Army Standard for Aviation Maintenance Hangar Complex: TOE Rotary 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 Hangar Complex is part of the overall Airfield Complex, not all portions of the airfield are covered under this 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 TOE Rotary Wing Aviation Maintenance Hangar Army Standard applies to the planning, design, and construction of aviation maintenance facilities for all Active Army Table of Organization and Equipment (TOE) manned Rotary Wing aviation units.
- 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 Special Operations Aviation Regiment 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 (R&D), much of which is accomplished within the Special Operations community.
- While criteria in this Army Standard (architectural and planning) may inform facility decisions within Army Test and Evaluation Command (ATEC), plans for facilities supporting ATEC are approved by the ATEC Headquarters and their associated G-4.
- The primary source for determining unit allowances is the Real Property Planning and Analysis System (RPLANS).

Waivers:

- Approval for exceptions and waivers from Army Standards must be requested in accordance with the 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 Group.

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.

The Army Standard

Item	Mandatory Criteria
Site Selection & Planning	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. 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. See Guidance Section below
Physical Security and Safety Zone	1. 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. 2. 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. 3. Fences will include a 20-foot-wide vehicle gate with separate pedestrian gate as stipulated by the AAF / AHP master plan. See Guidance Section below
Hangar Functions and Types	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. 2. Aviation maintenance has two echelons: Field and Sustainment. This Army Standard deals with Field Maintenance. 3. TOE Flight battalions (and, historically, separate TOE flight companies with organic aviation maintenance) perform light Field Maintenance. 4. TOE Aviation Support Battalions (and, historically, separate TOE intermediate maintenance support companies outside the division / aviation brigade structure) provide heavy Field Maintenance. 5. Maintenance facilities for rotary wing aircraft assigned to TDA organizations, for fixed wing aircraft, and for Unmanned Aerial Systems (UAS) are covered under separate standards. 6. No aircraft hangar shall take up more than 850' of flight line frontage. See Guidance Section below

Primary Facility Scope and Capacity	1. Hangar allowances are calculated for TOE flight battalions and separate flight companies, and for TOE Aviation Support Battalions, under this Army Standard. It would also be applicable to self-supporting separate aviation companies or Echelon Above Brigade Aviation Maintenance Companies backing up those in the Combat Aviation Brigade, if either of those ever return to the force. 2. Allowance for hangars is a function of the sum of the allowances for aircraft hangar bays, shop areas, aircraft parts storage, and aviation unit operations. See Guidance Section below
Maintenance Operations -- Aircraft Maintenance Bays (facility CC 21114, also functional area within CC 21110)	1. Elements under this Army Standard are allowed one module size for maintenance and repair of airframes. This module is 110' deep and 70' wide. This size accommodates all enduring fleet rotary wing aircraft up to the xH-47 to include proposed Future Vertical Lift (FVL) aircraft. 2. Units that provide light Field Maintenance (flight battalions and separate flight companies) are allowed aircraft maintenance modules to support 20% of assigned aircraft. When 20% of the aircraft calculates an allowance for a fractional number of modules, round the result up. 3. Units that provide heavy Field Maintenance (Aviation Maintenance Companies within Aviation Support Battalions) are allowed aircraft maintenance modules to support 10% of supported aircraft. When 10% of supported aircraft calculates an allowance for a fractional number of modules, round the result up.

4. The total number of aircraft maintenance modules will be used in other calculations related to component repair shops. Note that performance of heavy Field Maintenance will mean aircraft in those hangar bays will be in shop for a longer period than jobs in the shop that performs light Field Maintenance. This means that the corresponding spaces in component repair shops in heavy Field Maintenance activities will be able to work on a mix of components for aircraft in shop and component repair for components passed back from light Field Maintenance in order to return the repaired components to Tech Supply.

5. In addition to TOE maintenance activities which provide aircraft maintenance modules for a total of 30% of all TOE aircraft, the spoke and hub Logistics Readiness Centers-Aviation (LRC-A's) will have maintenance modules to accommodate repairs on an additional 7.5% of supported aircraft as back-up and augmentation to TOE rotary wing maintenance capabilities. The LRC-A authorization is provided in detail in the TDA Rotary Wing Maintenance Hangar Standard. Additional space in a battalion hangar is not authorized to accommodate Heavy Field Maintenance because such maintenance, if not provided by an ASB, is to be provided by the LRC-A unless the battalion is designed to provide both Light and Heavy Field Maintenance like the SOAR battalions.

6. Provide water, power, compressed air, drainage, and data connectivity to all maintenance modules.

7. The basic module size of 70' x 110' provides 5' to the right and left of the rotor blades (60' in diameter for the Chinook family of aircraft + 5' + 5' = 70') plus 5' to the front and back (a length of a little over 98' for the Chinook family rounded to 100' + 5' + 5' = 110').

8 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.

	9 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. 10 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. See Guidance Section below
Overhead Lift in Aircraft Maintenance Bay Modules (facility CC 21114, functional area within CC 21110)	1. 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. For hook height, see Standard Design. 2. All hangars get at least one 10-ton overhead bridge crane. In cases where hangars have >4 aircraft maintenance modules, 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.
Maintenance Operations -- Shops (CC 21116, functional area within CC 21110)	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, Tech Supply, and Contractor Logistics Support Area. Many functional area calculations are the same between light and heavy Field Maintenance. See Guidance Section below
Maint Ops -- Shops (CC 21116) -- Shop Administration	1. This space accommodates office space for Shop Section headquarters, Airframe Maintenance Platoon, Component Repair Platoon, Armament Repair Sections, Avionics Sections, Quality Control / Quality Assurance Sections, Production Control, Aviation Support Battalion safety office, Unit Level Logistics System - Aviation (Enhanced) or ULLS-A(E) equipment room, etc.

