraft parts storage, and aviation unit operations. The allowance for a Gray Eagle Company is NTE 51,200 GSF, with a breakout as follows:

5.Maintenance Operations -- Aircraft Maintenance Bay (facility CC 21114, also functional area within CC 21110) The term aircraft maintenance bay is a structural term that includes all the maintenance modules within the hangar. A maintenance module is designed to fit one aircraft. Two sizes of maintenance modules are provided because of the wide variation in sizes for Army fixed wing aircraft. A C-130 module is also shown for comparison purposes.



<b>Overview of Fixed Wing Aircraft &amp; Size of Hangar Maintenance Module</b>			
<b>Extra-Large Module (C-130J): Design Acft 113' L x 133' W</b>			
<b>Module Depth 113' + 15' (rear) + 10' (front) = 138' Deep</b>			
<b>Module Width 133' + 7.5' (½ 15' left) + 7.5' (½ 15' right) = 148' Wide</b>			
<b>Large Module: Design Aircraft 97' L (C-37) x 96' W (C-31)</b>			
<b>Module Depth 97' + 10' (front) + 10' (rear) = 117' Deep</b>			
<b>Module Width 96' + 5' (½ 10' on left) + 5' (½ 10' on right) = 106' Wide</b>			
<b>Civilian Aircraft</b>	<b>Military Designation</b>	<b>Length</b>	<b>Wingspan</b>
Gulfstream V	C-37	96.40	93.45
Fokker F27	C-31 Troopship	82.25	95.17
DHC-7 Series 102	EO-5 (RC-7)	80.65	93.00
Alenia C-27J	C-27 Spartan	74.50	94.17
DHC-8 Series 300	C-147	84.25	90.00
Gulfstream III	C-20 Gulfstream	83.08	77.83
	C-23 Sherpa	58.00	74.75
	MV-22 Osprey	57.33	84.58
DHC-6 300 / 400 Twin Otter	UV-18	65.00	65.00
C-212 Aviocar	C-41A	53.15	66.54
	A-10 Thunderbolt II	53.30	57.50
<b>Small Module: Design Aircraft 65' L (UH-60) x 55' W (C-12)</b>			
<b>Module Depth to Accommodate Helicopters = 84' Deep</b>			
<b>Module Width 55' + 5' (½ 10' on left) + 5' (½ 10' on right) = 65' Wide</b>			
<b>Civilian Aircraft</b>	<b>Military Designation</b>	<b>Length</b>	<b>Wingspan</b>
Sikorsky S-70		64.83	53.67
Citation V Ultra	UC-35 Cessna	48.92	52.17
Citation V (Encore)	UC-35 Cessna	48.92	52.17
Beechcraft Super King Air	C-12 Huron	43.75	54.50
Beechcraft Super King Air	RC-12 Huron	43.75	54.50
Metro III / Metro 23	C-26 Metroliner	42.17	46.25
Pilatus PC-6 Porter	UV-20 Chiricahua	36.08	52.06
Ayers Turbo-Thrush		29.16	44.33
Embraer EMB 314	A-29 Super Tucano	37.33	36.54
Beechcraft Texan II	AT-6 Texan II	33.33	33.42

6. Maintenance Operations -- Shops (CC 21116, functional area within CC 21110). The shop facilities include Shop Administration, Maintenance Support space, Aviation Life Support Equipment (ALSE) Shops, and Tech Supply. Separate areas within the shop are calculated based on the **estimated** number of aviation maintenance administrative and shop control personnel, the count of maintenance modules, and other factors. This leads to the number of Net Square Feet (NSF) dedicated to Shop space. This quantity includes workspace and circulation within the section or shop. The quantity of shop space will be summed with Aircraft

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Maintenance and other types of space into a total NSF requirement for the hangar, which is then adjusted to Gross Square Feet (GSF) including circulation space (horizontal between shops and vertical between floors), latrines, mechanical rooms, electrical rooms, communications and server rooms, janitor closets, etc.

