



September 2016

# AIR FORCE TRAINING

## Further Analysis and Planning Needed to Improve Effectiveness

Accessible Version

# GAO Highlights

Highlights of [GAO-16-864](#), a report to congressional committees

## Why GAO Did This Study

For more than a decade, the Air Force focused its training on supporting operations in the Middle East. The Air Force has established goals for its combat aircrews to conduct training for the full range of core missions. Both the Senate and House Reports accompanying bills for the FY 2016 National Defense Authorization Act included a provision for GAO to review the Air Force's training plans.

This report discusses the extent to which the Air Force has (1) determined requirements to train combat aircrews for the full range of core missions, (2) met annual training requirements for combat fighter squadrons across the full range of core missions and evaluated the effectiveness of this training, and (3) established virtual training plans that include desirable characteristics of a comprehensive strategy. GAO reviewed Air Force training requirements and plans and interviewed officials with a non-generalizable sample of units based on the units' range of core missions.

## What GAO Recommends

GAO recommends that the Air Force (1) reassess assumptions for annual training requirements, (2) establish and collect data on desired learning objectives and training support elements for its training expectations, and (3) develop a risk-based investment strategy for its virtual training plans. DOD concurred with the third recommendation and did not concur with the first and second recommendations, stating that existing initiatives and policies address these issues. GAO believes the recommendations remain valid for the reasons discussed in this report.

View [GAO-16-864](#). For more information, contact Cary Russell at (202) 512-5431 or [russellc@gao.gov](mailto:russellc@gao.gov).

September 2016

## AIR FORCE TRAINING

### Further Analysis and Planning Needed to Improve Effectiveness

#### What GAO Found

The Air Force establishes combat aircrew training requirements for the full range of core missions based on an annual process, but these requirements may not reflect current and emerging training needs, because the Air Force has not comprehensively reassessed the assumptions underlying them. Specifically, assumptions about the total annual live-fly sortie requirements by aircraft, the criteria for designating aircrews as experienced or inexperienced, and the mix between live and simulator training have remained the same since 2012. For example, Air Combat Command has set the same minimum number of live-fly sortie requirements across aircraft platforms, but has not conducted the analysis needed to determine if requirements should differ based on the number of core missions for each platform. Reassessing the assumptions underlying annual training requirements would better position the Air Force to meet its stated goals for its forces to achieve a range of missions for current and emerging threats.

Combat fighter squadrons were generally able to complete mission training requirements for ongoing contingency operations, such as close air support to ground forces, but were unable to meet annual training requirements across the full range of core missions. Further, the Air Force does not systematically evaluate the effectiveness of training that has been completed against established expectations. Selected unit commanders that GAO interviewed cited four common factors that limited their ability to complete training, such as high deployment rates, and other factors that affected the training that aircrews were able to accomplish. However, Air Force processes used to record and monitor annual training do not include a systematic evaluation of training effectiveness against expectations. Specifically, Air Combat Command has not established the desired learning objectives or training support elements needed to accomplish training expectations and does not collect data to assess effectiveness. A more consistent basis for monitoring results is critical in tracking the Air Force's progress in training units for the full range of core missions.

Air Force plans for virtual training do not include all desirable characteristics of a comprehensive strategy, such as a risk-based investment strategy or a time line for addressing training needs. A strategy that included these elements would help ensure that the Air Force's plans addressed its capability needs.

This is a public version of a sensitive report GAO issued in August 2016. It omits sensitive information and data on some of the Air Force's training priorities, completion of annual training requirements for active-duty fighter squadrons, and aircraft maintenance generation capabilities.

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### **Abbreviations**

AFI	Air Force Instruction
DOD	Department of Defense
FOUO	For Official Use Only
LVC	Live, Virtual, and Constructive
RAP	Ready Aircrew Program

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September 19, 2016

Congressional Committees

For more than a decade, the Air Force focused the training of its forces on supporting operations in the Middle East, including Iraq and Afghanistan. Commanders established training requirements that they deemed necessary to prepare aircrews to conduct missions in these locations—such as close air support to ground forces—limiting training opportunities in other areas. According to Air Force reports, in the coming years, the Air Force will confront an increasingly complex security environment that will demand a wider range of skill sets and different capabilities than are currently being employed.<sup>1</sup> For example, aircrews may be called upon to conduct missions that require freedom of maneuver in highly-contested air spaces. To meet these emerging needs, the Air Force has established goals for its fighter aircrews to conduct training for a full range of core missions.<sup>2</sup>

Replicating complex threats—such as a highly-contested airspace—in a live training environment is resource intensive and can be constrained by several factors, including airspace restrictions, weather, and range capabilities, among others. The Air Force has stated that by integrating live, virtual, and constructive (LVC) components into training it could overcome some of the limitations of training in a live-only environment but notes that it will take time and dedicated resources to address technological and capacity limitations.<sup>3</sup> The Air Force has further stated

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<sup>1</sup>See, for example, Secretary of the Air Force, *America's Air Force: A Call to the Future* (July 2014); U.S. Air Force, *USAF Strategic Master Plan* (May 2015).

<sup>2</sup>For the purposes of this report, we use the phrase “full range of core missions” to describe the primary and secondary missions as established in each aircraft’s Designed Operational Capability statement, which summarizes specific capabilities that an Air Force unit can be called on to provide.

<sup>3</sup>According to Air Force documents, the live (L) environment is defined as real people operating real weapons systems, the virtual (V) environment is defined as real people operating simulated systems, and the constructive (C) environment is identified as software models and code that are used to improve training scenarios with computer-generated entities—such as terrain, threats, aircraft, people, and vehicles, among others. For the purposes of this report, we refer to training that includes a simulator as virtual training.

that the integration of these components is particularly important for fifth-generation aircraft, such as the F-35, which will rely more heavily on virtual training because of the limitations of training in the live environment and security considerations attributable to the sensitive capabilities of these aircraft.

We have previously reported on virtual training issues for the Air Force. In 2012, we assessed the Air Force's virtual training efforts in response to the Secretary of Defense's efficiency initiatives.<sup>4</sup> We found that the Air Force lacked some key elements of an overarching organizational framework that were needed to fully integrate virtual training into overall training goals and that it had no methodology for determining the costs of its virtual training enterprise. We recommended that the Air Force designate an entity to integrate its virtual training efforts, develop a strategy to align virtual training initiatives and goals, and develop a methodology to collect cost data on virtual training. In response, the Air Force has taken a series of actions to improve the planning and management of its virtual training efforts. For example, in 2012 the Secretary of the Air Force issued a guidance letter that restructured the management of virtual training responsibilities within Headquarters Air Force and designated the Air Force Agency for Modeling and Simulation as the lead implementation organization for LVC operational training integration. According to Air Force officials, the Air Force is also in the process of updating guidance on the management, acquisition, modification, and modernization of simulator and other training devices. We analyze other actions the Air Force has taken related to virtual training later in this report.

Both the Senate and House reports accompanying the bills for the 2016 National Defense Authorization Act included provisions for us to review the Air Force's training plans and requirements.<sup>5</sup> This report discusses the extent to which the Air Force has (1) determined requirements to train

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<sup>4</sup>GAO, *Air Force Training: Actions Needed to Better Manage and Determine Costs of Virtual Training Efforts*, [GAO-12-727](#) (Washington, D.C.: July 19, 2012).

<sup>5</sup>S. Rep. No. 114-49 and H. Rep. No. 114-102. Both reports' provisions also included review of the Army's training plans and requirements, which we addressed in a separate report. See GAO, *Army Training: Efforts to Adjust Training Requirements Should Consider the Use of Virtual Training Devices*, [GAO-16-636](#) (Washington, D.C.: Aug. 16, 2016).

its combat aircrews for the full range of core missions, (2) met annual training requirements for combat fighter squadrons across the full range of core missions and evaluated the effectiveness of this training, and (3) established virtual training plans that include desirable characteristics of a comprehensive strategy.

This report is a public version of the prior sensitive report that we issued in August 2016.<sup>6</sup> The Department of Defense (DOD) deemed some of the information in the prior report as For Official Use Only (FOUO), which must be protected from public disclosure. Therefore, this report omits FOUO information and data on some of the Air Force's training priorities, completion of annual training requirements for active-duty fighter squadrons, and aircraft maintenance generation capabilities. Although the information provided in this report is more limited in scope, it addresses the same objectives as the sensitive report. Also, the methodology used for both reports is the same.

We focused our review on the annual requirements for continuation training as established in the Ready Aircrew Program<sup>7</sup> for aircrews assigned to aircraft within the active component of the combat air forces.<sup>8</sup> The aircraft included in our review were the A-10, F-15, F-16, F-22, and F-35. To determine the extent to which the Air Force has determined requirements to train its combat aircrews for the full range of core missions, we analyzed Air Force documents to identify the Air Force's current process for developing annual training requirements and reviewed changes in these requirements for fiscal years 2012 through 2016. We evaluated these processes against DOD and Air Force guidance that

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<sup>6</sup>GAO, *Air Force Training: Further Analysis and Planning Needed to Improve Effectiveness*, GAO-16-635SU (Washington, D.C.: Aug. 16, 2016).