	2. Count number of maintenance administration and shop control personnel based on military occupational specialty and grade. Multiply by 130 NSF / PN. 3. Add 1,000 NSF for Production Control 4. Aviation Missile Command (AMCOM) Logistics Assistance Representatives (or LAR's) provide technical expertise to solve logistical problems. They are also allocated 130 NSF / PN, the same as unit maintenance administration and shop control personnel. A. Aviation LAR's are assigned to only flight battalions, not ASB's, LRC-A's, or other support maintenance activities. The number of personnel is based on the following rules, and the numbers are additive. B. A flight battalion hangar with assigned attack aircraft gets 2 ea. LAR's, one for the aircraft and one for the weapons and sensors. C. A flight battalion hangar with assigned assault / cargo aircraft gets 1 LAR per airframe type. D. The flight battalion in an Aviation Brigade with the most aircraft will be assigned space for an additional Electronics LAR. E. AMCOM Missile LAR's will not be accommodated in hangars. F. Any AMCOM fixed wing LAR's will be accommodated in corresponding fixed wing hangars (e.g., Gray Eagle) and not with rotary wing LAR's. See Guidance Section below

Maint Ops -- Shops (CC 21116) -- Maintenance Support	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. 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. 4. Provide a base tool room space of 300 NSF. Provide an additional 400 NSF for each different type of aircraft assigned or supported. 5. Provide 1,000 NSF for crew chiefs for each aviation line company, i.e., flight company. See Guidance Section below
Maint Ops -- Shops (CC 21116) -- Component Repair Shops	1. The basic format for sizing most shop areas is 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. 2. Power Plant Shop (used by 15B personnel) needs a base quantity of 450 NSF plus 75 NSF/maintenance module, no additional minimum. 3. Power Train Shop (used by 15D personnel) needs a base quantity of 450 NSF and 75 NSF/maintenance module, no additional minimum. 4. Structural Repair Shop (used by 15G personnel, or civilian equivalent) needs a base quantity of 1,150 NSF and 75 NSF/ 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 a 150 NSF area for robing and disrobing for technicians wearing protective equipment.

5. Blade Shop (also used by 15G personnel, or civilian equivalent) in a Light Field Maintenance activity such as a flight battalion needs 1,000NSF. This is sufficient for spot painting 12" x 12" areas on objects up to the size of a single rotor blade. It is located where there can be co-use of the robing and disrobing area of the Structural Shop. In a Heavy Field Maintenance activity such as an ASB the Blade Shop needs 2,500 NSF. This is sufficient space to paint an entire set of 3 rotor blades for an xH-47, or 4 rotor blades for an xH-60 or AH-64.

6. Pneudraulics Repair Shop in light Field Maintenance (used by 15H personnel) needs a base quantity of 200 NSF and 50 NSF/maintenance module, with a minimum size of 530 NSF. Note that, while 15H personnel are often involved in maintaining Aviation Ground Support Equipment (AGSE in the Army, GSE in DoD terms), that function is accomplished in another space. In heavy Field Maintenance, a unit needs a base quantity of 200 NSF plus 75 NSF/maintenance module.

7. Electrical / Avionics Shop (used by 15G and 15N personnel) needs 125 NSF/maintenance module for light field maintenance and 300 NSF/maintenance module for heavy Field Maintenance with a minimum size of 450 NSF. If 15F and 15N personnel are in a paragraph with a 15X or 15Y Non-Commissioned Officer in Charge (NCOIC), this shop is not needed, and the function is consolidated with the Systems / Armament Shop.

8. A Night Vision Device Repair Shop area of 200 NSF will be allowed based on the assignment of 94R personnel, typically in heavy Field Maintenance.

9. Systems / Armament Shop (used by 15X and 15Y personnel) needs 125 NSF for each attack aircraft (AH-64, AH-6, AH-60, etc.) maintenance module in light Field Maintenance with a minimum of 530 NSF if any attack aircraft are present. For heavy Field Maintenance, the need is 300 NSF / attack aircraft maintenance module, also with a minimum of 530 NSF. If 15X or 15Y personnel are in a paragraph with a 15F or 15N NCOIC, this shop is not needed, and the function is consolidated with the Electrical / Avionics Shop.

10. An Arms Vault for aircraft mounted weapons will be allowed for a light Field Maintenance activity (300 NSF) and for a heavy Field Maintenance activity (900 NSF.) The larger area is to accommodate storage of the 30mm chain gun from the Apache. This arms room should meet any arms room requirements in accordance with the current AR 190-11 Physical Security of Arms, Ammunition and Explosives or its successor publications. This will also provide sufficient space for secure storage of any communications security (COMSEC) equipment needing a higher level of security than other communications equipment.

11. A Non-Destructive Inspection (NDI) Room of 100 NSF will be provided for each light Field Maintenance Activity, and one of 150 NSF will be provided for each Heavy Field Maintenance Activity.

12. A Machine Shop / Welding Shop base area of 400 NSF will be allowed for each maintenance activity with organic 91E personnel. An additional 40 NSF/maintenance module will be added.

13. A Ground Communications Equipment Shop (based on the presence of and used by 94E personnel) will be allowed 500 NSF. These are typically found in a heavy Field Maintenance Activity.

	14. Provide accommodations for use of SPAM's (Shelter, Portable, Airmobile) and IFTE/EETF (Improved Flight Test Equipment/ Enhanced Electronic Test Facility) vans adjacent to the Shop area with accommodations for daily operations and use (e.g., loading dock, personnel accessibility and circulation, provisions of commercial power) See Guidance Section below
Maint Ops -- Shops (CC 21116) -- Aviation Life Support Equipment (ALSE) Repair	1. Units with an enlisted soldier in grades E1 - E7 with "ALSE" in the duty title need an ALSE Shop. 2. Provide a base area of 1,500 NSF for ALSE Shop. 3. Provide an additional 100 NSF for units with a medevac mission for maintenance and testing of hoists. 4. Provide an additional 120 NSF for units with over-water mission, documented on a case-by-case basis. 5. Provide an additional 120 NSF oxygen generation room for units with high-altitude missions, documented on a case-by-case basis, at the ASB level. 6. Provide 5 NSF of ALSE locker space for each assigned pilot, by MOS. 7. 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. See Guidance Section below
Maint Ops - Acft Parts Storage (CC 21113), Overhead Protection for Components & Parts (CC 14970), & Tech Supply & Contractor Logistics Support (CLS)	1. Each light Field Maintenance activity such as Delta Company within a flight battalion will be allowed a base area of 2,600 NSF of Aircraft Parts Supply within the light Field Maintenance hangar. 2. Each heavy Field Maintenance activity such as Bravo Company within an Aviation Support Battalion will be allowed a base area of 8,000 NSF of Aircraft Parts Supply within the heavy Field Maintenance hangar.