7. Maint Ops -- Shops (CC 21116) -- Shop Administration. Fixed Wing Aviation Maintenance Activities (except for Gray Eagle) are staffed by contractors, so detailed data on the breakout between supervisory staff and maintenance mechanics is probably proprietary and critical to the competitiveness of bids and proposals. Because of this, the size of the Shop Administration Area is based on the number of maintenance modules and not a count of administrative staff.

For manned Fixed Wing Flight Organizations, the number of shop admin personnel is seven (7) times the number of maintenance modules. This is the average across Attack Battalions / Recon Squadrons, Assault Battalions, and General Support Aviation Battalions, rounded to a whole number.

The 1,000 NSF for Production Control accommodates office space for contractor activities equivalent to Shop Section headquarters, Airframe Maintenance Platoon, Quality Control / Quality Assurance Sections, Production Control, Logistics Information System (LIS) equipment room, etc.

8. Maint Ops -- Shops (CC 21116) -- Maintenance Support. Maintenance support space provides work areas for aircraft specific repair sections who need space for storage of tools and bench stock and to conduct various work assignment meetings. In TOE rotary wing units this space typically accommodates soldiers in MOS's such as 15R AH-64 Attack Helicopter Repairer, 15T UH-60 Helicopter Repairer, 15U CH-47 Helicopter Repairer, and 15V Observation / Scout Helicopter Repairer. In the case of fixed wing units, it accommodates corresponding crew-chief type contractors when they are not working in the aircraft bay areas or out on the hardstand. Provide 1,200 NSF for a unit that maintains a single type of airframe. By type of airframe, we mean per family of airframes – C-12's, RC-12's, and UC-21's are all considered a single type of airframe for these purposes. If a hangar performs maintenance on more than one type of airframe, e.g., the mix of C-31's and UV-18's within the Golden Knights at Ft. Bragg, each additional type of aircraft is allowed an additional 1,200 NSF. Provide a base tool room space of 300 NSF. Provide an additional 400 NSF for each different type of aircraft assigned or supported. Provide 1,000 NSF for each flight company for crew chiefs. A fixed wing flight company is identified based on the presence of an O3 or O4 COMMANDER, an E8 with a "M" identifier in the last character of the MOS, or other clues from the TDA such as paragraph names. Each Fixed Wing hangar will be planned with a minimum of one flight company.

9. Maintenance Operations Shops (CC 21116)-Component Repair Shops. Shop space allowances for fixed wing organizations are significantly different from those supporting rotary wing aircraft because component repair of components of fixed wing aircraft are typically repaired by contractors who are not located on an Army base. Fixed wing organizations do perform structural repair in the hangar. ALSE shops include lockers for both pilots and non-pilot flight crew. Identification for counting pilots is explained under flight operations. Non-pilot flight crew are soldiers with an "F" in the final digit of their occupational specialty.

10. Maintenance Operations- Aircraft Parts Storage (CC 21113) Tech Supply & Contractor Logistics Support (CLS). The application guidance herein addresses how

supply allowances will be incorporated into HGR projects. Supply and logistics space allowances are generally categorized along maintenance levels and should be provided either within the hangar structure or immediately adjacent to the hangar commensurate with the maintenance level to be performed. The AVN COS shall review any request for increased space allocation above what is called out in this standard.

11. Maintenance Operations- Overhead Protection (CC 14179)-Aviation Ground Support Equipment (AGSE). Fixed wing aircraft hangars will also have storage for supporting AGSE.