<sup>7</sup>The Ready Aircrew Program establishes the minimum number of live training events and simulator missions that aircrews must complete during the annual training cycle.

<sup>8</sup>In this report, we refer to continuation training as annual training requirements. The Ready Aircrew Program establishes the annual training requirements aircrews must accomplish to sustain combat mission readiness, as discussed later in this report.

prioritizes and establishes training requirements and leading practices that we have identified for managing strategic training.<sup>9</sup>

To determine the extent to which the Air Force has met annual training requirements for combat fighter squadrons across the full range of core missions and evaluated the effectiveness of this training, we analyzed training completion data from fiscal years 2012 through 2015 for the combat air forces. We performed data reliability procedures on information included in Ready Aircrew Program reports by comparing the data against related documentation and interviewing knowledgeable officials on controls over reporting systems and determined that the data presented in our findings were sufficiently reliable for the purposes of this report. We reviewed Air Force documentation that describes training challenges and interviewed Air Force officials, including wing and squadron commanders at selected units, to discuss any factors that limited the ability of aircrews to complete training for the full range of core missions. We selected a non-generalizable sample of units to speak with based on our analysis of training completion data and the range of units' core missions. We evaluated the Air Force's process for assessing the effectiveness of its annual training against leading practices that we have identified for managing strategic training and the Ready Aircrew Program tasking memorandums that specify the requirements for annual continuation training for personnel assigned to combat units.<sup>10</sup>

To determine the extent to which the Air Force has established virtual training plans that include desirable characteristics of comprehensive strategies, we reviewed planning documents established by the Air Force to guide its virtual training efforts and evaluated those actions against our

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<sup>9</sup>GAO, *Human Capital: A Guide for Assessing Strategic Training and Development Efforts in the Federal Government*, [GAO-04-546G](#) (Washington D.C.: Mar. 1, 2004). This guide introduces a framework, consisting of a set of principles and key questions that federal agencies can use to ensure that their training and development investments are targeted strategically. Information in this guide was developed through consultations with government officials and experts in the private sector, academia, and nonprofit organizations; examinations of laws and regulations related to training and development in the federal government; and reviews of the sizeable body of literature on training and development issues, including previous GAO products on a range of human capital topics.

<sup>10</sup>[GAO-04-546G](#).



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prior work on desirable characteristics of national strategies.<sup>11</sup> We determined whether these actions addressed, partially addressed, or did not address the desirable characteristics of strategy documents, based on our assessment of whether the planning documents explicitly cited all elements of a characteristic and the level of specificity and detail included. Further details on our scope and methodology can be found in appendix I.

We conducted this performance audit from June 2015 to September 2016 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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## Background

The Secretary of the Air Force is responsible for recruiting, organizing, training, and equipping forces in order to meet the current and future operational requirements of DOD's combatant commands.<sup>12</sup> The Air Force is organized into 10 major commands that are assigned a major

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<sup>11</sup>We assessed planning documents established by the Air Force to guide its virtual training efforts against criteria that we developed for national strategies. These criteria are cited in GAO, *Combating Terrorism: Evaluation of Selected Characteristics in National Strategies Related to Terrorism*, [GAO-04-408T](#) (Washington, D.C.: Feb. 3, 2004). Given the size and complexity of the Air Force's virtual training efforts, we concluded that a comprehensive strategy to guide these efforts would be similar in scope and would need to include characteristics similar to those of a national strategy.







<sup>12</sup>The Air Force supports DOD's six geographic combatant commands and three functional combatant commands. The six combatant commands are U.S. Africa Command, U.S. Central Command, U.S. European Command, U.S. Northern Command, U.S. Pacific Command, and U.S. Southern Command. The three functional combatant commands are U.S. Special Operations Command for special operations forces, U.S. Strategic Command for space and nuclear forces, and U.S. Transportation Command for air, land, and sealift forces.

part of the Air Force mission.<sup>13</sup> Numbered Air Forces fall directly under the major commands and are focused on ensuring the readiness of assigned forces. For example, Pacific Air Forces contains three numbered air forces that are located in South Korea, Japan, and Alaska. They provide operational leadership and supervision and are assigned subordinate units, such as wings, groups, and squadrons. The component numbered Air Force is a specialized category of numbered Air Force that is structured to perform an operational and warfighting mission in support of a combatant command. Air Force units, such as an operational flying squadron, are designed to provide a specific set of mission capabilities to meet anticipated operational requirements. See figure 1 for general characteristics of the combat aircraft platforms included in our review. Each combat unit has a Designed Operational Capability statement that it uses for reporting readiness data and includes, among other things, the full range of core missions that the unit can be called on to provide. Air Combat Command has responsibility for developing and managing aircrew training requirements to meet the full range of core missions.

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<sup>13</sup>The Air Force's major commands are Air Combat Command, Air Education and Training Command, Air Force Global Strike Command, Air Force Materiel Command, Air Force Reserve Command, Air Force Space Command, Air Force Special Operations Command, Air Mobility Command, U.S. Air Forces in Europe—Air Forces Africa, and Pacific Air Forces.

**Figure 1: Characteristics of Selected Fourth- and Fifth-Generation Combat Aircraft Platforms**

	Fourth generation platforms				Fifth generation platforms	
	 A-10 Thunderbolt II	 F-15C Eagle	 F-15E Strike Eagle	 F-16 Block 40/50 Fighting Falcon <sup>a</sup>	 F-22 Raptor	 F-35A Lightning II
<b>Primary function</b>	Attack fighter	Tactical fighter	Multirole fighter	Multirole fighter	Multirole fighter	Multirole fighter
<b>Primary missions</b>	Close air support, forward air controller, combat search and rescue	Offensive counter air-escort, defensive counter air	Air interdiction, offensive counter air, defensive counter air, close air support	Suppression of enemy air defenses, defensive counter air, offensive counter air-escort	Defensive counter air, offensive counter air	Offensive counter air, suppression of enemy air defenses, close air support
<b>Secondary missions</b>	Counter fast attack craft, air interdiction	None	Strike coordination and reconnaissance, counter fast attack craft	Offensive counter air, close air support, counter fast attack craft	Air interdiction	Offensive counter air-escort, defensive counter air, forward air controller
<b>Number of active squadrons in fiscal year 2015<sup>b</sup></b>	4	3	6	13	5	1
<b>Number of aircrew</b>	1	1	2	1	1	1

Source: Air Forces (data); Defense Video and Imagery System (photos). | GAO-16-864

<sup>a</sup>Primary and secondary missions listed are for the F-16 Block 50 aircraft.

<sup>b</sup>There were no operational F-35 squadrons in fiscal year 2015.

Throughout their careers, Air Force personnel designated as aircrews participate in several different types of training. When they first enter the Air Force, they receive basic military training. After basic military training, aircrews receive additional training, including undergraduate training by the Air Force’s Air Education and Training Command. Next, aircrews receive initial qualification training that is focused on their career specialties and is provided by the Air Education and Training Command for the F-16, F-15C, and F-35 platforms and by Air Combat Command for the A-10, F-15E, and F-22 platforms. After aircrews complete initial qualification training, they are assigned to a unit, where they complete mission qualification training—additional training on the skills specific to

the unit's capabilities. Air Force Instruction (AFI) 11-202 is the foundational aircrew training instruction that guides training programs for all Air Force flying training.<sup>14</sup> There is an AFI 11-2, Volume 1 for each aircraft platform that specifies the training requirements for aircrews who are assigned to units that operate that platform. For example, F-22 units would use AFI 11-2F-22A, Volume 1. In addition to AFI 11-202, tasking memorandums for the Ready Aircrew Program specify annual continuation training for personnel assigned to combat units. Specifically, Ready Aircrew Program tasking memorandums establish the minimum number of live training events ("sorties") and simulator missions (or virtual training) that aircrews must complete during the annual training cycle to be considered combat mission ready or basic mission capable for the assigned aircraft.<sup>15</sup> Finally, aircrews may complete upgrade training to qualify for positions such as flight leader, instructor pilot, or mission commander.

"Combat mission ready" is a squadron commander certification based on the extent to which aircrews or units have completed and sustained required training. Combat mission ready status is maintained by completing the annual continuation training requirements as prescribed by the unit's AFI 11-2, Volume 1, and the Ready Aircrew Program tasking memorandums. These requirements include completing a specific quantity of relatively advanced individual and unit training events within a given time period. For example, experienced F-22 aircrews must perform 11 defensive counter air training sorties in a 12-month period. In addition, aircrews must achieve and maintain "currency" by completing certain required training events deemed critical to safety of flight, such as landings, low altitude flight, and formation take-offs. For example, experienced F-22 aircrews are to land the aircraft every 45 days or else they would lose landing currency. Currency events are typically achieved by completing the annual training requirements.

