

TALKING PAPER
ON
USAF FEMALE FITMENT IN AVIATION

In December 2018, the Defense Advisory Committee on Women in the Service (DACOWITS) received briefings on the status of women in aviation. During these briefings, concerns about the sizing of equipment as a barrier to women's service in aviation emerged. This talking paper will address the seven concerns and questions posed by DACOWITS for the March 2020 quarterly business meeting.

a. What actions have been take or will be taken to accommodate the physiological differences in women verses men since aviation positions have been opened to women? Pertaining to aircraft, flight gear, training, etc.

The Human Systems Division (HSD), within the Air Force Life Cycle Management Center (AFLCMC), is responsible for the development and Life Cycle Management (LCM) of all Aircrew Flight Equipment (AFE) for AF aircrews. In that role, the HSD fully understands that female fitment is a priority because of the physiological differences in women versus men and incorporates female anthropometric range measurements to the maximum extent possible in all AFE equipment and uniforms worn by female aircrew.

Currently, the Individual Aircrew Ensemble provides a new version of the coverall flight duty uniform worn by many aviators, with fielding first to Air Force F-22 squadrons. This coverall has a larger size roll to better fit a larger range of anthropometric sizes. It also includes an elongated zipper to facilitate the use of in-flight bladder relief devices for women. Additionally, the two-piece flight duty uniforms are also a priority; our Air Force Uniform Office is designing the first ever female-variant of the Army Aircrew Combat Uniform (currently only available in limited unisex sizing) and researching ways to design a maternity flight suit.

In addition, HSD places great importance in improving protection of our aircrew. In these areas, programs such as the Next Generation Fixed Wing Helmet (NGFWH) and Next Generation Ejection Seat (NGES) include better incorporation of the female anthropometric range. Also, to enhance mission support, HSD increased testing efforts for more in-flight bladder relief options tailored for female aircrew.

Finally, products developed within HSD will be enhanced by the creation of a new feedback system through a Streamlined Feedback Application. This application allows users to submit equipment feedback directly visible to the HSD and Headquarters Air Force to allow for better requirements generation.

b. What are the anthropomorphic measurement requirements for service as a pilot? Service as Air Crew? When were these requirements established?

The AFI 48-123 Medical Examinations and Standards requires a minimum stature of 64 inches and a minimum sitting height of 34 inches for pilot training. Maximum stature is 77 inches. Applicants who do not meet these requirements may be submitted for an exception to policy (waiver). The anthropometric measurements for the waiver consist of standing height, sitting height, buttock-to-knee length, sitting eye height, sitting knee height, sitting shoulder height, and arm span. These measurements are acquired at either the USAF School of Aerospace Medicine or the USAF Academy. The measurements for exception-to-policy candidates are sent to AETC where they are input into the WebPASS (Pilot Accommodation Screening Software) to determine which aircraft they can fly safely given their anthropometric measurements. The WebPASS software, developed and maintained by the Humans Systems Division, contains algorithms for all USAF aircraft indicating body size limitations based on evaluations using performance criteria (mission requirements). Current exceptions to WebPASS are the KC-46 and T-7, both of which are scheduled to be evaluated and added to the software. WebPASS represents only the cockpit accommodation envelopes and does not presently consider other workstations or back end missions.

Career Enlisted Aviators (CEA) are limited to a minimum stature of 64 inches and maximum of 77 inches. The generation of these standards (for all aircrew) are unknown, but that they are “legacy” numbers. No CEA anthropometric data has been produced to CEA management functions to date. It is assumed that this standard was adopted from rated pilot standards. A study in CEA anthropometry limitations recently began, and the results will inform anthropometric requirements for CEA accession.

c. Approximately what percentage of Service members were disqualified from flight status based on these requirements? Provide breakdown by gender.

There are roughly 15,000 CEAs required in the USAF. It is estimated that the population of females (who are predominately affected by this standard) who may meet the most basic of service entry criteria and with a propensity to serve are ~700k, and that 43.5% of females are ineligible on average based on mean heights. Since 2013, only 8% of women make up the CEA population, in contrast to 92% of men, a trend that has not changed.