12. Aviation Unit Operations (CC14112) Flight Operations & Pilot Work Areas. The work area for a single pilot is 33.5 NSF for a desk area plus 8.5 NSF of in-room circulation for a total of 42 NSF, based on the sizing of planning rooms in EAB C2F. This is a hot desk area, and desks equal to 1/2 the total strength of pilots are provided. This comes to 21.0 NSF/pilot assigned. A flight planning room will be provided. It is sized the same as the pilot workroom, but space is only provided for 1/4 of assigned pilots. This comes to 10.5 NSF/pilot assigned. A secure planning room will be provided at 6.0 NSF/pilot to accommodate 1/7th of all assigned pilots in a space identical to the others. A pilot briefing room will be provided. It is sized using the same criteria as the EAB C2F 150 person briefing room -- 15 NSF/seat plus an additional 25% of in-room circulation for a total of 19.0 NSF/seat. One seat is provided for each pilot assigned to the organization. Design with moving partitions to separate into three small spaces. Pilots are commissioned officers in MOS's 15A, 15B, and 15C, plus warrant officers in 155x MOS's, plus enlisted soldiers in MOS 15C (UAS Pilots). Permanent workspace is also included for designated flight operations personnel. This includes 15P E1-E9, commissioned officers in MOS's 15A, 15B, and 15C and grades O1 - O6 less those assigned to Battalion, Brigade, or EAB C2F SRC's, plus warrant officers in MOS 150U and in 155x with SQI's B (Aviation Safety Officer), C (Instructor Pilot), F (Senior Instructor Pilot / Instrument Flight Examiner), H (Standardization Instructor Pilot), & I (Aviation Mission Survivability or AMS Officer) in grades W1 - W5, plus 15C UAS Operator personnel in grades E6 – E7. Each soldier matching these criteria is allotted 110 NSF of office space. Non-pilot aircrew or aircraft flight crew are enlisted soldiers with an "F" SQI as the final digit in their MOS who are in grades E1-E9. These soldiers do not generate pilot space, except they get ALSE lockers.

13. Aviation Unit Operations (CC 14112) Company Headquarters. A company is generally identified based on the presence of an O3 or O4 with the duty title of "Commander" plus an E8 with an M identifier (which may be replaced by a P, S, or V) and the duty title "First Sergeant". There will often be a 92Y or 74D also present. TDA duty titles are not standardized, so there may be a variety of spellings like "CDR", "CO", or "COMMANDER". Flight companies are those with pilots assigned that are not maintenance test pilots. They may or may not have military or civil service aviation maintenance personnel assigned. There is also space for equipment maintenance and inventory, the conduct of small classes, etc. Companies other than flight companies or

aviation maintenance companies (e.g. Headquarters and Headquarters Companies) do not get CC 14112 Aviation Unit Operations Company Headquarters but should use CC 14185 Company Headquarters for their requirements.

14. Secure Storage: The arms vault contained within the systems/armament shop serves three separate requirements: Sensitive Secure Storage (weapons and ammo/munitions) for aircraft mounted systems, Non-Sensitive Secure Storage (e.g., high value, pilferable, serial numbered items other than arms) for aircraft mounted systems, and Telecommunications Secure (COMSEC) Storage of organic aircraft mounted equipment as defined by the AR 190-series. Secure storage for individual and crew served weapons not mounted on aircraft are provided in a separate arms room when Aviation Line Companies are consolidated in the hangar. Non-sensitive secure storage of non-aircraft mounted systems is similarly provided in the Company Operations Facility separate from aircraft systems.

- a. In a typical Army hangar, secure storage for aircraft mounted systems has a primary intended use for the storage of issue and turn-in of aircraft mounted weapons & equipment as primary subcomponents of the assigned aircraft.
- b. Space allowances are typically based on weapon type (e.g., M240G, M230 Chain Gun), their targeting and acquisition systems, thermal weapons sights (TWS), and ancillary equipment as delineated by OTOE, MTOE, and/or TOA Augmentation.
- c. The secondary purpose for secure storage space within the HGR is to provide temporary storage of equipment removed to perform repair. For this reason, and for reasons of future flexibility, fixed wing hangars will also be provided with secure storage.