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<sup>14</sup>Air Force Instruction 11-202, Volume 1, *Flying Operations: Aircrew Training* (Nov. 22, 2010).

<sup>15</sup>For the purposes of this report, we focus on combat mission ready requirements—the training requirements that indicate that aircrews are qualified, current, and proficient in all of the primary missions tasked to their assigned combat unit. In contrast, basic mission capable aircrews are familiar with all the primary missions tasked to their assigned or attached unit.

Most Air Force combat units report the status of their unit training through the Air Combat Command's Ready Aircrew Program. The Ready Aircrew Program establishes the minimum number of sorties and simulator missions that aircrews must accomplish to sustain combat mission readiness. These sorties and simulator missions are aligned with the unit's primary missions, for which the units must maintain "proficiency," and secondary missions, for which they must maintain "familiarity."<sup>16</sup> For example, the fiscal year 2016 tasking memorandum for the F-15E aircraft specifies that experienced aircrews are required to complete a minimum of 96 annual live sorties (8 per month) to be considered combat mission ready, of which 49 are flown to fulfill primary mission requirements. Similarly, inexperienced aircrews are to complete 108 annual sorties (9 per month), of which 54 are flown to fulfill primary mission requirements. Both experienced and inexperienced aircrews are required to complete 36 annual simulator missions (3 simulator missions per month) to be considered combat mission ready. Units are required to submit an annual end-of-cycle training report covering the 12-month training cycle. These reports include information on the percentage of training accomplished by the unit against the training requirements for its primary and secondary missions, as well as any factors that limit the unit's ability to meet its training requirements, such as the availability of personnel or aircraft.

Virtual training uses aircraft simulators that replicate the live environment for various missions and events. Aircraft simulators can be standalone or linked to information networks that bring together geographically-separated simulators in order to conduct training. Training missions that connect geographically-separated simulators are referred to as distributed mission operations. Distributed mission operations utilize the integration of virtual (e.g., a person training in a simulator) and constructive (e.g., computer-generated) elements to train aircrews. To date, Air Force virtual training efforts have focused mainly on the integration of virtual and constructive aspects of distributed training. However, the Air Force's goal is to integrate live training with distributed mission operations, which is referred to as Live, Virtual, and Constructive (LVC) operational training.

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<sup>16</sup>Proficiency means the aircrew is ready to fly the mission in combat. Familiarity is limited experience with a mission that can be brought up to proficiency with 60 to 90 days of focused training.

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## The Air Force's Process for Developing Combat Aircrew Annual Training Requirements for the Full Range of Core Missions Is Based on Dated Assumptions

The Air Force establishes combat aircrew training requirements for the full range of core missions based on an annual process, but these requirements may not reflect current and emerging training needs, because the Air Force has not comprehensively reassessed the assumptions underlying them. The Air Force process to develop annual training requirements for the aircrews of each type of combat aircraft includes input from the component numbered Air Forces and concludes with an annual training review board that brings together stakeholders. However, these requirements may not reflect current and emerging training needs, because the Air Force has not comprehensively reassessed the assumptions underlying the total number of annual live-fly training sorties by aircraft, the criteria for designating aircrews as experienced or inexperienced, and the mix between live and simulator training since 2012.

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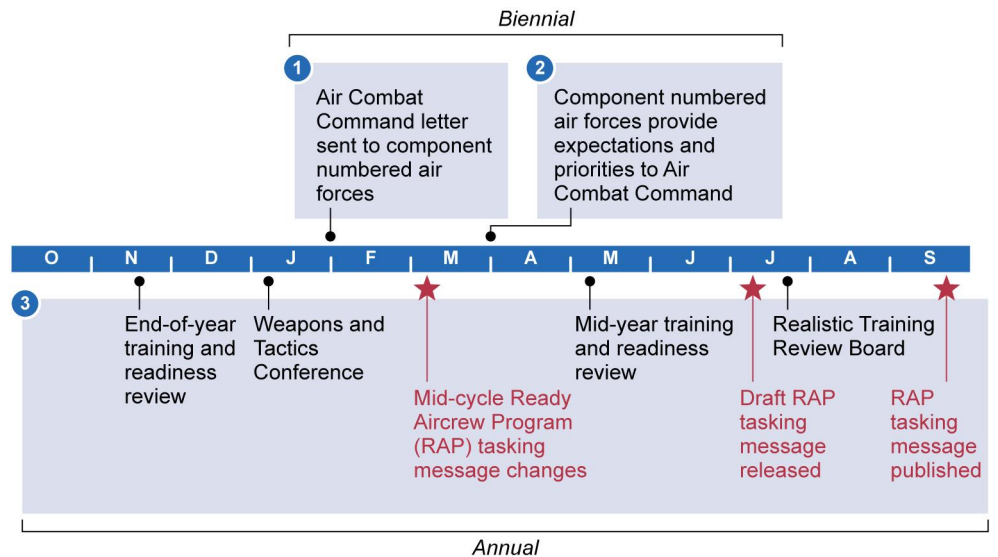
## Air Combat Command Has a Process to Develop Annual Training Requirements for the Full Range of Core Missions

The Air Force has established a process to develop annual training requirements for the aircrews of each type of combat aircraft for the full range of core missions. This process begins with identifying the capability needs of the component numbered Air Forces. Every two years the Vice Commander of Air Combat Command sends a letter to the component numbered Air Forces requesting that they review their primary and secondary mission lists and identify their priorities for Air Force units by mission and type of combat aircraft. The component numbered Air Forces provide their responses to Air Combat Command, describing their expectations and priorities.

Annually, Air Combat Command takes the expectations and priorities identified by the component numbered Air Forces and develops the draft Ready Aircrew Program tasking memorandums that set the annual training requirements for each aircraft. Inputs into development of the draft tasking memorandums include subject-matter experts' assessments

of available training resources and the mid-year and end-of-year training and readiness reviews. The draft Ready Aircrew Program tasking memorandums are then released to the fighter wings to obtain feedback from the operations group commanders on their units' ability to execute the training requirements.<sup>17</sup> Air Combat Command officials consolidate group commander responses and prepare the agenda for the annual Realistic Training Review Board. The review board consists of senior officers who meet over three days during the summer to review the draft Ready Aircrew Program tasking memorandums and make their final recommendations to Air Combat Command. The final adjustments are made by Air Combat Command, and the Ready Aircrew Program tasking memorandums are published before the start of the next fiscal year. Figure 2 summarizes Air Combat Command's process for developing these annual training requirements.

**Figure 2: Air Combat Command's Process for Developing Annual Training Requirements**



Source: Air Force. | GAO-16-864

<sup>17</sup>The annual Weapons and Tactics Conference—which brings together warfighters from across the combat air forces to discuss current issues, look at future issues, and provide solutions for joint and combined employment of airpower—is another opportunity for units to have input into the process for determining annual training requirements.

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The annual training requirements are used to estimate the Air Force's budget request for the flying-hour program, which funds live training. These hours are determined using the Air Force Single Flying Hour Model, which provides the methodology and processes that the major commands use to build their flying-hour programs. The model calculates the flying hours needed based on inputs of the force structure (number of aircraft and aircrew), aircrew data (types and number of aircrew that require training), and live-fly requirements (established in the Ready Aircrew Program tasking memorandums for combat air forces). Headquarters Air Force has overall program management responsibility for the flying-hour program, and major commands are responsible for their requirements and for reporting on how those hours are used. Air Combat Command performs this function for the combat air forces. Once flying hours are allocated to units, the wing commanders manage those hours and report monthly to Headquarters Air Force on the number of hours actually flown.

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### Annual Training Requirements Are Based on Dated Assumptions and May Not Reflect Current and Emerging Training Needs

The Air Force strategy, *America's Air Force: A Call to the Future*, discusses the need to ensure a full-spectrum-capable force that can successfully achieve missions to address a broad range of current and emerging threats.<sup>18</sup> Further, the document states that the design of training should move to achieve sufficient readiness across all mission sets while utilizing virtual training to deliver robust and realistic training against existing and emerging threats. On an annual basis, Air Combat Command makes updates to its training plans based on the process discussed above. These updates can include changes to the aircraft's primary and secondary missions, the allocation of sorties among missions, and the types of required training events, among other changes. However, based on our review of annual training requirements for combat aircrews from 2012 through 2016 and discussions with Air Force officials, we found that Air Combat Command has used the same underlying assumptions to establish its annual training requirements.

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<sup>18</sup>Secretary of the Air Force, *America's Air Force: A Call to the Future* (July 2014).