	3. In addition, each heavy Field Maintenance activity will be allowed an additional 4,000 GSF of Aircraft Parts Supply storage in a covered but not enclosed area. 4. Contractor Logistics Support (CLS), including office space and storage, will be accommodated within the Logistics Readiness Center - Aviation (LRC-A) with parts storage within allocated storage at flight battalion, ASB, and LRC-A. 5. Special requirements for humidity control IAW AR 710-2 will be addressed in the standard design. See Guidance Section below
Maintenance Ops-Overhead Protection (CC 14179) Aviation Ground Support Equipment (AGSE) and Associated Items of Equipment (ASIOE)	1. Each flight battalion will be allowed a base area of 2,000 GSF of covered storage for storage of aircraft components: wings, tanks, etc. 2. Every company performing aviation maintenance (e.g., Delta Company of flight battalions and Bravo Company of the ASB) will be allowed 3,000 GSF of covered storage for AGSE.
Aviation Unit Ops (CC 14112) MEDEVAC Ready Area and Storage	1. Aviation units with a medical evacuation (MEDEVAC) mission gets 1,270 NSF of space for the base area of a MEDEVAC Ready Area and Storage. In addition, each MEDEVAC platoon gets an additional 400 NSF of workroom and storage. See Guidance Section below
Aviation Unit Ops (CC 14112) Flight Ops & Pilot Work Areas	1. The number of pilots is the total of 15A, 15B, & 15C commissioned officers in grades O1 – O6 and 152x, 153x, & 154x warrant officers in grades W1 – W5 2. Pilot workroom will be provided at 21.0 NSF/pilot assigned. 3. Flight planning rooms will be provided at 10.5 NSF/pilot assigned.

	4. A secure planning room will be provided at 6.0 NSF/pilot 5. Conference rooms will be provided at 6.0 NSF/pilot 6. 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. 7. Permanent workspace is also included for designated flight operations personnel with a high administrative workload. Each soldier matching these criteria is allotted 110 NSF of office space. See Guidance Section below
Aviation Unit Ops (CC 14112) Company Headquarters	1. Provide each company 220 NSF for 2 ea. 110 NSF offices for Commander and First Sergeant. 2. Provide each flight company 400 NSF for an Arms Vault and each aviation maintenance Company 430 NSF for Arms Vault 3. Provide each flight company 400 NSF and each aviation maintenance company 430 NSF of Unit Storage (Supply Room) 4. Provide each flight company 180 NSF and each aviation maintenance company 200 NSF of Secure Storage. 5. Provide each flight company 100 NSF and each aviation maintenance company 110 NSF of Chemical Biological Radiological Nuclear (CBRN) Storage 6. Provide each flight company 100 NSF and each aviation maintenance company 110 NSF of communications storage 7. Provide each company (flight and maintenance) 150 NSF training office. See Guidance Section below

Fire Suppression (CC's 21110 / 21114 / 21116 / 21113 / 14112)	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. 2. Aircraft maintenance modules will not use water systems as the primary suppression system without waiver approval. 3. Maximize protecting of personnel, minimizing risk to personnel within hangars during dispensing. 4. Maximize protection of airframes, trying to minimize loss of airframes resulting from dispensing and cleanup. 5. Design system to provide fastest return of airframes to a mission ready status after discharge. 6. Minimize use of water in terms of total quantity and in terms of the percent of content of the agents used. 7. Minimize infrastructure cost.
Power (CC's 21110 / 21114 / 21116 / 21113 / 14112)	1. Primary service to all hangars shall be 480v AC, three-phase, with Y-ground. 2. Provide power for the type and quantity of aircraft supported or assigned.
Gross Square Feet of Building	1. Net square feet of CC 21114 Hangar Bay (including maintenance modules, safety clearances, and structural space) + NSF CC 21116 Shops + NSF 21113 Aircraft Parts Storage + NSF 14112 Aviation Unit Operations = Total NSF of Facility.

	2. This result is the target NSF to support the unit mission. This is also the target NSF 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. 3. Not only should the total space be within +/- 20%, but the quantity of hangar bay must either be >= 80% of the authorized hangar bay in square feet, or the hangar bay must be able to accommodate at least 80% of the aircraft (by type) actually requiring hangar space. For example, if the unit has 25 Blackhawks it needs light field maintenance modules for 5 ea. Blackhawks (25 Blackhawks * 20% = 5 maintenance modules), and they have four modules smaller than those specified for CH-47's in the standard but that can accommodate Blackhawks, then those 4 ea. Blackhawk modules meet the minimum mission standard even though they occupy <80% of the required hangar bay. See Guidance Section below
Aircraft Wash Apron (CC 11370)	1. Provide each aircraft hangar with an external wash apron or aprons. 2. This apron must be sized for the largest rotary wing aircraft and need only provide access for non-power on operations (i.e., it will be moved to the apron by a tug rather than under the aircraft's power.) 3. The apron will be sized per UFC 3-260-01 to accommodate two UH-60 or one CH-47.

	4. The wash apron will be provided with not only water but also power and compressed air service. 5. 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. See Guidance Section below
Hangar Access Apron (CC 11340)	1. Provide a continuous concrete surface from parking apron or taxiway to the hangar door sized to be commensurate in width with the door and NLT 75' in depth. There may be a valid requirement to make the apron deeper in the event there are power-on activities or taxiways / taxilanes with obstruction clearance factors requiring more space. 2. 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. 3. While no allowance will be calculated for pavements on the side of hangars, if these exist on a given airfield then they constitute a valid requirement. These typically provide access to the flight line for ground support equipment, material handling equipment, fuel trucks, maintenance shop trailers and vans, and other equipment the size of a vehicle.
Aircraft Maintenance Apron (CC 11330)	1. Aircraft maintenance aprons are provided for aviation maintenance organizations that typically have either no assigned aircraft (i.e., current Aviation Sustainment Battalion Aviation Maintenance Bravo Companies) or very small numbers of assigned aircraft relative to their size (i.e. former separate non-divisional Aviation Intermediate Maintenance Companies with two aircraft.) 2. They are authorized NMT 14,000 SY.