15. Recapitulation of Net Square Feet. The following shows how the number of Net Square Feet of building is calculated from the sum of the various functional areas. This also provides an estimate for the adjustment from Net to Gross Square Feet. The most current version of the Standard Design is the source for sizing supporting spaces included under Gross but not Net Square Feet, and planning adjustments from Net Square Feet to Gross Square Feet.

1. Total NSF of CC 21114 Aircraft Maintenance Bay= NSF of Aircraft Maintenance modules + Safety Corridor + Structural Corridor.
2. Total NSF of CC 21116 Maintenance Operations Shops = NSF Shop Administration + NSF Maintenance Support + NSF Component Repair Shops + NSF Aviation Life Support Equipment Repair
3. Total NSF of CC 21113 Aircraft Parts Storage = NSF of Aircraft Parts Storage
4. Total NSF of CC 14179 Overhead protection= NSF of Aviation Ground Support Equipment + Associated Items of Equipment (ASIOE)

5. Total NSF of CC 14112 Aviation Unit Ops = NSF of Flight Ops and Pilot Work Areas + NSF of Aviation Unit Ops Company Headquarters.
6. Adjustments from Net - to - Gross Square Feet will be different across these four categories, and in some cases will occur independently of these NSF.
7. The estimated factors for net-to-gross should be NLT 3,030 SF + 6.5 SF/Occupant + 20% aircraft maintenance bays + 42% other areas (shops, aviation unit ops, parts storage)
8. The number of planned building occupants for Fixed Wing Flight Operations units will be equal to the number of personnel assigned to flight missions and aviation maintenance in the TOE or TDA, but not less than 40 personnel per aircraft maintenance module (the average for Assault, Attack, and GSAB rounded to a whole number) in order to account for contractor personnel.

16. Aircraft Wash Apron (CC 11370). This is a rigid pavement area for aircraft washing and cleaning as a function of or in preparation for conducting maintenance and repair. It is located immediately adjacent to the hangar in order to optimize connections to water, power, and compressed air. Environmental considerations in accordance with current law require dealing with detergent, oil, and particulate waste by-products IAW AR 200-1 and AR 200-2. The apron shall be designed to ensure wastewater containment (except spray), collection, and processing through an oil-water separator before entering any storm water system.

17. Hangar Access Apron (FCC 113 40). Hangar access aprons provide a stabilized circulation path between the hangar and the parking area of an aviation facility. Hangar access aprons size is predicated on the hangar design and orientation to the nearest operational taxiway or hover/taxi lane. Width of the apron should be a continuous concrete pad across the entire hangar door width. Depth is dependent upon obstruction clearance requirements but nominally NLT 125 feet deep. When using an individual access design, the hangar access apron normally abuts the mass parking apron and its associated hover/taxi lane. When a hangar design has its doors facing perpendicular to the runway centerline, a circulation pathway NLT 65-foot-wide shall connect the Hangar Access Apron with the nearest taxiway or hover/taxi lane. The minimum length of the circulation pathway is based on obstruction clearance dimensions.

18. Aircraft Parking Apron (FCC 11210 & 11220). The aircraft parking area is addressed in UFC 3-160-01. The aircraft parking area is normally a unit support function and is divided into two major types of parking aprons, fixed and rotary. A modular approach should be utilized for determining the scope of this area which is comprised of parking pads, and hover/taxi lanes. The parking areas should be designed and constructed as a continuous mass parking area of concrete composition and must be separated from the nearest fixed or mobile object as discussed in Chapter 6 of UFC 3-260-01. The size of the aircraft parking apron will be based on the type of aircraft, parking module size and parking arrangement, as discussed in Chapter 6 of UFC 3-260-01.

