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 Rotary Wing Aviation Units

1. The enclosed Army Standard (hereinafter 'standard') for the Aviation Maintenance Hangar Complex, TDA Rotary Wing Aviation Units is hereby approved for implementation. It applies to Active Component facilities for TDA Rotary 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; LTC Charlton J. Mosley, DCS, G-9, DAIN-ODR, charlton.j.mosley.mil@army.mil and Ms. Susan Nachtigall, USACE/Combat Readiness Support Team, CEMP-CI, susan.d.nachtigall@usace.army.mil. The USACE Center of Standardization FDT Representative is Mr. Daniel Bush, CESAM, daniel.e.bush@usace.army.mil.

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Encl

JASON T. EVANS
Lieutenant General, GS
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DAIN-ZA (420-1nn1)
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Army Standard for Aviation Maintenance Hangar Complex: TDA 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 TDA Rotary 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 The four individual standards identified below collectively address the scope of the rescinded 2013 Aircraft Maintenance Hangar Complex standard.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 **TOE Rotary Wing Aviation Maintenance Hangar Army Standard** applies to TOE manned Rotary Wing aviation units. The **Tactical Unmanned Aircraft System (TUAS) Unmanned Aircraft (UA) Maintenance Hangar** Army Standard applies to the planning, design, and construction of aviation maintenance facilities for Active Army Group 3 TUAV's. The **TDA Rotary Wing Aviation Maintenance Army Standard** applies to the planning, design, and construction of aviation maintenance facilities for Active Army TDA organizations operating and/or maintaining Rotary Wing manned aircraft.
- 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. 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 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.

Planning Criteria:

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 for Flight TDAs with assigned pilots and aircraft. It also deals with a mix of Field and Sustainment for Aviation Maintenance TDAs that don't have assigned aircraft but that are tasked with maintaining aircraft operated by other organizations. 3. TDA flight organizations will be treated as if they perform Light Field Maintenance on assigned aircraft. Facilities for TDA 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 TDA flight organizations 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.

	4. TDA aviation maintenance organizations (hereinafter termed Logistics Readiness Centers - Aviation or LRC-As) provide maintenance support for TOE and TDA flight units, as well as back-up for Aviation Support Battalions. This support includes a mix of backup Field Maintenance as well as some Sustainment Maintenance. Note that when the Standard says LRC-A, it can also be understood to refer to the function that is the equivalent of an LRC-A such as the Aviation Center Logistics Command at Ft. Rucker, Theater Aviation Sustainment Maintenance - Europe and their main shops at Illesheim, etc. There are three types of Sustainment Maintenance: Sustainment Forward at the equivalent of an LRC-A spoke as designated by Aviation and Missile Command or AMCOM, Sustainment Intermediate at the equivalent of an LRC-A hub as designated by AMCOM, and Sustainment Rear at Corpus Christi Army Depot (CCAD). In addition to addressing TDA flight organizations, this standard only addresses spokes and hubs, not CCAD. 5. Maintenance facilities for rotary wing aircraft assigned to and maintained by TOE organizations, for fixed wing aircraft, and for Unmanned Aerial Systems (UAS) are covered under separate standards. This standard does apply to maintenance on TOE aircraft when the maintenance is support maintenance provided by a TDA. 6. No single aircraft hangar shall take up more than 850' of flight line frontage, nor have more than 12 maintenance modules. *See Guidance Section below*
Primary Facility Scope and Capacity	1. Under this Standard, a hangar allowance is calculated for each TDA flight organization with 1 - 50 aircraft. A hangar allowance is also calculated for each TDA aviation maintenance activity. In the unique case of a flight TDA having more than 50 aircraft, this standard is used to calculate multiple hangars for the organization. 2. If a TDA flight organization has >50 rotary wing aircraft, facilities will be planned based on separate hangars for groups of about 28 aircraft. If the organization is large enough, these separate hangars will be planned on the basis of one type of aircraft per hangar unless this means that a hangar will support <24 aircraft, in which case those aircraft of more than one type will be combined into a single hangar.