Specifically, the total annual live-fly training sorties by aircraft, the criteria for designating aircrews as experienced or inexperienced, and the mix between live and simulator training remained the same during this time period and may not reflect current and emerging training needs, as discussed below.

Since 2012, Air Combat Command has set the same requirement for the minimum number of live-fly sorties across all combat aircraft platforms, regardless of the number of core missions assigned to each platform. For fiscal year 2016, for example, the annual requirement for live training sorties for an F-15C, which has two primary missions and no secondary missions, is the same as the annual requirement for an F-35, which has three primary missions and three secondary missions. Officials from Air Combat Command stated that the live-fly sortie requirements are based in part on a 2010 Navy analysis of the number of sorties needed to perform safe flying operations. However, two of four wing commanders we spoke with noted that differences in the number of core missions should be considered when establishing minimum requirements for live training sorties by platform, because of variations in the level of complexity of each aircraft and mission. Air Combat Command officials told us that aircrews flying more complex combat aircraft may require additional training but stated that given the constrained resource environment that DOD and other federal agencies have operated under for the past several years, it would be difficult to increase training requirements and the flying hours required to meet them, even in the face of a potential need. According to its fiscal year 2017 budget request, the Air Force capped its flying-hour programs at a level it determined to be executable and therefore has not been able to grow readiness in the full range of missions over previous years. The budget request also notes that the fiscal year 2017 request is intended to align funding for the flying-hour program to maintain current readiness levels and to meet its highest priorities. However, Air Combat Command officials stated that the analysis needed to determine the relative differences in annual live-fly training requirements based on the complexity of various aircraft and missions had not been conducted.

In addition, the criteria for designating experienced and inexperienced aircrews are based on assumptions that have been in place for the last 40 years. The annual training requirements differ for aircrews designated as experienced and those designated as inexperienced. For example, inexperienced aircrews are required to complete one more training sortie each month than experienced ones. In most cases, aircrews are designated as experienced if they have flown 500 hours in their primary

aircraft.<sup>19</sup> Certain wing and squadron officials offered that, as a result of ongoing deployments to the Middle East, aircrews can achieve 500 hours in their primary aircraft on their first deployment. However, because the scope of missions these aircrews conduct while deployed is narrow, they are not necessarily getting training and experience across the full range of core missions. As a result, when they return from their deployment, these aircrews can be designated as experienced, and therefore they will not get the additional training that they may need. These officials also noted that aircrew capability within the squadron may suffer and there could be less capacity to fill squadron positions with sufficiently qualified aircrews.

Further, annual training requirements since fiscal year 2012 have set the same mix of live and simulator requirements across most of the platforms we reviewed. For all but one combat aircraft platform, both experienced and inexperienced aircrews are required to complete 36 simulator missions per year to be considered combat mission ready.<sup>20</sup> These requirements were established based on the capacity of simulators at one installation and not on an analysis of the training needs of aircrews. According to Air Combat Command officials, the requirement for aircrews to fly 36 simulator missions per year was established based in part on the simulator capacity at Shaw Air Force Base, which had the greatest demands on its simulators because it supports three active fighter squadrons and an Air National Guard squadron. However, one wing commander and two squadron commanders told us that simulator requirements may need to differ among aircraft, depending on the full range of core missions that the aircraft is expected to perform. Additionally, Air Combat Command officials told us that aircrews of fifth-generation aircraft may require additional simulator training. In fact, the simulator training requirements for F-35 aircrews include one more simulator mission per month, for a total of 48 simulator missions per year. However, Air Combat Command did not provide any analysis that supports the need for an additional simulator mission for the F-35 or

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<sup>19</sup> Simulator training accomplished toward annual training requirements is counted as an hour to determine the experienced designation, but cannot exceed 20 percent of the total hours when determining experience level.

<sup>20</sup> Twelve of the 36 simulator missions per year are required to be distributed mission operations.

explain why the F-22, another fifth-generation aircraft, would not also require additional simulator training for its aircrews over what is required for fourth-generation aircraft. Based on our review of fiscal year 2015 data provided by Air Combat Command on available simulator hours at combat air forces bases, we found that there was excess simulator capacity at a number of locations. For example, F-15E squadrons at Mountain Home Air Force Base had an annual capacity of approximately 6,000 hours at their simulator facility, but the annual simulator requirement was approximately 4,000 hours.

According to our prior work on strategic training, training plans should be designed to determine the skills and competencies a workforce needs to achieve current, emerging, and future agency missions and to identify gaps—including those that training and development strategies can help address. Periodic reassessments should be part of a continual effort to evaluate and improve the agency's training and development efforts, and evidence of timely changes should be reflected in those efforts.<sup>21</sup> While Air Combat Command makes updates to the annual training plans each year, it has not comprehensively reassessed the assumptions underlying its annual training requirements—including, but not limited to, the total annual training requirements by aircraft, the criteria for designating aircrews as experienced or inexperienced, and the mix between live and simulator training—and updated these new assumptions in its training plans.

Officials at Air Combat Command told us that they had two studies under way to help inform the needed analysis to address these issues, but the studies had not been completed at the time of our review. For example, Air Combat Command has an ongoing study evaluating the current requirement that aircrews accomplish 500 flying hours in order to be considered experienced. The study is intended to explore various options for the F-22, including adjusting the current 500-hour requirement that is used to determine when to designate an aircrew as experienced. Air Combat Command officials stated that they may explore applying the results of this study to other combat aircraft. Additionally, in 2016, Air Combat Command issued a proposal to study the minimum, safe, and optimal numbers of live-fly and simulator training sorties aircrews must

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<sup>21</sup>[GAO-04-546G](#).

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complete each year. The study is intended to include an examination of the minimum number of sorties required by mission type, the definition of proficient and familiar, and the mix of live and simulator training to support each mission set, among other areas. According to officials from Air Combat Command, the results of the study are expected to be available in 2017.

While these initiatives are a positive step, it is too early to determine how the results of the two studies will be used to implement changes to the Air Force's annual training requirements or whether the scope of the studies is sufficient to address all of the assumptions that need to be revisited. Without fully reassessing the assumptions underlying its annual training requirements, the Air Force cannot be certain that its annual training plans are aligned with its stated goals to ensure a full-spectrum-capable force that can successfully achieve missions across a broad range of current and emerging threats.

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## **Combat Fighter Squadrons Are Not Meeting All of Their Annual Training Requirements across the Full Range of Core Missions, and Completed Training Is Not Being Evaluated for Effectiveness**

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### **Combat Fighter Squadrons Are Not Meeting All of Their Annual Training Requirements across the Full Range of Core Missions**

Based on our analysis of data on the completion of annual training, we found that combat fighter squadrons were generally able to complete mission training requirements for ongoing contingency operations, such

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as close air support to ground forces, but were unable to meet annual training requirements across the full range of core missions.<sup>22</sup>

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### Various Factors Affected the Ability of Combat Fighter Squadrons to Complete Annual Training across the Full Range of Core Missions

Wing and squadron commanders cited various factors that have limited the ability of their squadrons to complete training across the full range of core missions. We analyzed the information we obtained from our interviews with four wing commanders and eight squadron commanders—including commanders overseeing aircrew training for both fourth- and fifth-generation aircraft—and found that they identified similar training limitations.<sup>23</sup> They cited four common limitations: the maintenance unit's ability to provide adequate numbers of aircraft for training, high deployment rates, adversary air tasking, and manpower shortfalls in the squadrons.

Seven of the squadron commanders we interviewed told us that their maintenance unit's ability to provide an adequate number of aircraft affected their squadrons' ability to complete their annual training requirements.<sup>24</sup> These commanders stated that in recent years, maintenance units for U.S.-based squadrons have been consistently manned below their authorized levels. Air Force officials told us these

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<sup>22</sup>The number and type of primary and secondary missions can differ both by aircraft and between fiscal years. For example, the full range of core missions for an F-16 Block 50 in fiscal year 2015 included three primary missions—defensive counter air, offensive counter air-escort, and offensive counter air-suppression of enemy air defenses—and four secondary missions—air interdiction/offensive counter air, close air support, counter fast attack craft/fast inshore attack craft, and red air. In contrast, the core missions for an F-22 in fiscal year 2015 included three primary missions—defensive counter air, offensive counter air, and offensive counter air-attack operations—and one secondary mission—red air.

<sup>23</sup>We interviewed commanders from seven of the thirty-one fighter squadrons that were active in fiscal year 2015 and the commander from an F-35 squadron that became operational in August 2016. The views we obtained from these interviews are not generalizable, but they reflect a wide range of perspectives across the combat air forces.

<sup>24</sup>According to the F-35 squadron commander we spoke with, maintenance will be fully manned until fiscal year 2019.

shortfalls in maintenance personnel limit their ability to produce the number of aircraft required to meet annual live-fly training requirements.