	3. This provides space for about 3-4 aircraft which can be used for temporary storage of deadlined aircraft awaiting room within the shop, or repaired aircraft awaiting pick-up by the owning unit, or performance of outside tasks like engine run-up.
Rotary Wing Aircraft Parking Apron (CC 11320)	1. Aircraft parking is planned for flight battalions and separate flight companies that are assigned aircraft. This space includes parking pads for the aircraft, as well as taxilanes used to circulate within the parking area and to move from the parking area to a hangar access apron, aircraft wash apron, maintenance apron, or taxiway. A taxiway is distinct from a taxilane as taxilanes provide circulation within the parking area while taxiways provide circulation from one end of the runway to the other end or between a runway or taxiway and parking aprons, maintenance aprons, etc. 2. Parking apron is planned for 75% of assigned aircraft plus maintenance space for 15% of assigned aircraft for a total of 90% of assigned aircraft. 3. Parking spaces for xH-47 sized aircraft are 150' long and 100' wide. 4. Parking spaces for rotary wing aircraft other than the xH-47 family are 100' long and 80' wide. 5. Interior taxilanes are 120' wide for 2-way traffic, perimeter taxilanes are 60' wide plus a 25'
Telecommunications	1. Telecommunications infrastructure will meet the USAISEC Technical Guide for Installation Information Infrastructure Architecture (I3A) and ANSI/TIA/EIA 568 and 569 requirements. 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.

	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. 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. 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.
Secret Internet Protocol Router Network (SIPRNET) Room	Provide a SIPRNET room in accordance with the USAISEC Technical Guide for the Integration of SIPRNET) and AR 380-5.
Energy Policy Act of 2005 / Executive Order 134323	Facilities shall be designed in compliance with requirements for federal facilities IAW the Energy Policy Act of 2005 and Executive Order 134323.
Sustainable Design Development	Facilities shall be designed to meet current sustainable development and design policy requirements as established by the Department of the Army.
Handicapped Accessibility	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.

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 Aviation Line Company refers to company sized aviation units within an aviation battalion whose primary mission is to operate aircraft to meet assigned missions. This term does not apply to command & control or headquarters companies, air traffic control companies, signal or intelligence analyses companies or maintenance companies regardless of whether aircraft are assigned to the company.

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 provided facility durability requirements are satisfied.

Maintenance Echelons:

- Army aviation maintenance has two echelons: Field and Sustainment. See ATP 3-04.7 Army Aviation Maintenance, dated Sep 2017, Section I-Two Level Maintenance, pg. 2-1.

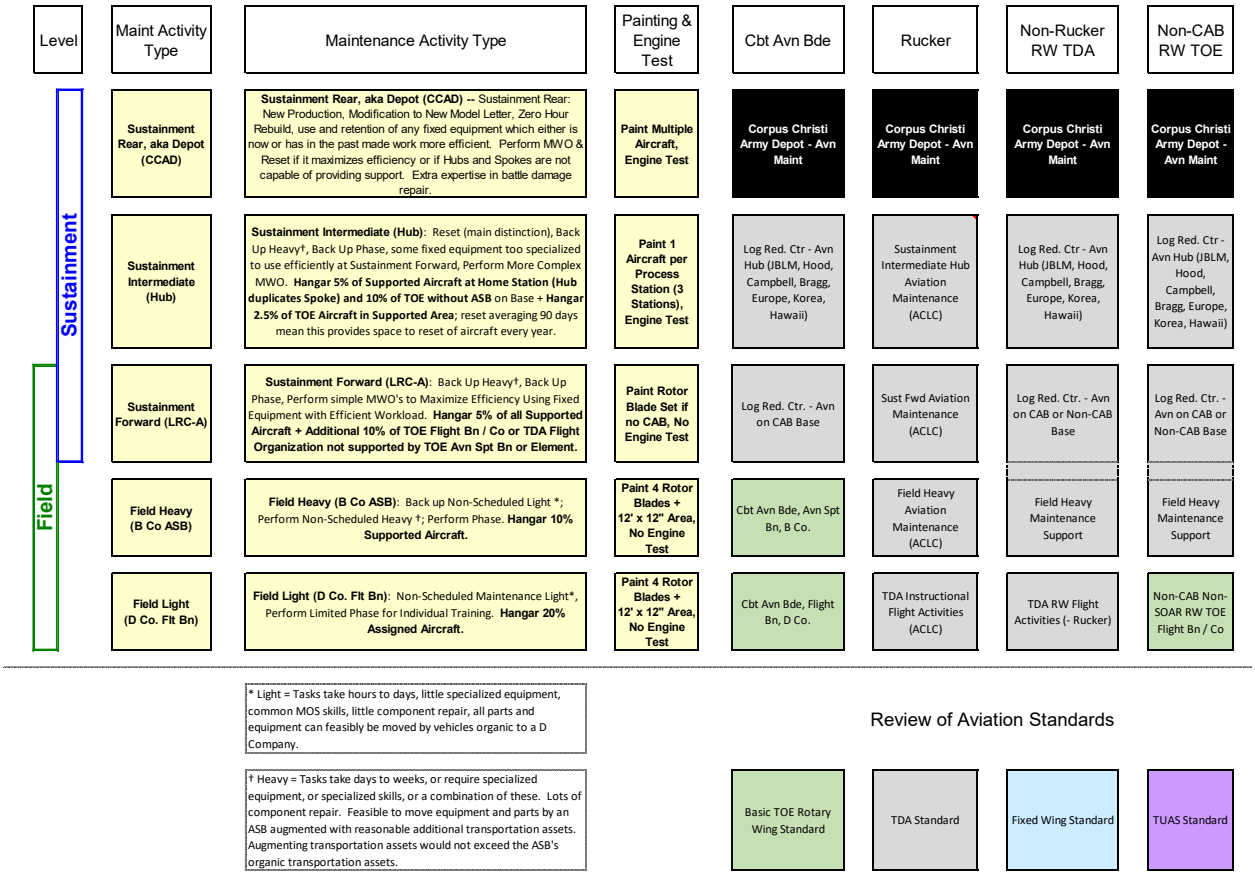
- These two echelons define a spectrum of tasks to accomplish a wide variety of work, and sometimes an organization within one or the other echelon can conduct maintenance tasks at one end or the other of that spectrum.
- Field Maintenance includes Light Field Maintenance and Heavy Field Maintenance.
- 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 the flight battalion.
- 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. In the event a TOE flight unit does not have a supporting TOE unit performing heavy field maintenance, this level of support will be provided by a supporting TDA maintenance activity addressed in the Rotary Wing TDA Standard.
- Sustainment Maintenance includes Forward Sustainment Maintenance, Intermediate Sustainment Maintenance, and Rear Sustainment Maintenance also known as Depot Maintenance.