	3. TDA aviation maintenance activities will have allowances calculated for one or more hangars. If a single TDA aviation maintenance activity generates more than 12 aircraft maintenance modules, then multiple hangars are calculated for that activity with each of those hangars having a full allotment of supporting spaces such as shops, shop admin, etc. 4. Allowance for hangars for a TDA 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. Allowances for a TDA Aviation Maintenance Activity do not include aviation unit operations except for the company headquarters of the maintenance element, other aviation unit operations functions (including space for maintenance test pilots) are included in the shop admin space. *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 CH-47 to include proposed Future Vertical Lift (FVL) aircraft. The proposed FVL tilt rotor aircraft exceed the module width, however, with standard aircraft repositioning procedures the FVL tilt rotor can be fully accommodated. The module also accommodates the proposed FVL compound rotor aircraft. 2. TOE units that provide light Field Maintenance (flight battalions and separate flight companies) are allowed aircraft maintenance modules to support 20% of assigned aircraft. In the same manner, TDA flight organizations are allowed maintenance modules for 20% of assigned aircraft, corresponding with the TOE unit allowance for Light Field Maintenance. When 20% of a type of aircraft calculates an allowance for a fractional number of modules, the answer is rounded up.

3. Within a Combat Aviation Brigade, TOE flight units are provided with Heavy Field Maintenance support from an Aviation Support Battalion including hangar bays for 10% of supported aircraft. Select TOE rotary wing flight units (e.g., 01600 series TOE's) and all TDA flight organizations are not aligned to TOE ASB's. Within these portions of the force, the supporting LRC-A provides maintenance equivalent to the ASB and that LRC-A generates maintenance modules for 10% of the aircraft in designated units of this type that are supported by the LRC-A.

4. In addition to CAB maintenance activities which provide aircraft maintenance modules for a total of 30% of all CAB aircraft, and non-CAB TOE and TDA activities that get maintenance modules for 20% of assigned aircraft at the unit level and an additional 10% at the local LRC-A, each spoke LRC-A will have additional maintenance modules to accommodate back-up field maintenance and sustainment maintenance on another 5% of supported aircraft at the installation.

5. Select installation LRC-A's will function as hubs. These hubs are designated by AMCOM. A hub LRC-A provides units on the base all the same aviation maintenance capabilities as does a spoke LRC-A. In addition, the Hub provides additional capabilities to their aligned spoke installation LRC-A's, including providing maintenance modules for an additional 2.5% of aircraft assigned to either the hub or one of the spokes aligned with the hub.

6. The total number of aircraft maintenance modules will be used in other calculations related to component repair shops. Note that performance of backup heavy Field Maintenance and Sustainment 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 and Sustainment 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 or the Supply System.

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

	8. Provide a five-foot (5') safety corridor around each contiguous group of three or four 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 three or four 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.
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 bays across the entire facility must be provided with lift capability. 2. All hangars get at least one 10-ton overhead bridge crane. In cases where hangars have >4 aircraft maintenance bays, provide at least one crane for every four (4) aircraft maintenance bays, i.e., 5 - 8 bays get two (2) cranes, 9 - 12 bays 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 Field Maintenance, heavy Field Maintenance and Sustainment.
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, Logistics Information System (LIS) equipment room, etc.

	2. The allowance for admin and shop control In a TDA Flight Organization will be based on a designated number of admin and shop control spaces per aircraft maintenance module. For a TDA flight organization, there will be space allowed for 7 admin and shop control personnel per maintenance module. 3. For a TDA aviation maintenance activity, space will be allowed for 9 admin and shop control personnel per maintenance module. 4. Multiply estimated number of admin and shop control personnel by 130 NSF / person. 5. Add 1,000 NSF for Production Control *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 flight company identifiable in the TDA. If no flight companies are individually identifiable, provide a minimum of one. *See Guidance Section below*
Maint Ops -- Shops (CC 21116) -- Component Repair Shops	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.

2. Power Plant Shop (used by 15B personnel, or civilian equivalent) needs a base quantity of 450 NSF plus 75 NSF/aircraft maintenance module, no additional minimum.

3. Power Train Shop (used by 15D personnel, or civilian equivalent) needs a base quantity of 450 NSF and 75 NSF/aircraft 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/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 a 150 NSF area for robing and disrobing for technicians wearing protective equipment. These areas may be separated by walls in the Standard Design.

5. Blade Shop (also used by 15G personnel, or civilian equivalent) in a Light Field Maintenance activity such as a flight TDA needs 1,000 NSF. 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 LRC-A 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 such as a TDA flight battalion (used by 15H personnel, or civilian equivalent) needs a base quantity of 200 NSF and 50 NSF / aircraft 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 and Sustainment, such as an LRC-A, the need is a base quantity of 200 NSF plus 75 NSF per aircraft maintenance module.