Squadron commanders we interviewed also identified factors that can limit the time aircrews have available to meet annual training requirements, including the following:

*High deployment rates*—Four squadron commanders told us that high deployment rates limited the ability of aircrews to conduct annual training across the full range of core missions between deployments. Certain fighter squadrons have been deploying every eighteen months for a 6-month period each time. During these 6-month deployments, squadrons have been flying primarily close air support missions and are unable to be proficient across their full range of core missions. When they return from deployment, squadrons have 12 months to rebuild proficiency across their full range of core missions before their next six-month deployment. Some squadron commanders told us that this high deployment rate typically reduces aircrews' 12-month training schedule by at least 2 months, because they must focus on close air support training in preparation for the next deployment.

*Adversary air tasking*—Five squadron commanders told us that their squadrons have been tasked heavily to provide adversary air for large force exercises,<sup>25</sup> such as joint and multinational "Red Flag" exercises designed to provide realistic training in a contested or degraded environment.<sup>26</sup> According to Air Force officials, the demand for adversary air at large force exercises has increased because in fiscal year 2015 one of the two dedicated adversary air squadrons at Nellis Air Force Base was eliminated because of budgetary reductions. To help mitigate this reduction in adversary air capability, Air Combat Command increased the tasking of fighter squadrons to provide this capability. For example, an F-15E squadron commander told us that his squadron will have been tasked 3 of the first 9 months of fiscal

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<sup>25</sup>Adversary air or "red air" missions are those in which the aircrews play the role of an adversary threat in support of aircrews flying a "blue" (U.S. and allied force) training sortie.

<sup>26</sup>According to the Air Force, Red Flag is the U.S. Air Force's premier air-to-air combat training exercise. Participants often include both United States' and allied nations' combat air forces. The exercise provides aircrews the experience of multiple, intensive air combat sorties in the safety of a training environment.

year 2016 to provide adversary air for various exercises, including a Red Flag exercise. According to one squadron commander, participation as adversary air in these large force exercises can take up to 2 months out of the squadron's training cycle to prepare for and execute this role. This limits the time available to conduct annual training for the squadron's primary and secondary missions.

*Squadron manpower shortfalls*—Five squadron commanders told us that shortfalls in their squadron manning can limit the time aircrews have to meet their annual training requirements. Specifically, with fewer aircrews assigned to a squadron, aircrews are required to take on a larger share of the administrative functions of the squadron, including scheduling training and weapons evaluation. This challenge can be greater for squadrons operating under the total force integration construct, which uses aircrews from reserve component squadrons to supplement the aircrews in active-duty squadrons. For example, the two F-22 squadrons in the 1st Fighter Wing are integrated with F-22 aircrews from the 192nd Fighter Wing of the Virginia Air National Guard. As a result, there are fewer active-duty aircrews in the squadron. However, according to both F-22 squadron commanders, these aircrews are required to perform the administrative duties for the full squadron, because the Air National Guard aircrews are typically available only on the weekends, and their time with the squadron is used for training. Both F-22 squadron commanders we spoke with told us that even if maintenance personnel could generate the number of aircraft needed to meet their annual training requirements, the squadrons would be unable to conduct additional training, because their aircrews' availability is limited by their other assigned responsibilities within the squadrons.

In addition to factors that limit the ability of squadrons to meet their annual training requirements, the squadron commanders we spoke with also cited a number of factors that affected the training that aircrews are able to accomplish. The extent to which these factors affected training differed between fourth- and fifth-generation aircraft. For fourth-generation aircraft, five squadron commanders told us that the considerable number of taskings to perform adversary air at large force exercises do not provide effective training opportunities. Additionally, some of these commanders expressed concern that adversary air taskings would increase and that recent changes to their annual training requirements

may mask this problem. Specifically, prior to fiscal year 2016, the annual training requirements for certain combat aircrews set a cap on the annual number of adversary air sorties that could count toward their combat mission ready status.<sup>27</sup> However, in the fiscal year 2016 training requirements, that cap was removed, allowing for all adversary air sorties to count toward the designation of combat mission ready. Two squadron commanders told us they were concerned that this change could result in masking the readiness ratings for squadrons, since overflying adversary aircraft sortie requirements provides limited training compared with their full range of core missions, but still allows the aircrews to be designated as combat mission ready. According to Air Combat Command officials, this change was made to encourage aircrews to accurately log adversary air sorties. These officials stated that previously some aircrews may have been flying in an adversary air role, but would complete some other limited type of training maneuver so that they could record the sortie as a different mission that would count toward their combat mission ready status.

For fifth-generation aircraft, all three squadron commanders we interviewed cited various factors affecting training, including airspace and training range limitations and the availability of adversary air to fly against. For example, two F-22 squadron commanders at Langley Air Force Base told us that the size of the base's airspace limits their ability to train for their more complex missions, including offensive counter air and defensive counter air missions, because the available airspace constrains the capabilities they are able to deploy. Additionally, all three of the commanders for squadrons flying fifth-generation aircraft told us that limits in training range capabilities, such as threat replicators and targets, affected the training completed at smaller regional training ranges, as well as at larger training ranges such as the Utah Test and Training Range and the Nevada Test and Training Range. According to these officials, the training ranges lack many of the more advanced threat replication systems that can challenge F-35 and F-22 capabilities and provide effective training across their full range of core missions. According to training range officials at the Nevada Test and Training Range, the

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<sup>27</sup>In the annual training requirements for fiscal year 2015, both experienced and inexperienced F-16 aircrew could count only 14 adversary air sorties toward their combat mission ready status, while F-15E aircrews could count only 8 for experienced aircrews and 9 for inexperienced aircrews.



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current range capabilities are adequate to replicate only a “first Gulf War”-era threat scenario.

Air Combat Command has implemented some initiatives to help increase the number of training sorties that aircrews are able to conduct. However, these initiatives can further affect the training that is completed. For example, Air Combat Command has received increased funding for “Red Flag” exercises to enable a fourth annual exercise at Nellis Air Force Base. These exercises can provide a high-end, realistic training environment for aircrews. However, officials explained that Red Flag exercises require a significant adversary air presence to provide high quality training for the participants. As discussed above, these exercises can result in squadrons being overtasked to fly as the adversary force, which can further limit aircrews’ availability to train to their full range of core missions. To help mitigate the burden on squadrons, in December 2015, the Air Force began contracting with a private company to provide adversary air capabilities on a short-term basis to support exercises at Nellis Air Force Base. According to Air Force officials, in fiscal year 2017, the Air Force plans to spend about \$25 million to contract for six A-4 aircraft (a legacy fighter platform first developed in the 1950s) to provide adversary air for two months of exercises.

In addition, squadron commanders, in coordination with maintenance groups, have developed some initiatives to increase the number of sorties they are able to produce, but these initiatives can further limit the training that is completed. For example, seven squadron commanders told us they have implemented the use of “hot pits”—a practice where the aircrew flies a sortie, lands and refuels, and then flies another sortie without shutting down the aircraft. This practice minimizes the aircraft repairs that may arise between sorties if an aircraft is shut down and then restarted. Five squadron commanders told us that they also occasionally use tanker aircraft to refuel their squadrons in the air during training. Both “hot pitting” and aerial refueling practices produce an additional sortie for the aircrews that day. However, squadron commanders told us that such practices prevent the aircrews from getting the full benefit from both training sorties. Specifically, these practices do not allow the aircrews to receive a mission brief and debrief for both sorties, a critical learning component of effective training. In addition, squadron commanders told us that without the benefit of a full briefing for the second training sortie, the aircrews are not able to conduct their more complex missions that require additional instruction to be effective. Figure 5 shows an F-22 aircraft conducting a “hot pit” refueling and an F-15C aircraft conducting an aerial refueling.

**Figure 3: F-22 Aircraft Conducting a “Hot Pit” Refueling and an F-15C Aircraft Conducting an Aerial Refueling**

Source: Defense Video and Imagery Distribution System. | GAO-16-864

The Air Force has a number of efforts under way to study or address some of the factors that limit the ability of fighter squadrons to meet annual training requirements and that affect the training that aircrews are able to accomplish, but it will likely take time before the full benefit of these efforts can be assessed. For example, the Air Force has announced several initiatives to manage the shortage of maintenance personnel, including hiring additional maintenance personnel, temporarily transitioning active-duty maintenance units from some legacy aircraft, and offering selective reenlistment bonuses as an incentive to improve retention, among other initiatives. According to Air Force officials, it may take several years before newly hired maintenance personnel will have the training and experience they need in order to improve aircraft availability rates. In addition, Air Combat Command officials told us that there is an ongoing study reviewing adversary air requirements. Further, the Air Force has taken steps to upgrade its training infrastructure, including training ranges. For example, in its fiscal year 2017 budget request, the Air Force requested a funding increase of about \$35 million for the maintenance and sustainment of 21 training ranges, including installation of additional threat emitters and expansion of communication capabilities between air and ground forces.