Concept for Supporting Maintenance with Facilities:

- TOE Rotary Wing battalions and squadrons (assigned to Combat Aviation Brigades and other standard organizations that include Aviation Support Battalions and their associated Aircraft Maintenance Companies) will be provided with a hangar for performing Light Field Maintenance. That facility is described and prescribed in this Standard.
- TOE Aviation Maintenance Companies within Aviation Support Battalions supporting TOE Rotary Wing battalions and squadrons will be provided with a hangar for performing Heavy Field Maintenance, in support of those associated TOE Rotary Wing battalions. That facility is described and prescribed in this Standard.

- Sustainment maintenance in support of TOE Rotary Wing battalions and squadrons will be provided under the TDA Standard.
- TOE Rotary Wing battalions, squadrons, and separate companies not assigned to Combat Aviation Brigades will be provided facilities for Light Field Maintenance under this Standard.
- TOE Rotary Wing battalions, squadrons, or separate companies not part of a standard higher-level organization like a Combat Aviation Brigade and therefore not supported by a TOE Heavy Field Maintenance activity will have this support provided by TDA organizations like LRC-A's; these facilities are described and prescribed in the TDA Standard.
- In the past, the Army had Aviation Intermediate Maintenance Companies that were not part of a standard Aviation Brigade but would provide the equivalent of Heavy Field Maintenance for an ad hoc group of aviation battalions and companies. If such an organization is re-incorporated into the Army, their facilities will be as described and prescribed in this Standard.

Aviation Maintenance Activity and Standards: Rotary Wing



Level	Maint Activity Type	Maintenance Activity Type	Painting & Engine Test	Cbt Avn Bde	Rucker	Non-Rucker RW TDA	Non-CAB RW TOE
Sustainment	Sustainment Rear, aka Depot (CCAD)	**Sustainment Rear, aka Depot (CCAD) --** 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**	**Corpus Christi Army Depot - Avn Maint**	**Corpus Christi Army Depot - Avn Maint**	**Corpus Christi Army Depot - Avn Maint**	**Corpus Christi Army Depot - Avn Maint**
Sustainment	Sustainment Intermediate (Hub)	**Sustainment Intermediate (Hub)**: Reset (main distinction), Back Up Heavy†, Back Up Phase, some fixed equipment too specialized to use efficiently at Sustainment Forward, Perform More Complex MWO. **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**; reset averaging 90 days mean this provides space to reset of aircraft every year.	**Paint 1 Aircraft per Process Station (3 Stations), Engine Test**	Log Red. Ctr - Avn Hub (JBLM, Hood, Campbell, Bragg, Europe, Korea, Hawaii)	Sustainment Intermediate Hub Aviation Maintenance (ACLC)	Log Red. Ctr - Avn Hub (JBLM, Hood, Campbell, Bragg, Europe, Korea, Hawaii)	Log Red. Ctr - Avn Hub (JBLM, Hood, Campbell, Bragg, Europe, Korea, Hawaii)
Sustainment / Field	Sustainment Forward (LRC-A)	**Sustainment Forward (LRC-A)**: Back Up Heavy†, Back Up Phase, Perform simple MWO's to Maximize Efficiency Using Fixed Equipment with Efficient Workload. **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.**	**Paint Rotor Blade Set if no CAB, No Engine Test**	Log Red. Ctr. - Avn on CAB Base	Sust Fwd Aviation Maintenance (ACLC)	Log Red. Ctr. - Avn on CAB or Non-CAB Base	Log Red. Ctr. - Avn on CAB or Non-CAB Base
Field	Field Heavy (B Co ASB)	**Field Heavy (B Co ASB)**: Back up Non-Scheduled Light *; Perform Non-Scheduled Heavy †; Perform Phase. **Hangar 10% Supported Aircraft.**	**Paint 4 Rotor Blades + 12' x 12" Area, No Engine Test**	Cbt Avn Bde, Avn Spt Bn, B Co.	Field Heavy Aviation Maintenance (ACLC)	Field Heavy Maintenance Support	Field Heavy Maintenance Support
Field	Field Light (D Co. Flt Bn)	**Field Light (D Co. Flt Bn)**: Non-Scheduled Maintenance Light*, Perform Limited Phase for Individual Training. **Hangar 20% Assigned Aircraft.**	**Paint 4 Rotor Blades + 12' x 12" Area, No Engine Test**	Cbt Avn Bde, Flight Bn, D Co.	TDA Instructional Flight Activities (ACLC)	TDA RW Flight Activities (- Rucker)	Non-CAB Non-SOAR RW TOE Flight Bn / Co

* 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.

Review of Aviation Standards

Basic TOE Rotary Wing Standard	TDA Standard	Fixed Wing Standard	TUAS Standard

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 Heliport (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 a planner must move functions away from the hangar bay because of site limitations, the feasibility of moving the aviation company headquarters should be analyzed first, placing it separate from the hangar bays. Next, analyze 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 bay 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 Field Maintenance. Different criteria are applied to light Field Maintenance and heavy Field Maintenance.

4. Primary Facility Scope and Capacity (FCC 21110). Hangar allowances are calculated for TOE flight battalions and separate flight companies, and for TOE Aviation Support Battalions, under this Army Standard. It would also be applicable to Echelon Above Brigade Aviation Maintenance Companies backing up those in the Combat Aviation Brigade if those ever return to the force. Allowance for hangars is a function of the sum of the allowances for aircraft hangar modules, shop areas, aircraft parts storage, and aviation unit operations. Ideally, it is best for aviation battalions, separate aviation companies with organic or contracted maintenance support, and Aviation Maintenance Companies (Bravo Companies) in Aviation Support Battalions to get one (1) hangar battalion each. Aviation elements without organic maintenance capability,

who are supported by other Army elements rather than by contract support, should be consolidated with their supporting organization while ensuring the physical separation of the aviation operations, flight company headquarters, and flight operations areas of the attached unit. Currently, there are no TOE rotary wing aviation units in the force whose field maintenance is provided exclusively by contractors, if there were such a unit, it should get a hangar.

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, plus 5' on the front, back, and each side of the aircraft. The one size maintenance module provides the design flexibility needed due to future force structure changes and the possibility of future aircraft and legacy aircraft mix within the units. An additional 5' safety zone wraps each group of contiguous modules. Finally, a 5' structural zone follows the demising walls of an entire maintenance bay or internal structural line dividing a bay into multiple zones, each of which is a group of modules plus safety zones. The Net Square Feet of Hangar Bay are the sum of the maintenance modules plus safety zones plus structural zone.