7. Electrical / Avionics Shop needs 125 NSF/ non-attack aircraft maintenance module for TDA flight units that perform Light Field Maintenance and 300 NSF/ non-attack aircraft maintenance module with a minimum size of 450 NSF for Heavy Field Maintenance and Sustainment Maintenance such as in an LRC-A.

8. A Night Vision Device Repair Shop area of 200 NSF will be allowed to an LRC-A.

9. Systems / Armament Shop (used by 15Y personnel, or civilian equivalent) needs 125 NSF for each attack (AH-64, AH-6, AH-60, etc.) aircraft maintenance module in TDA flight organizations with a minimum of 530 NSF if any attack aircraft are present. An LRC-A needs 300 NSF / attack aircraft maintenance module, also with a minimum of 530 NSF.

10. A 300 NSF Arms Vault for aircraft mounted weapons will be allowed for a TDA flight organization, and an LRC-A will be allotted 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 TDA flying organization, and one of 150 NSF will be provided for each LRC-A.

12. A Machine Shop / Welding Shop base area of 400 NSF will be allowed for each LRC-A. An additional 40 NSF / aircraft maintenance module will be added.

13. TDA organizations will not be allowed a Ground Communications Equipment Shop, as TDAs can use regular communications as provided by Network Command, local phone companies, etc.

14 Even though a TDA organization may not be assigned SPAMs (Shelter, Portable, Airmobile) and IFTE/EETF (Improved Flight Test Equipment/ Enhanced Electronic Test Facility) vans, provide space adjacent to the Shop area for daily operations and use of SPAMs and IFTE vans (e.g., loading dock, personnel accessibility and circulation, provisions of commercial power) in case of future need. As long as space is present, the capability can be retrofitted if necessary.

	See Guidance Section below
Maint Ops -- Shops (CC 21116) -- Aviation Life Support Equipment (ALSE) Repair	1. Provide an ALSE shop for each TDA flight organization. 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 5 NSF of ALSE locker space for each assigned pilot, by MOS. When counting assigned pilots, include the average structural load of pilots in student status such as at the Aviation School at Ft. Rucker, even though these pilots are not carried on the TDA. 6. 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. 7. In aviation training units that conduct individual training of soldiers to qualify pilots and flight crew, provide students / trainees with 5 NSF of ALSE locker space for the average structural load of soldiers in these courses. *See Guidance Section below*
Maint Ops - Acft Parts Storage (CC 21113) Tech Supply & Contractor Logistics Support (CLS)	1. Each hangar for a TDA flight operations unit will receive 2,600 NSF of Aircraft Parts Supply. 2. Each LRC-A hangar will be allowed a base area of 8,000 NSF of Aircraft Parts Supply within every hangar. 3. In addition, each LRC-A hangar will be allowed an additional 4,000 GSF of Aircraft Parts Supply storage in a covered but not enclosed area near each hangar. 4. Contractor Logistics Support (CLS), including office space and storage, will be accommodated within tactical units, not within the LRC-A or TDA Flight Organizations. 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 TDA flight organization hangar will be allowed a base area of 2,000 GSF of covered storage for storage of aircraft components: wings, tanks, etc. 2. Every TDA activity performing aviation maintenance (both TDA flight organizations and LRC-A's) will be allowed 3,000 GSF of covered storage for AGSE for each hangar.
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. NSF of CC 21114 Hangar Bay + NSF CC 21116 Shops + NSF 21113 Aircraft Parts Storage + 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 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.
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 140' wide and 110' deep, 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*
Aircraft Paint Shop (CC 21130)	1. The LRC-A Hub needs the capability to paint an entire aircraft fuselage. This should be designed IAW UFC 4-211-02 Aircraft Corrosion Control and Paint Facilities, dated 1 December 2012.

	2. This facility will provide space for three process phases, with each phase provided a separate bay. The phases are: (1) Preparation, (2) Depainting, and (3) Wash / Painting. This requirement reduces cross contamination by isolating each work process and is supported by an Operations area and a Building Support Systems area. 3. The space allocation for this building is 22,296 GSF. *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 commensurate in depth with obstruction clearance factors from closest power-on activity, typically NLT 75' deep. 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. Actual dimensions should be in accordance with the current version of UFC 3-260-01.
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 TDA Flight Organizations 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. These are provided facilities similar to a TOE Flight Battalion. The term TDA Aviation Maintenance Organizations describes TDA organizations that do not have significant numbers of assigned aircraft, but maintain aircraft assigned to other organizations. A typical example is an LRC-A.