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## The Air Force Does Not Systematically Evaluate the Effectiveness of Completed Training against Expectations

Air Force processes used to record and monitor combat fighter squadrons' annual training are focused on the frequency of training completed to meet annual requirements and do not include a systematic evaluation of the effectiveness of that training against established expectations. Squadron commanders track and report monthly and 3-month "look-backs" to determine if aircrews are meeting their prescribed annual training requirements. These assessments emphasize the frequency of training and inform the designation of aircrews as combat mission ready.<sup>28</sup> According to Air Force officials, squadron commanders are delegated with the authority to determine whether a sortie should "count" toward meeting the annual training requirements. These determinations are based on Air Force guidance—including AFI 11-2, Volume 1—that establish common training standards for each type of combat aircraft and documentation supporting the Ready Aircrew Program that provides a list of training expectations that include the types of events that should be included in a training mission to be considered effective.<sup>29</sup> For example, the Ready Aircrew Program tasking memorandums establish when a non-effective sortie should be recorded, for example when training limitations are caused by weather conditions, aircraft maintenance or weapon malfunctions, or cancellation of training support elements—which can include adversary air or air-refueling assets.

Air Combat Command uses quantitative data on the completion of annual training requirements and qualitative information on broad factors that affect training in various forums that discuss training. However, our review

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<sup>28</sup>Aircrews that do not meet the training requirements during the look-back period are designated as non-combat mission ready or non-basic mission capable, or the aircrew may be placed in probation status for one month at the squadron commander's discretion. Aircrews designated as non-combat mission ready or non-basic mission capable must complete a recertification program established by the squadron commander to regain combat mission ready or basic mission capable status, while aircrews on probation must reestablish a complete one-month look-back by the end of the probation period.

<sup>29</sup>For example, for an F-22 aircrew conducting an offensive counter air mission, the training expectations include events such as multi-ship formations, high/medium altitude operations, and rules of engagement compliance, among others.

of documentation supporting these forums found that the Air Force does not systematically evaluate the extent to which completed training met expectations or the degree to which certain challenges have affected training. In our review, we identified two forums that Air Combat Command uses to oversee training completion and discuss training challenges. These forums are focused on a review of training completion data and include discussions of factors that affect training completion and the effectiveness of training. For example, at the end of each fiscal year, Air Combat Command aggregates combat fighter squadrons' training completion data for its end-of-year training and readiness review. Tables are compiled by squadron and by aircraft type to provide a comparison of annual training completion data against each aircraft's full range of core missions. According to Air Combat Command officials, the squadron commanders are required to submit a list of qualitative factors that, in general, affected the completion and effectiveness of the squadron's training. These factors are then discussed at an end-of-year training and readiness review, which is an informational briefing used to inform the state of readiness of the combat air forces.

In addition, the annual Realistic Training Review Board provides another forum for discussion between Air Combat Command and leadership at the group commander level on training challenges. According to officials and our review of documentation discussed during these forums, these discussions are focused on a number of issues that affect training, such as funding for the flying-hour program and distributed mission operations. Further, the Board identifies a number of action items related to training that need to be addressed. For example, output from the 2015 Board included actions directed toward improving cruise missile threat replication, targets for F-22 ranges, and opportunities for certain weapons employment for F-15C squadrons. While these forums provide an opportunity for Air Force officials to discuss and identify training challenges, neither includes a systematic evaluation of the effectiveness of training against established expectations in order to identify limitations to the effectiveness of training.

The lack of a systematic evaluation of the effectiveness of training against established expectations has affected the Air Force's ability to make informed resource decisions to improve its training infrastructure. For example, training range officials from both the Nevada and Utah Test and Training Ranges told us that without information on the gaps between aircraft training requirements and current range capabilities, they were not well positioned to make informed decisions on where to focus their resources to improve range capabilities. An official from the Nevada Test

and Training Range told us that identifying training gaps is becoming even more important, because the new F-35 aircraft will have additional range requirements that exceed those of fourth-generation fighter aircraft. However, under current Air Force guidance, the Nevada Test and Training Range is required to provide capabilities only for large force exercises and does not currently possess the range capabilities needed to support a number of training events identified in the training expectations for the F-35, including close air support in an urban terrain and certain attack events, among others.

We found that the Air Force does not systematically evaluate the effectiveness of training against established expectations for two reasons. First, Air Combat Command has not established the desired learning objectives and training support elements needed to accomplish the training expectations in its annual Ready Aircrew Program tasking memorandums. Our prior work on strategic training notes that agencies should systematically evaluate the effectiveness of their training efforts and collect data corresponding to established training objectives to continually improve, deliver, and enhance training and ensure the effective allocation of resources.<sup>30</sup> In contrast to the Ready Aircrew Program tasking memorandums, we found that documentation underpinning other types of aircrew training, such as mission qualification training and upgrade training, provide more detailed information on critical features needed to measure the effectiveness of training sorties. For example, the upgrade training syllabus for the F-22 provides desired learning objectives for an aircrew to conduct an effective defensive counter air sortie and information on the number of adversary aircraft required and the period of time that should be spent defending a target. However, the Ready Aircrew Program tasking memorandum for the F-22 does not include similar information on an effective defensive counter air sortie. Instead, it provides only a list of expectations that could be included in a training mission, along with information on the desired amounts of adversary air needs.

Second, the current process used by squadrons to report information on their training completion does not collect data on the effectiveness of the training against established expectations. Documentation supporting the

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<sup>30</sup>[GAO-04-546G](#).

Ready Aircrew Program notes that credible and detailed training accomplishment reporting provides an accurate assessment of readiness and the data needed to advocate for adequate resources. This documentation notes that Air Combat Command expects to see data that document the underlying challenges to providing an effective training program. However, the form that aircrews are required to complete following a training sortie requires them to record the number of flying hours and other information, such as the type of mission, but does not capture information on the ability of aircrews to meet the training expectations established in the Ready Aircrew Program. For example, the form does not provide the opportunity to record the training support elements involved in the sortie, such as the number of adversary aircraft involved and the threat replicators available. In the absence of a process to obtain this information, squadron commanders are also unable to collect data corresponding to the effectiveness of annual training completed to meet expectations or the degree to which certain challenges affected training. One squadron commander we interviewed has developed internal guidance for aircrews to determine whether a sortie was effective and should count toward the annual training requirements. This commander provides an annual guidance letter to be used within the squadron that sets the minimum requirements that must be met to log an effective training sortie. However, based on our interviews with other squadron commanders, this practice is not being consistently performed across all squadrons.

Officials from Air Combat Command told us that they had not developed more detailed expectations for combat fighter squadron commanders to measure and collect data on the effectiveness of annual training for several reasons. These officials stated that Air Force instructions and the Ready Aircrew Program provide squadron commanders with the authority to determine if a training sortie was effective and should be counted toward meeting annual training requirements. Further, these officials noted that aircrews have been limited in their ability to complete annual training requirements due to the factors previously discussed in this report and that having more detailed expectations for measuring the effectiveness of annual training could make it more difficult for aircrews to achieve a combat mission ready status. In addition, Air Combat Command officials stated that the need to complete training against more detailed expectations and collect information on training effectiveness should be balanced against the time and other factors that would be required to collect the information.

Given the range of factors that have limited the ability of combat fighter squadrons to complete annual training requirements, having a consistent basis for monitoring training results is critical in tracking progress toward achieving the Air Force's goal of training units for the full range of core missions. Moreover, Air Combat Command has stated its goal of moving to a training model based on the effectiveness of training, using quantifiable levels of performance, rather than the current model focused on the frequency of training. Without a process to systematically measure and collect data on the effectiveness of training against established expectations, the Air Force will not be well positioned to improve, deliver, and enhance training or allocate resources to address factors that limit the effectiveness of training.

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## Air Force Planning Documents for Virtual Training Do Not Include All Desirable Characteristics of a Comprehensive Strategy

The Air Force's virtual training plans do not include all desirable characteristics of a comprehensive strategy, such as a risk-based investment strategy or a time line for addressing training needs. We have previously reported that when addressing national or department-wide issues, it is standard practice for organizations to have a strategy that includes desirable characteristics such as establishing goals and objectives, identifying actions for addressing those objectives, allocating resources, identifying roles and responsibilities, and measuring performance against objectives, among others.<sup>31</sup>

In recent years, the Air Force has developed some planning documents to guide its virtual training efforts. In 2013, for example, the Headquarters Air Force issued its *United States Air Force Live Virtual Constructive Operational Training Flight Plan*. The flight plan was the first Air Force level strategic document to address LVC operational training from an Air Force-wide perspective. The document established the Air Force's broad vision for the future of the LVC operational training environment and highlighted areas that needed attention to advance the program and

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<sup>31</sup>[GAO-04-408T](#).

realize its full potential. In addition, in 2014, Air Combat Command issued the *Combat Air Force Live, Virtual, Constructive Vision*, which describes the command’s goals for the integration of LVC operational training capabilities, along with the priority tasks and general timeframes for implementation. Further, in 2015, Air Combat Command released the *Combat Air Force Live, Virtual, Constructive Roadmap* that sets near-, mid-, and far-term tasks that are required to better define needed training capabilities.