The National Health Statistics Report Number 10, 22 Oct 2008 (representing information on the US population from 2003-2006) indicates that about 50 percent of women (all races/all ethnicity) over the age of 20 are 64 inches tall. This data is provided to illustrate the pool from which personnel are drawn. This compares to 95% of men being 64 inches tall (except for Mexican American men-85%). There are only currently approximately 128 women with FCI/II/III waiver for short stature, i.e., that includes all flying classes and encompasses retired/expired waivers, as well. There were 15 more disqualified (DQ) and 10 of those 15 were FCIII. This is out of over 24,000 waivers for women with rated FC (encompasses retired/expired waivers; and no women have waivers for tall stature). (Thirteen men have waivers for short stature and 10 are FCIII, none were DQ. Twelve have waivers for tall

stature, 8 are FCIII and none DQ; there are over 149,000 waivers ...encompasses retired/expired waivers).

d. What are the anthropomorphic measurement requirements for each aviation platform and why?

In early 2000, an enormous effort was conducted by the Airmen Accommodation Lab (AAL) to determine the Accommodation Envelopes for all USAF aircraft. Development of Accommodation Envelopes requires first, determining the functional requirements of the aircraft (what must the pilot reach, see etc.); second, evaluating the ability of subjects of various sizes to accomplish these tasks; and third, establishing the accommodation body size boundaries within the aircraft using the results of the twenty-five or so subjects of specific body size. Examples of functional requirements include adequate leg clearance, over-the-nose vision, reach to controls, head clearance, etc. Every aircraft has a different set of performance requirements. For each aircraft, the requirements were signed off by the command.

For each aircraft, there are objectively derived anthropometric limitations incorporated into an assessment of capability to safely perform duties within the cockpit envelope. A person with a short torso and long arms and legs may be able to fly certain aircraft. A person who meets height/sitting height with short arms and legs might not be able to fly certain aircraft.

The algorithms representing the accommodation envelopes for each aircraft are now part of the WebPASS program. For each USAF aircraft, subjects of specific body sizes were measured against performance requirements specific to that aircraft (such as reaches with locked restraints), the results of which define the aircraft's anthropometric accommodation envelope. When the ETP candidate measurements are entered, the algorithms determine which aircraft could be safely flown by that individual. AAL evaluates and estimates physical accommodation limits based on Subject Matter Expert (SME) input for functional/operational/mission requirements for any crew station or PPE. The operational requirements set by the pilot community, combined with performance mapping of actual test participants, ultimately determine the anthropometric limits for any pilot or crew station.

AAL continues to evaluate and estimate physical accommodation limits based on SME input for functional/operational/mission requirements for new airframes, and airframe modifications.

AAL is planning to evaluate the KC-46 cockpit to add the accommodation envelope to WebPASS. In addition, AAL plans to evaluate the AROS to begin assessments of CEA stations.

e. What are the anthropomorphic measurements around which flight equipment is procured?

Size Tariffs are used to inform Defense Logistic Agency (DLA) on the needed size quantities for equipment. Equipment is made to accommodate the percentage of population dictated by user requirements, for example, covering the 5% to 95% percentile. Anthropometric data that is available helps to project what those percentages look like. This data is used to create sizing schedules, which are found in the specifications documented within ASSIST.

f. What is the process to procure sizes of flight equipment not in a squadron's inventory? How long does the process take?

If stock is on hand, the delivery time would depend on the requisitions priority code:

Pri 01-03- Delivers in 3 business days.

Pri 04-08- Delivers in 6 business days.

Pri 09-15- Delivers in 6 business days.

The Military Standard Requisitioning and Issue Procedures (MILSTRIP) priority urgency code of need designator is established with the Department of Defense Activity Address Code (DoDAAC). Depending on the mission and location of each particular DoDAAC, the Issue Priority Group (IPG) is established. This determines what priority code can be used for each unit's requisitions, and are as follows:

IPG I (Pri code 01-03).

IPG II (Pri code 04-08).

IPG III (Pri code 09-15).

Urgent requirements can be expedited and overnight deliveries can be made if needed.

For items with no stock on hand, depending on the item, there are different lead-times and it must be determined if a contract is in place or if a new acquisition is needed.

g. What is the process to procure uniquely sized flight equipment not in standard issue?

Please see the attached forms. One is the DD Form 358 for Men (Attach 1) and one is the DD Form 1111 for Women (Attach 2) special measurements.

Once the form is completed, it is submitted to the AF special measurement POC at DLA, to include the AF Liaison within DLA.