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:

- 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. TDA flight organizations don't perform this type of maintenance, instead this level of maintenance support is provided to TDA flight organizations by TDA aviation maintenance organizations. TDA aviation maintenance organizations also provide this level of support to TOE flight battalions that are not aligned to ASB's or equivalent TOE units.

- Sustainment Maintenance includes Forward Sustainment Maintenance, Intermediate Sustainment Maintenance, and Rear Sustainment Maintenance also known as Depot Maintenance.

- Forward Sustainment Maintenance is performed at a Logistics Readiness Center – Aviation (LRC-A) "spoke", often co-located with a Combat Aviation Brigade. At this echelon, Field and Sustainment Maintenance overlap. These activities back-up Heavy Field Maintenance, for example by providing back-up Phase Maintenance. They also perform sustainment-level maintenance, including Modification Work Orders (MWO's) and "Reset". They should be capable of painting entire aircraft, and testing engines on engine test stands. This type of organization does not need to be able to move, which allows for much larger investments in equipment and large inventories of spare parts to increase efficiency of maintenance operations. This type of organization may be termed a "spoke" to contrast it with an Intermediate Sustainment Maintenance location or a "hub."

- Intermediate Sustainment Maintenance is performed at an LRC-A "hub." This is always co-located with at least a Combat Aviation Brigade (CAB) or else an aviation activity even larger than a CAB. It typically has greater capability for

painting or engine test than a “spoke” LRC-A, and always has at least all the capabilities of a “spoke.” MWO or Reset work can be concentrated at a “hub” location if this is the most efficient way of accomplishing the mission. This is also a fixed base operation, allowing even larger investments in facilities, equipment, and repair parts to maximize efficiency.

- Rear Sustainment Maintenance is performed only at the Corpus Christi Army Depot (CCAD) in Texas. This location has all capabilities possessed at any of the other levels. It also has additional capabilities. While other locations have capabilities to maximize the efficiency of repair and maintenance activities, CCAD provides the definitively full range of all production, repair, and modification capabilities. If there is a maintenance capability the Army might need that requires facilities or equipment, it is maintained here. These standards do not address CCAD, but the absence of certain capabilities within the other categories is made up for by the capabilities at CCAD.

Concept for Supporting Maintenance with Facilities:

- TDA Flight Organizations will be provided with a hangar for performing Light Field Maintenance. That facility is described and prescribed in this Standard and is very similar to the hangar for a TOE Flight Battalion. A hangar will be allowed for each separate TDA Flight Organization; any TDA Flight Organization with more than 50 rotary wing aircraft will be allowed multiple hangars, each supporting 25 – 50 aircraft. Currently, there is only one TDA Flight Organization with >50 aircraft. This is the Aviation Center of Excellence at Ft. Rucker. The calculation for this organization will be shown in an Annex of the Army Standard Design.

- The hangar for a TDA Flight Organization will be provided Aircraft Maintenance Modules for 20% of assigned aircraft.

- In a TOE Combat Aviation Brigade, TOE Flight Battalions receive Heavy Field Maintenance support from the Aviation Support Battalion. TDA Flight Organizations, as well as select TOE Flight Organizations (especially TOE’s in the 016xxXx00 series) do not have a supporting ASB and must receive this type of support from a TDA Aviation Maintenance Organization, typically called an LRC-A. This Heavy Field Maintenance function is combined with Sustainment Maintenance support in the LRC-A. That facility is described and prescribed in this Standard. Aircraft maintenance modules are provided for 10% of TDA Flight Organizations and 10% of TOE Flight Units not supported by an ASB. Standard.

- Forward and Intermediate Sustainment maintenance in support of TOE Rotary Wing battalions and squadrons will be provided under this TDA Standard.

- Forward Sustainment Maintenance will be provided by an LRC-A or LRC-A type organization (e.g., Aviation Center Logistics Command or ACLC at Ft. Rucker) at the same location as the assigned aircraft, also termed a “spoke.” A spoke will

have Aircraft Maintenance Modules performing this function. The number of these modules will be sized at 5% of the number of supported aircraft.