6. Maintenance Operations -- Shops (CC 21116, functional area within CC 21110). The shop facilities include Shop Administration, Maintenance Support space, Allied Component Repair Shops, Special Shops, Aviation Life Support Equipment (ALSE) Shops, Tech Supply, and Contractor Logistics Support Area. Many functional area calculations are the same between light and heavy Field Maintenance. Some functional area calculations differ between light and heavy field maintenance. Some differ. Units that perform light Field Maintenance generate shop allowances in some cases based on a standard for light Field Maintenance, while (in those specific cases) units that perform heavy Field Maintenance generate shop allowances based on separate criteria for heavy Field Maintenance. Units are distinguished based on the presence of AVUM tool kits indicating light Field Maintenance and AVIM tool kits indicating heavy Field Maintenance. A handful of units may possess both types of tool kits, indicating they perform both types of maintenance. In these cases, those units receive both light and heavy shop allowances. Separate areas within the shop are calculated based on the 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 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. The count of Aviation Maintenance Admin personnel is the sum of the personnel in the following specialties:

15D Aviation Maintenance Officers O1 - O4
151A Aviation Maintenance Warrant (Non-Rated) W1 - W5
Enlisted Personnel in grades E6 and Above and occupational specialties:
15B Aircraft Powerplant Repairer
15D Aircraft Powertrain Repairer
15F Aircraft Electrician
15G Aircraft Structural Repairer
15H Aircraft Pneudraulics Repairer
15K Aircraft Components Repair Supervisor
15N Avionics Mechanics
15R AH-64 Attack Helicopter Repairer
15T UH-60 Helicopter Repairer
15U CH-47 Helicopter Repairer
15V Observation/Scout Helicopter (Reserve Component)
15L AH-64A Armament/Electrical/Avionics Systems Repairer
15Y AH-64D Armament/Electrical/Avionics Systems Repairer
15Z Aircraft Maintenance Senior Sergeant in grades E8-E9
Aviation Flight Warrant Officers (series 152-, 153-, 154-) with SQI of G (Aviation Maintenance Officer) or L (Maintenance Test Flight Evaluator)

In addition, E5 enlisted soldiers in the 15-series MOS's noted above who have a duty title including "TECH INSP" or " TI " count towards Maintenance Shop Administration. Those E5's in the designated MOS's with other duty titles are assumed to work directly on aviation equipment in the shops or at hot desks, rather than needing assigned desks.

The 1,000 NSF for Production Control accommodates office space for Shop Section headquarters, Airframe Maintenance Platoon, Component Repair Platoon, Armament Repair Sections, Avionics Sections, Quality Control / Quality Assurance Sections, Production Control, Aviation Support Battalion safety office, Unit Level Logistics System - Aviation (Enhanced) or ULLS-A(E) 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. 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 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 -- UH-60's, MH-60's, AH-60's, and HH-60's are all considered a single type of airframe; AH-64D's and AH-64E's are considered the same type of aircraft for these purposes. If a hangar performs maintenance on more than one type of airframe, e.g. xH-60 and xH-47 airframes such as within a General Support Aviation Battalion, 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. In the event a unit is assigned A92 Tool Sets, provide accommodations for daily operations and use (e.g. loading dock, personnel accessibility and circulation with door and dock, commercial power) in lieu of the allowed space. Provide 1,000 NSF for each flight company for crew chiefs. A flight company is defined as a company with assigned aircraft.

9. Maintenance Operations Shops (CC 21116)-Component Repair Shops. Shop space allowances are mostly allotted by the same set of criteria, whether those shops are Field Light activities or Field Heavy activities. The type of activity can be determined by assigned tool sets. Field Light maintenance activities are assigned AVUM tool sets, such as W60206 Tool Set Aviation Unit Maintenance: Set No 2 Airmobile. Field Heavy maintenance activities are assigned AVIM tool sets, such as S37240 Shop Set Tool Crib: AVIM, S29568 Shop Set Engine: AVIM, S32719 Shop Set Machine / Welding: AVIM, S35596 Shop Set Sheet Metal / Component: AVIM, S34774 Shop Set Powertrain: AVIM, S35435 Shop Set Non-Destructive Inspection (NDI): AVIM, S33441 Shop Set Pneudraulic: AVIM, and / or S31897 Shop Set Armament and Electrical: AVIM. In the event a single unit conducts both Field Light and Field Heavy Maintenance (e.g., Special Operations Aviation Regiment battalions) the unit will generate duplicate shops to support both levels of the mission. Light Field Maintenance shops will include a 1,000 NSF space to paint a 12" x 12" section of a rotor blade. If a flight unit needs to have an entire set of blades painted, this will happen at the level of Heavy Field Maintenance. A Heavy Field Maintenance shop will include a 2,500 NSF area for repairing and painting blades.

10. Aviation Life Support Equipment (ALSE) Shops. 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.

11. 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.

12. Maintenance Operations- Overhead Protection (CC 14179)-Aviation Ground Support Equipment. There is no specific MOS for personnel who maintain or operate AGSE. Often, 15H personnel maintain this equipment, but this relationship is not fixed by training or duties of the specialty. Equipment that can be serviced in the Pneudraulic Shop will be serviced there; other equipment will be serviced in the vehicle maintenance shop.

13. Aviation Unit Operations (CC 14112) MEDEVAC Ready Area and Storage. Aviation units with a medical evacuation (MEDEVAC) mission gets 1,270 NSF of space for the base area of a MEDEVAC Ready Area and Storage. This includes 650 NSF of sleeping quarters supporting the duty MEDEVAC platoon, 300 NSF for a break room and kitchenette, a 250 NSF medical equipment and supply area, and 70 NSF for a unisex toilet. In addition, each MEDEVAC platoon gets an additional 400 NSF of workroom and storage. A unit has a MEDEVAC mission when it has assigned aircraft and assigned personnel in the MOS and grade of 67J O1-O3 and 68W E1-E8 personnel with a Special Qualifications Identifier (SQI) of "F." The number of platoons is equal to the number of 68W4F and 15T4F soldiers with "PLATOON" in their duty title.

14. 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. 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's 152x, 153x, 154x, & 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. 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.

15. 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. Flight companies are those with aircraft and pilots assigned. Aviation maintenance companies are those with aviation tool sets 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 Company (HHC), and Ground Forward Support Company (FSC)) do not

get CC 14112 Aviation Unit Operations Company Headquarters but should use CC 14185 Company Headquarters for their requirements.