While the Air Force has issued these planning documents to help guide its LVC operational training initiatives for the combat air forces, they do not include all of the characteristics we have identified as being desirable in comprehensive strategies.<sup>32</sup> Based on our analysis of the *United States Air Force Live Virtual Constructive Operational Training Flight Plan* and the *Combat Air Force Live, Virtual, Constructive Vision*, we found that the Air Force has only partially addressed or has not addressed most of the desirable characteristics, as shown in table 1.<sup>33</sup>

**Table 1: Extent to Which the United States Air Force Live Virtual Constructive Operational Training Flight Plan and Combat Air Force Live, Virtual, Constructive Vision Address GAO’s Desirable Characteristics for Comprehensive Strategies**

Desirable Characteristic	Description	United States Air Force Live Virtual Constructive Operational Training Flight Plan	Combat Air Force Live, Virtual, Constructive Vision
Problem definition and risk assessment	Defines the particular problem the strategy is directed toward and includes an analysis of threats to critical operations.	<b>Partially Addresses.</b> Discusses risk and defines the program but does not include a risk assessment that identifies the threat and vulnerabilities the strategy is directed toward.	<b>Partially Addresses.</b> Discusses the problem definition but does not include a risk assessment that identifies the threat and vulnerabilities the strategy is directed toward.

<sup>32</sup>We assessed these two documents against criteria that we developed for national strategies. These criteria are cited in GAO, *Combating Terrorism: Evaluation of Selected Characteristics in National Strategies Related to Terrorism*, [GAO-04-408T](#) (Washington, D.C.: Feb. 3, 2004). Given the size and complexity of the Air Force’s virtual training efforts, we concluded that a comprehensive strategy to guide these efforts would be similar in scope and would need to include characteristics similar to those of a national strategy.

<sup>33</sup>For the purposes of our review, we focused our evaluation on planning efforts at Headquarters Air Force, which is responsible for Air Force-wide virtual training and at Air Combat Command, which is responsible for virtual training within the combat air forces.



Desirable Characteristic	Description	United States Air Force Live Virtual Constructive Operational Training Flight Plan	Combat Air Force Live, Virtual, Constructive Vision
Purpose, scope, and methodology	Discusses why the strategy was produced, the scope of its coverage, and the process by which it was developed.	<b>Partially Addresses.</b> Discusses the strategy’s purpose, but does not fully discuss its scope and methodology, including the major functions and activities it covers and the process of how it was developed.	<b>Partially Addresses.</b> Discusses why the strategy was produced and its scope, but does not describe the process of how it was developed.
Organizational roles, responsibilities, and coordination	Identifies who will be implementing the strategy, defines what roles will be compared to others, and discusses mechanisms for coordination of efforts.	<b>Addresses.</b>	<b>Addresses.</b>
Integration and implementation	Discusses how the strategy relates to other strategies’ goals, objectives, and activities.	<b>Partially Addresses.</b> Discusses supporting DOD guidance and strategies, but does not provide details on implementation plans.	<b>Partially Addresses.</b> Describes broad phases of implementation, but does not provide guidance on how implementing parties link their roles, responsibilities, and capabilities.
Goals, subordinate objectives, activities, measures of performance, and monitoring of progress	Defines what the strategy is trying to achieve and identifies steps to achieve those results, as well as the priorities, milestones, and measures to gauge results and monitor progress.	<b>Partially Addresses.</b> Includes end-state goals, along with some objectives, activities, and milestones, but no specific performance measures or process to monitor progress are identified.	<b>Partially Addresses.</b> Includes objectives across three implementation phases but no specific performance measures or process for monitoring progress are identified.
Resources, investments, and risk management	Identifies what the strategy will cost, the sources and types of resources, and where resources and investments should be targeted.	<b>Does not address.</b>	<b>Does not address.</b>

Source: GAO analysis of Air Force virtual training strategic documents | GAO-16-864.

Note: Explanations are provided only for why an element partially meets GAO criteria for desirable characteristics of strategy documents. A document “addresses” a characteristic when it explicitly cites all elements of the characteristic, even if it lacks specificity and details and thus could be improved upon. A document “partially addresses” a characteristic when it explicitly cites some, but not all elements of the characteristic. Within our designation of “partially addresses” there is wide variation between a document that addresses most of the elements of a characteristic and a document that addresses few of those elements. A document “does not address” a characteristic when it does not explicitly cite or discuss any elements of a characteristic, or when any implicit references are either too vague or general.

For one characteristic, we found that both of the planning documents contained the desirable elements. For example, *United States Air Force Live Virtual Constructive Operational Training Flight Plan* establishes the roles and responsibilities for organizations involved in the implementation of LVC operational training initiatives, including Headquarters Air Force

and the major commands, such as Air Combat Command. It also discusses the governance structure and the role of primary support organizations, such as the LVC Council of Colonels and the Distributed Warfare Integration Cell, which are intended to identify and prioritize LVC operational training gaps and shortfalls that cut across the major commands. For other characteristics, we found that some of the elements were included, but not all. For example, the *Combat Air Force Live, Virtual, Constructive Vision* identifies a number of implementation tasks across a range of implementation phases, but it does not establish priorities, specific milestones, or performance measures. Our prior work has shown that these elements can help to ensure effective implementation and accountability to achieve results. Further, for some characteristics, we determined that neither planning document contained any of the desirable elements. For example, neither of the two documents identified what the virtual training efforts will cost, the sources and types of resources required, or the prioritization of needed investments. Our prior work has shown that a risk-based investment strategy may be used to define and prioritize related resource and operational requirements, as well as to develop a time line for obtaining capability needs. A risk-based investment strategy includes five key phases: (1) setting strategic goals and objectives and determining constraints, (2) assessing risks, (3) evaluating alternatives for addressing these risks, (4) selecting the appropriate alternatives, and (5) implementing the alternatives and monitoring the progress made and results achieved.<sup>34</sup>

We identified several areas where the Air Force is making significant investments in virtual training, despite the lack of a comprehensive strategy needed to guide and prioritize these efforts. In some cases, this has led to investments that may not maximize available Air Force resources. For example, the Air Force is building an F-22 simulator facility at Nellis Air Force Base. The facility is expected to be completed in fiscal year 2017, at an estimated cost of \$14 million. However, according to officials at Nellis Air Force Base, the Air Force does not expect the four simulators to arrive there until fiscal year 2019 at the earliest, leaving the facility potentially unutilized during that interim period. Additionally, officials identified a number of examples where the Air Force has not

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<sup>34</sup>See GAO, *Intelligence, Surveillance, and Reconnaissance: DOD Needs a Strategic, Risk-Based Approach to Enhance Its Maritime Domain Awareness*, [GAO-11-621](#) (Washington, D.C.: June 20, 2011) and [GAO-04-408T](#).

made cost-efficient investments in virtual training systems. For instance, officials from Headquarters Air Force noted that different versions of the F-16 simulator have been procured within the active, guard, and reserve components, which create inefficiencies among the components as they develop, procure, and sustain these differing simulators.

Air Force officials also provided examples of prior investments in simulators that do not meet the training needs of aircrews across their full range of core missions. For example, the Air Force Audit Agency reported in 2013 that Air Force officials had not adequately defined F-22 simulator requirements, because the procurement contracts did not include simulator performance specifications. Instead, all F-22 simulators shared a single training system specification that provided insufficient technical detail as to what the Air Force considered an acceptable product.<sup>35</sup> As a result, F-22 squadrons at Langley Air Force Base have traveled to the Air Combat Simulator facility in Marietta, Georgia to utilize the contractor-owned F-22 simulators at that location. Officials from the F-22 squadrons told us that the contractor-owned simulators provide higher-quality training than the simulators at their home station and allow them to train in a more realistic threat environment. For 2015, the cost of using the Air Combat Simulator facility in Marietta was around \$10,000 per day, plus travel costs for the aircrews. According to an official from Air Combat Command, F-22 squadrons at Langley Air Force Base utilized the Air Combat Simulator facility for 5 days in calendar year 2015 and, as of February 2016, have utilized the facility for 11 days in calendar year 2016. In addition, based on our review of simulator utilization data, the F-22 simulators at Langley Air Force Base remain underutilized.