Intermediate Sustainment Maintenance locations will be designated by AMCOM, along with the catchment areas these locations support. These will be termed “hubs.” Note that National Guard and USASOC flight organizations do not fall under this Standard, and will not be included in counts of supported aircraft without the specific agreement of the National Guard and USASOC, to include eliminating any requirements based on supporting these aircraft at Guard and USASOC organizations. Intermediate Sustainment Maintenance “hubs” will be sized at 2.5% of the number of supported aircraft.

- The LRC-A is sized based on the combination of Heavy Field Maintenance support for TDA Aviation and TOE Aviation units without supporting ASB’s, plus the Forward Sustainment Maintenance mission (which includes backup Heavy Field Maintenance) corresponding to a “spoke,” plus, if the location is a “hub”, the Intermediate Sustainment Maintenance mission

- Note that the calculation of these maintenance modules is additive. Combat Aviation Brigade aircraft assigned to a “hub” get aircraft maintenance modules at the LRC-A to support 5% of those aircraft to accomplish the Forward Sustainment Maintenance, and an additional 2.5% to accomplish the Intermediate Sustainment Maintenance, for a total of 7.5%. CAB Aircraft located at “spoke” locations get aircraft maintenance modules for 5% of those aircraft at the “spoke”, and an additional 2.5% at the “hub.”

- In the case of a TDA Flight Organization (or a TOE Flight Unit without a supporting ASB) assigned to a location with a “hub”, the LRC-A equivalent will need aircraft maintenance modules for 10% of the TDA Flight Organization (the Heavy Field Maintenance mission) + 5% (the Forward Sustainment Maintenance mission) + 2.5% (the Intermediate Sustainment Maintenance mission) for a total of 17.5% of the aircraft in this type of unit.

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	**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 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 TDA flight organizations, and for LRC-A type TDA Aviation Maintenance Organizations, under this Army Standard. The allowance for a hangar is a function of the sum of the allowances for aircraft hangar modules, shop areas, aircraft parts storage, and aviation unit operations. TDA Flight Organizations with <50 aircraft get one (1) hangar each. LRC-A type Aviation Maintenance Organizations that get ten or less aircraft maintenance modules get one (1) hangar. Those LRC-A type organizations that get more than 10 aircraft maintenance modules are divided into hangars of approximately equal size, where all hangars have < 10 hangar maintenance modules. For example, an LRC-A needing 11 aircraft maintenance modules would get a hangar with 5 modules and a hangar with 6 modules.

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. 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.

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 TDA Flight Organizations and TDA Aviation Maintenance Organizations. Some functional area calculations differ between TDA Flight Organizations and TDA Aviation Maintenance Organizations. TDA Flight Organizations are identified based on the presence of aircraft and pilots. TDA Aviation Maintenance Organizations are identified by AMCOM, based on the TDA. 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 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. TDA Aviation Maintenance Activities are predominately 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 TDA 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.

For TDA Aviation Maintenance Organizations, the number of shop admin personnel is nine (9) times the number of maintenance modules. This is the ratio found in an Aviation Support Battalion.

Each estimated shop admin person is allocated 130 NSF.

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, 15V Observation / Scout Helicopter Repairer, and corresponding 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 -- 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. the mix of OH-58, UH-60, and UH-72 airframes within the flight operations portion of the Joint Readiness Training Center TDA, 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 TDA 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 TDA Flight Operations hangar will be planned with a minimum of one flight company.

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, Field Heavy activities, or Sustainment activities. TDA Flight Operations organizations have pilots and aircraft. Aviation Maintenance TDA's are organizations such as LRC-As and ACLC that have missions to perform maintenance, but do not have aircraft assigned. A separate blade painting shop will be allowed for the LRC-A; this will also support work orders from any flight battalions that are TDAs or TOE's without supporting ASB's. LRC-A safety personnel will monitor painting operations to insure they are safe and performed within the guidelines for the various hazardous materials used; control by the LRC-A will probably mean these facilities will not support training use by TOE flight battalion personnel as can be performed in an ASB component paint shop. The LRC-A will have a small number of pilots assigned, to accomplish the maintenance test mission. 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. In the event a single activity (such as an LRC-A hub) requires multiple hangars, each hangar will be allowed the quantity of storage associated with that level of maintenance. 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. 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 a vehicle maintenance shop, possibly the LRC Maintenance Shop.

12. 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 a function of the

number of platoon leaders and / or platoon sergeants. Note that in TDAs, duty titles are not standardized as they are in TOEs.

13. 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.