16. 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. Secure storage for aircraft mounted systems in an HGR 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 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.

17. 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.

a. Total NSF of CC 21114 Aircraft Maintenance Bay= NSF of Aircraft Maintenance modules + Safety Corridor + Structural Corridor.
b. Total NSF of CC 21116 Maintenance Operations Shops = NSF Shop Administration + NSF Maintenance Support + NSF Component Repair Shops + NSF Aviation Life Support Equipment Repair
c. Total NSF of CC 21113 Aircraft Parts Storage = NSF of Aircraft Parts Storage
d. Total NSF of CC 14179 Overhead protection= NSF of Aviation Ground Support Equipment + Associated Items of Equipment (ASIOE)
e. Total NSF of CC 14112 Aviation Unit Ops = NSF of MEDEVAC Ready Area and Storage + NSF of Flight Ops and Pilot Work Areas + NSF of Aviation Unit Ops Company Headquarters.
f. Adjustments from Net - to - Gross Square Feet will be different across these four categories, and in some cases will occur independently of these NSF.
g. The definitive source of the adjustment from net-to-gross is the Standard Design. In order to establish unit allowances in RPLANS, the 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)

h. The number of building occupants will be equal to the number of personnel assigned to flight companies and aviation maintenance companies.

Note that there is an acceptable band where a hangar >80% and <120% of what is calculated as needed by a unit will be judged capable of supporting the unit mission. One caveat to this is that the hangar bay area must either be >80% of the area required for hangar bay, or the unit must be able to hangar over 80% of the number of aircraft calculated as needing maintenance modules. The reason for this is that excess hangar bay can be used to fulfill a need for parts storage, shops, or administrative space, albeit at a loss of efficiency and quality. A helicopter cannot be moved into Aviation Unit Operations or Shop space for repair. Having 100% of the total square feet of hangar needed, but only being able to accommodate 60% of the aircraft needing maintenance modules means the hangar fails to meet the mission. One exception to this rule is that if an existing hangar can accommodate at least 80% of the aircraft requiring maintenance modules, then this hangar can meet mission. The maintenance modules available may not accommodate the xH-47, but if the unit does not need to accommodate the xH-47 then the hangar can work.

18. 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. It will be sized IAW UFC 3-260-01. 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.

19. 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 75 feet deep. Situations where the hangar is adjacent to a taxiway for large fixed-wing aircraft (C-5, C-17, etc.) may call for a deeper hangar access apron, but these are rare. 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 NL T 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. For the normal case of a 75' deep apron, see the table below.

70' RW Maint Modules (ea.)	5' Safety Corridors (ea.)	5' Structural Corridors (ea.)	Hangar Width (ft.)	Hangar Access Apron Depth (ft.)	Hangar Access Apron Area SF	**Hangar Access Apron Area SY**
1	2	2	90	75	6,750	**750**
2	2	2	160	75	12,000	**1,333**
3	2	2	230	75	17,250	**1,917**
4	2	2	300	75	22,500	**2,500**
5	4	4	390	75	29,250	**3,250**
6	4	4	460	75	34,500	**3,833**
7	4	4	530	75	39,750	**4,417**
8	4	4	600	75	45,000	**5,000**
9	6	6	690	75	51,750	**5,750**
10	6	6	760	75	57,000	**6,333**
11	6	6	830	75	62,250	**6,917**

20. Rotary Wing Aircraft Parking Apron (FCC 11320). The aircraft parking area is normally a unit support function. A modular approach should be used 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, also discussed in Chapter 6 of this UFC.

The most efficient way to lay out parking, at the micro-level, is as a single, long row of aircraft. This approach introduces a host of problems at the macro-level, which drives the decision to design and construct continuous mass parking aprons instead of either long single rows or keyhole parking. An impact of this decision is the fact that the required number of parking modules only controls about 50% - 70% of the size of aircraft parking, the other 30% - 50% is controlled by the specific geometry of the parking layout. This specific geometry includes decisions such as building more than the needed number of parking modules to provide the mass apron configuration. For example, if 23 spaces are needed, but the parking area must tie into other parking areas as part of the mass apron, then the only way to tie the modules together may be to build 24 spaces (6x4, 4x6, 8x3, 3x8) or even 25 spaces (5x5). If the mass apron has already established a row length for 4 Blackhawks or Apaches (80’ x 4 ea. = 320’) than this can only support 3 Chinooks (100’ x 3 ea. = 300’) with 20’ of waste space. A row of 4 Chinooks (100’ x 4 ea = 400’) does match well with rows of 5 Apaches or Blackhawks (80’ x 5 ea. = 400’)

In order to approximate the size of the parking apron needed, the computerized allowance must start with an estimate based on the number of Chinook rotary-wing aircraft assigned and the number of non-Chinook rotary-wing aircraft assigned. A reasonable estimate for Chinook parking, if Chinooks are present, is 10,970 SY + (3,890 SY * # of Assigned Chinooks). This accounts for the 90% parking factor, but also estimates the impact of providing additional parking spots to make up a mass apron configuration vs. a single line of aircraft. In addition, a reasonable estimate for

Blackhawk, Apache, and other aircraft is 9,375 SY + (2,665 SY * # of Assigned non-Chinook RW Aircraft). Requirements edits +/- 25%, based on actual airfield geometries, should be accepted at the level of landholding commands without review by higher headquarters or action by the facility design team.

Mooring and Grounding Points for Mass Parking Areas and Hardstands. Provisions will be made to moor aircraft at AAF and AHP through the use of tie-down anchors installed for this purpose in parking areas and hardstands. Moored parking spaces will be provided for 75 percent of each authorized aircraft by type. The combined total of apron parking space and hangar parking space (15% of each assigned aircraft type for Maintenance Operational Checks) provides parking for all mission ready aircraft based on the projected Operational Ready status of each airframe type. Additional parking spaces with mooring points may be added as necessary to ensure wind protection for all aircraft. The location of these additional mooring points can be on pavements other than parking aprons. Each rotary-wing aircraft parking space will have six mooring points spaced in a rectangular configuration. Additional discussion on mooring points is found in Attachment 12 in UFC 3-260-01.

21. 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:

a. Project specific USAISEC Information Technology Facility Design Criteria
b. USAISEC Technical Guide for Installation Information Infrastructure Architecture (I3A)
c. USAISEC Technical Guide for the Integration of Secret Internet Protocol Router Network (SIPRNET)
d. 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
e. 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.