19. Telecommunications. Telecommunications infrastructure will meet I3A and ANSI/TIA/EIA requirements. Data outlets will be provided per the I3A technical guide based on functional purpose of the various spaces within the facility as modified by operational requirements, with wireless access points provided in the maintenance and repair Shops. Provide a dedicated secure communication room constructed in accordance with the provisions of the Technical Guide for the Integration of Secret Internet Protocol Router Network (SIPRNET) to accommodate future Secure Internet Protocol Routing Network (SIPRNET) access. The telecommunications infrastructure, cabling and outlets will be allocated IAW the following references:

- Project specific USAISEC Information Technology Facility Design Criteria
- USAISEC Technical Guide for Installation Information Infrastructure Architecture (I3A)
- USAISEC Technical Guide for the Integration of Secret Internet Protocol Router Network (SIPRNET)
- National Security Agency (NSA), Department of Defense (DoD), Defense Information Systems Agency (DISA), and Department of the Army (DA) policies, practices, and memorandum for information assurance, security, and protection
- UFC 3-580-01 Telecommunications Building Cabling Systems Planning/Design

Facilities must connect to the Installation telecommunications (voice and data) system through the outside plant (OSP) underground infrastructure per I3A guidance. Telecommunications rooms and telecommunications entrance facilities must be provided for unclassified network and voice equipment and cabling infrastructure throughout the facilities.

Provide a SIPRNET room as indicated on the facility drawings for future use.

20. Connectivity & Distribution. Outside plant connectivity shall be provided in accordance with the Army I3A guidance. The HGR facilities shall be connected to a distribution node with single mode fiber optic cabling and shall be considered as an Area Distribution Node (AON) for engineering purposes. The fiber optic cabling shall be sized to support the common user systems and HGR critical systems. For planning purposes, 12 strands of fiber shall provide connectivity to the installation fiber backbone. Adjustments will be made during actual project design development.

**Reference Criteria:**

Use the latest editions of the following criteria:

- American with Disabilities Act Accessibility Guidelines (ADAAG)
- IBC - International building code
- NFPA 13 Standard for the Installation of Sprinkler Systems
- NFPA 101 Life Safety Code
- NFPA 409 Standard on Aircraft Hangars
- Uniform Federal Accessibility Standards (UFAS) Federal Standard 795
- Energy Policy Act 2005 (EPACT05)
- Executive Order 13423 (E.O. 13424), Strengthening Federal Environmental Energy and Transportation Management
- Army SOD LEED NC Silver Policy
- AR 95-2, Air Traffic Control, Air Space, Airfield Flight Facilities and Navigational Aids
- AR 190-16, Physical Security
- AR 190-51, Security of Unclassified Army Property (Sensitive and Nonsensitive)
- AR 210-20, Real Property Master Planning for Army Installations
- AR 380-5, Department of Army Information Security Program
- AR 405-70, Utilization of Real Property
- AR 415-15, Army Military Construction Program Development and Execution
- AR 420-1, Army Military Construction Program Development and Execution
- AR 420-90, Fire Prevention and Protection
- DA PAM 415-28, Facility Guide to Army Real Property Category Codes
- UFC 1-200-01 Design: General Building Requirements
- UFC 3-260-01, Airfield and Heliport Planning and Design
- UFC 3-260-02, Airfield Pavement Design

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- UFC 3-260-05A, Marking of Army Airfield Heliport Operational and Maintenance Facilities, with Change 1
- UFC 3-535-01, Visual Air Navigation Facilities
- UFC 3-600-01, Design: Fire Protection Engineering for Facilities
- UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings
- UFC 4-211-01, Aircraft Maintenance Hangars
- UFC 4-211-02 Aircraft Corrosion Control and Paint Facilities
- UFC 5-535-01, Airfield Lighting and Navigational Aids
- ER 1110-3-113, Engineering and Design, Department of the Army Facilities Standardization Program
- ETL 1110-3-491, Sustainable Design for Military Facilities
- D/CID 6/4, Personnel Security
- USAISE, Technical Criteria for the Installation Information Infrastructure Architecture (IA3)