14. 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 a variety of spellings like "CDR", "COMMANDER", "CO", exist. Flight companies are those with pilots assigned that are not maintenance test pilots. Aviation maintenance companies are those with an aviation maintenance mission. 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 Company (HHC), Ground Forward Support Company (FSC), instructional companies, evaluator companies, non-aviation subordinate companies like the 911th Engineer Company (TDA, Heavy Rescue) within The Army Aviation Brigade at Ft. Belvoir) do not get CC 14112 Aviation Unit Operations Company Headquarters but should use CC 14185 Company Headquarters for their requirements.

15. Secure Storage: The arms vault contained within the systems/armament shop serves three separate requirements: Sensitive Secure Storage (weapons) 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.

16. 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 MEDEVAC Ready Area and Storage + 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 building occupants for TDA Flight Operations units will be equal to the number of personnel assigned to flight missions and aviation maintenance in the TDA, but not less than 40 personnel per aircraft

maintenance module (the average for Assault, Attack, and GSAB rounded to a whole number).

9. The number of building occupants for TDA Aviation Maintenance will be equal to the number of personnel and contractors assigned to aviation maintenance, but not less than 27 personnel per aircraft maintenance module (the number from ASB, rounded to a whole number).

Facility constructed gross area shall not exceed 105% of space allocation set forth in this document to accommodate site, construction, or environmental factors.

17. 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.

18. Aircraft Paint Shop (CC 21130). An Aircraft Paint Shop is defined as “A building that provides space for washing, rinsing, paint stripping, corrosion removal, protective coating, chemical agent resistant coating, and painting of aircraft at maintenance facilities.” Since this definition says the facility must be capable of accommodating an aircraft, the earlier blade shop is categorized as a Shop under CC 21116, whereas this facility is categorized under CC 21130. The width of each of the three bays is calculated at the 12.58’ width of a CH-47 rounded up to 13’, + 30’ for safety and wall thickness for a width of 43’. The length is calculated as 50.58’ rounded up to 51’, + 30’ for safety and wall thickness, leading to 81’ long. Area is 43’ x 81’ = 3,483 GSF. Adding space for supply air plenum / exhaust air plenum for supply air and exhaust air, an air recirculation fan room, a supply fan room, paint storage, a decontamination area, a communications room, wash rack equipment, equipment storage, chemical storage, circulation, electrical room, supply and exhaust filters, heating system, process cooling system, an administrative area, a break room, sprinkler risers, a fire pump room, blast media unloading and storage, blast media recovery and feed, and an issue room leads to a facility NTE 22,300 GSF.

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. 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. Aprons must always meet the requirements of the current version of UFC 3-260-01.

20. Aircraft Parking Apron (FCC 11210 & 11220). The aircraft parking area is addressed in UFC 3-260-01. 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.

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:

- 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.

22. 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
- 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