21. 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)
- Energy Act 2020 (EA 2020)
- Army Sustainable Design and Development Policy Update
- 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
- 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 420-1, Army Facilities Management
- 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
- 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)

Attachment: Aviation Maintenance Hangar Bubble Diagrams

Diagram 1: Hangar Site

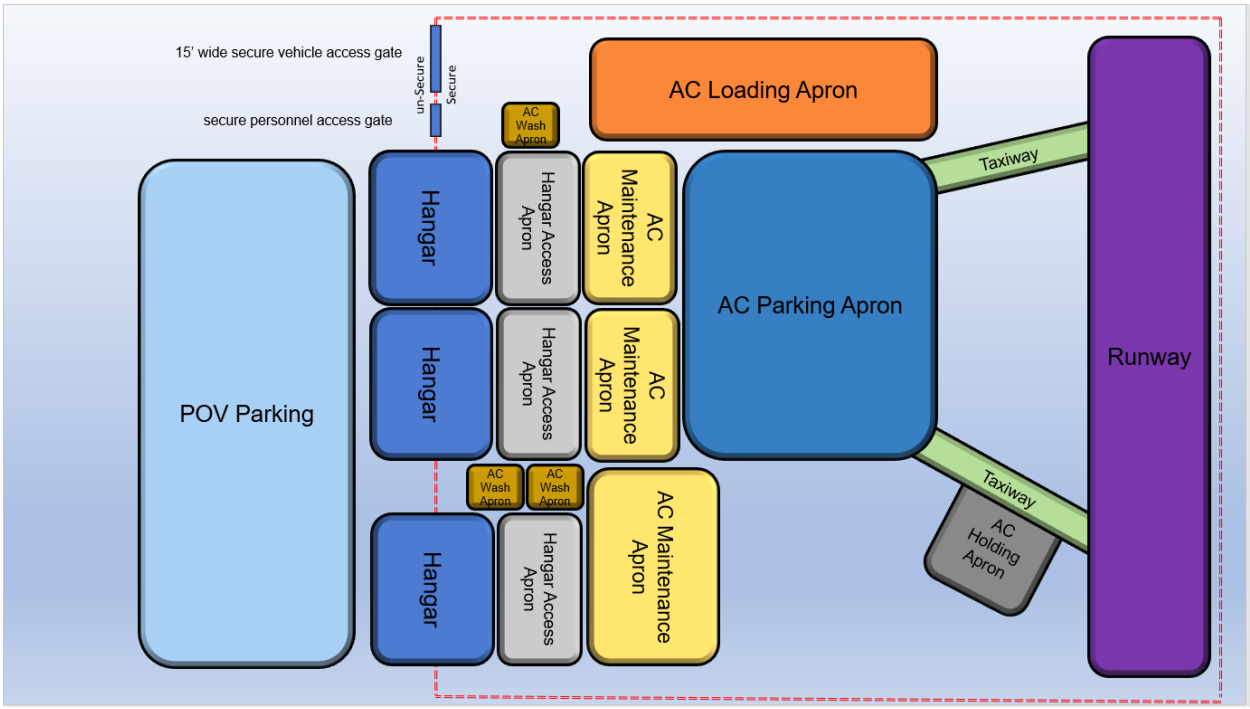


Diagram 2: Maintenance Shops (1st Floor)

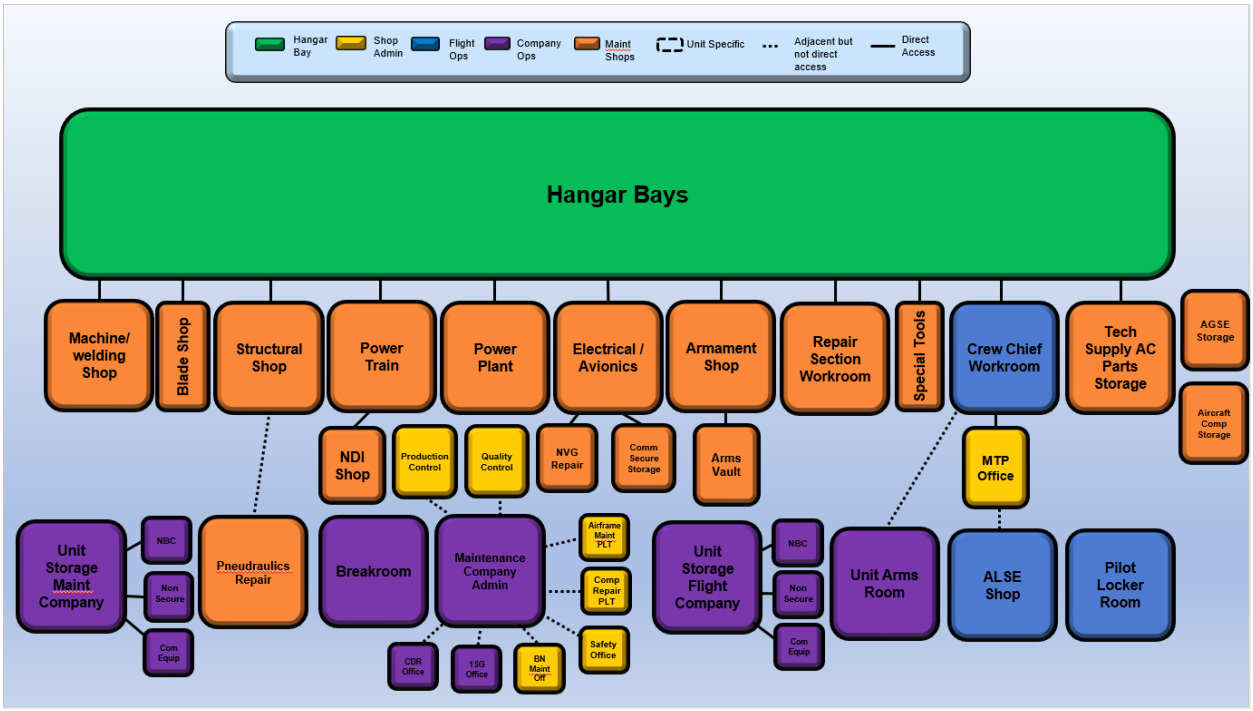


Diagram 3: Aviation Operations (2nd Floor)