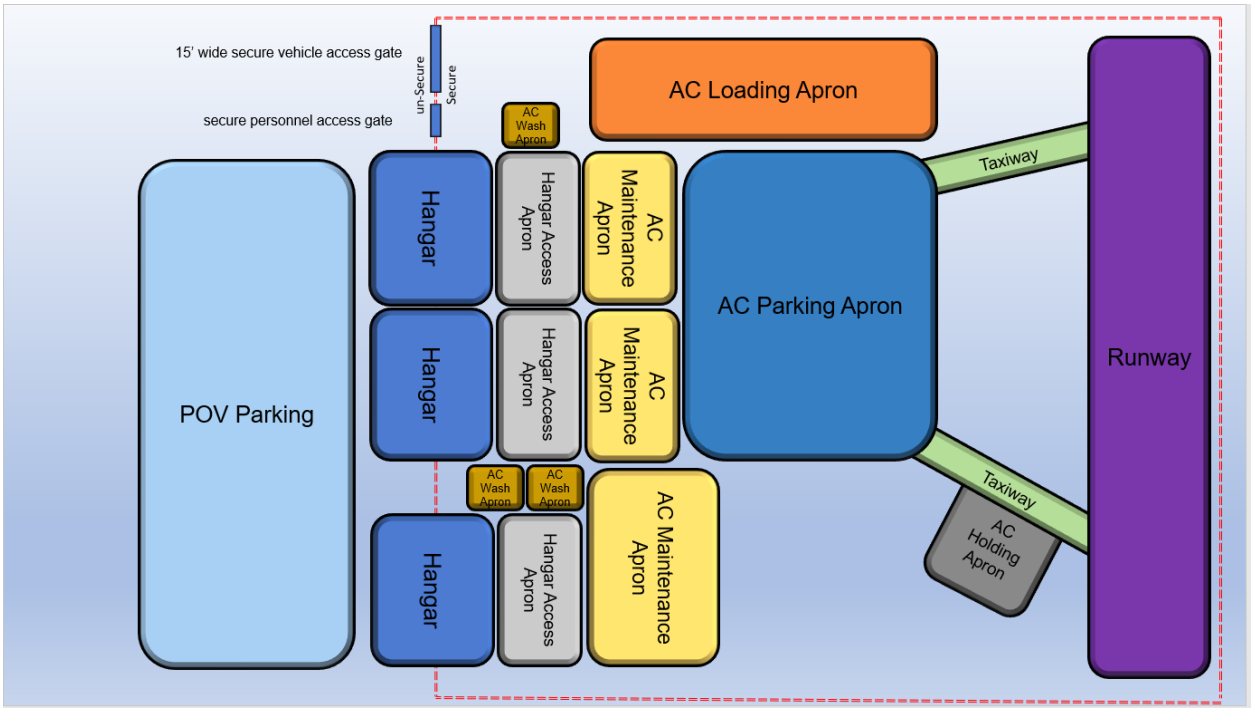

Diagram 2: Maintenance Shops (1st Floor)

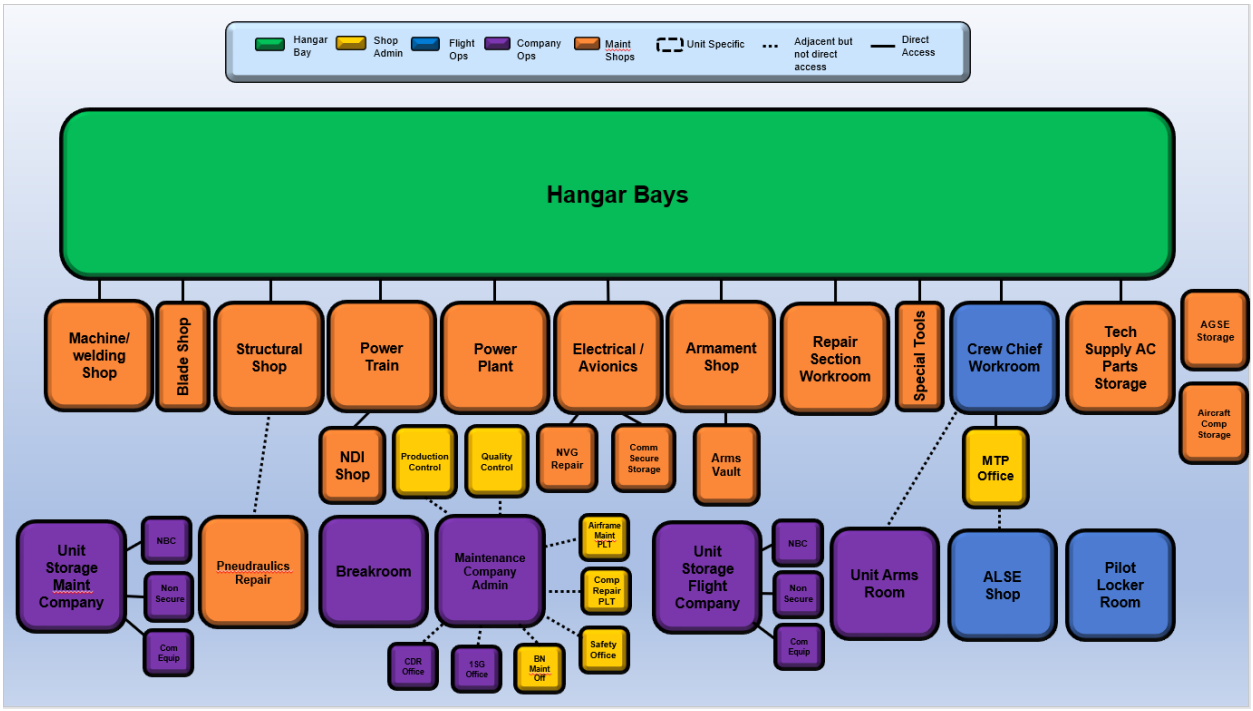

Diagram 3: Aviation Operations (2nd Floor)