Air Combat Command has identified significant requirements for LVC operational training capabilities that will require funding over the next several years. Specifically, the Air Force estimates that LVC operational training requirements will total approximately \$3.8 billion in funding for fiscal years 2015 through 2019. This includes funding to maintain simulator currency with the aircraft, modernize simulator visual systems, secure virtual training networks, and hire additional simulator instructors. Air Force officials told us that concern over simulator information

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<sup>35</sup>Air Force Audit Agency, *Acquisition Management of Fifth-Generation Fighter Aircraft Simulators*, F2013-0007-L30000 (Feb. 26, 2013).

security—particularly for fifth-generation aircraft—will require network upgrades to ensure that the infrastructure has adequate controls in place to protect data. According to these officials, network security and information assurance are currently the most pressing challenges in the Air Force’s virtual training environment.

While the *United States Air Force Live Virtual Constructive Operational Training Flight Plan* and the *Combat Air Force Live, Virtual, Constructive Vision* demonstrate some effort toward defining a broad strategy for the Air Force’s virtual training efforts, the Air Force lacks a comprehensive strategy, because it has not fully refined its planning documents to achieve its training vision, for example by developing a risk-based investment strategy that identifies and prioritizes capability needs and includes a time line for addressing them. The *Flight Plan* recognizes the need for an investment strategy to prioritize and guide investments in future LVC operational training capabilities; however, officials told us that development of an investment strategy has not begun. Additionally, as we reported in 2012, the Air Force does not have a methodology to fully account for and track the costs of its virtual training enterprise. Headquarters Air Force officials told us that they have made some progress in tracking operation and maintenance costs for virtual training but none toward tracking investment funding. As we reported in 2012, identifying virtual training costs is challenging, because funds that support virtual training are dispersed across multiple program elements. Headquarters Air Force officials told us that they have identified approximately 75 program elements that support the LVC operational training program, but that it is difficult to determine if these elements represent all required funding. Further, these officials told us that these 75 program elements are not consistently monitored, because the automation required to monitor and conduct any trending analysis on the program elements does not currently exist.

Given the importance of an integrated LVC operational training environment to the future of Air Force training, a comprehensive strategy would help ensure that the Air Force develops the capabilities needed to meet its virtual training needs. Without a comprehensive approach to virtual training that includes a risk-based investment strategy and a time line for prioritizing and addressing capability needs, the Air Force may be slow to develop needed capabilities and therefore could increase risk for fifth-generation fighter aircraft, whose training will require a robust, realistic virtual training environment.

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## Conclusions

The Air Force has identified the need to ensure a full-spectrum capable force that can successfully achieve missions to address a broad range of current and emerging threats. However, the Air Force has not completed the analysis and planning needed to ensure that aircrew training requirements fully align with those goals. Specifically, Air Combat Command has not comprehensively reassessed the assumptions underlying its annual training requirements, some of which have been in place for 40 years. Without fully reassessing the assumptions underlying its requirements, the Air Force cannot be certain that its annual training plans are aligned with its stated goals to ensure a full-spectrum capable force that can successfully achieve missions across a broad range of current and emerging threats. In addition, Air Combat Command has not identified desired learning objectives or training support elements necessary to accomplish the training expectations in its annual Ready Aircrew Program tasking memorandums. Having a consistent basis for monitoring training results is critical for tracking progress in achieving the Air Force's goal of training units for the full range of core missions. Also, without a process to collect data to assess the effectiveness of the training, the Air Force may not be well positioned to improve, deliver, and enhance training or allocate resources to address factors that limit the effectiveness of training. Further, the Air Force lacks a comprehensive strategy for virtual training, because it has not fully refined its planning documents to achieve its training vision, for example by developing a risk-based investment strategy and a time line for prioritizing its needs. Achieving this vision is critical; as new fifth-generation aircraft become operational they will require a robust and realistic virtual training environment to train to their full capabilities.

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## Recommendations for Executive Action

To ensure that annual training plans are aligned with the Air Force's stated goals to ensure that its forces can successfully achieve missions across a broad range of current and emerging threats, we recommend that the Secretary of Defense direct the Secretary of the Air Force to comprehensively reassess the assumptions underlying its annual training requirements—including, but not limited to, the total annual training requirements by aircraft, the criteria for designating aircrews as experienced or inexperienced, and the mix between live and simulator training—and make any appropriate adjustments in future training plans.

To improve the Air Force's ability to consistently monitor training results and better position it to allocate resources to address factors that limit the effectiveness of training, we recommend that the Secretary of Defense direct the Secretary of the Air Force to

- establish desired learning objectives and training support elements needed to accomplish the training expectations in its annual Ready Aircrew Program tasking memorandums and
- develop a process to collect data to assess the effectiveness of annual training against these features.

To improve the Air Force's ability to develop the capabilities needed to meet its virtual training needs, we recommend that the Secretary of Defense direct the Secretary of the Air Force to continue to refine its planning for virtual training to incorporate the desirable characteristics of a comprehensive strategy, including developing a risk-based investment strategy that identifies and prioritizes capability needs and includes a time line for addressing them.

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## Agency Comments and Our Evaluation

In written comments on the non-public sensitive version of this report,<sup>36</sup> DOD did not concur with the first and second recommendations, and concurred with the third recommendation. DOD's comments are reprinted in their entirety in appendix II.

In its comments, DOD stated it did not concur with our first recommendation, but DOD identified some actions it was taking to address the intent of the recommendation. Specifically, DOD stated that the Air Force has already begun a comprehensive reassessment of the assumptions underlying its annual training requirements and that those results will be used to influence future training plans. More specifically, DOD stated that the Air Force has directed a study that will reassess the full spectrum of the Air Force's Ready Aircrew Program training requirements and provide a range of readiness levels associated with varying training levels. According to DOD's comments, the estimated completion date of the study is September 2017. DOD also stated that a

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<sup>36</sup>GAO-16-635SU.

second study is reviewing the factors that contribute to the Air Force's aircrew experience designation. For example, the Air Force has completed a review of the F-22 that resulted in substantive changes for the F-22 experiencing criteria. DOD's comments further stated that the Air Force has directed a follow-on study for all fourth-generation fighter aircraft with an estimated completion date for this study of September 2017. As we noted in our report, the Air Force's initiatives represent positive steps to study aspects of the combat aircrew annual training requirements. However, given that these studies are in the initial stages or not yet underway, it is unclear whether the scope of the studies is sufficient to address all of the assumptions that need to be revisited. Further, it is too early to determine what adjustments, if any, the Air Force will make in its future training plans in response to the studies' results, as we recommended. Therefore, we believe the recommendation remains valid.

DOD did not concur with our second recommendation, stating that the Air Force's Ready Aircrew Program training differs significantly from other syllabus-directed courses of instruction and that desired learning objectives for this training are set at the squadron level in accordance with current Air Force guidance. Specifically, the Ready Aircrew Program tasking memorandums direct squadron commanders to develop unit training programs that focus on their primary and secondary missions, and that in order to be effective, each mission must successfully complete a sufficient number of events applicable to that mission type, according to the squadron commander. In addition, DOD's comments noted that Air Force guidance provides higher headquarters direction at the appropriate level while providing local commanders with the flexibility to set detailed learning objectives for individual sorties that allows them to maximize the training value and efficiency of each sortie. DOD also stated that a table in the Ready Aircrew Program tasking memorandums identifies the desired adversary air ratios, which serves as the training support elements needed to accomplish training expectations. Finally, DOD stated that because the effectiveness of annual continuation training is identified at the local level, only the accomplishment of training needs to be collected and reported. We agree that squadron commanders should have the flexibility to inform individual aircrew training needs. However, establishing a baseline of desired learning objectives to meet Air Combat Command's training expectations for the Ready Aircrew Program will provide squadron commanders information on what features a training event should include and help ensure that aircrews are receiving consistent and comparable training across the force. Further, while the Ready Aircrew Program tasking memorandums identify desired adversary

air ratios, the memorandums do not identify any other training support elements that are needed to accomplish training expectations. For example, the tasking memorandums do not provide information on the training range capabilities needed to meet expectations, such as threat replicators and targets. As noted in our report, a range of factors, in addition to the availability of sufficient ratios of adversary air, have limited the ability of combat fighter squadrons to complete annual training requirements. The lack of this information can affect the Air Force's ability to make informed resource decisions to improve its training infrastructure. Finally, our report also noted that Air Combat Command guidance states that it expects to see data that documents the underlying challenges to providing an effective training program. DOD's comment that only the accomplishment of training needs to be collected and reported contradicts this guidance as well as the Air Force's stated goal of moving to a training model based on the effectiveness of training, using quantifiable levels of performance, rather than the current model focused on the frequency of training. Without developing a process to collect data and measure the effectiveness of training against established expectations that includes information on desired learning objectives and training support elements, the Air Force will not have the information required to achieve this goal. Therefore, we believe the recommendation remains valid.

In concurring with the third recommendation, DOD stated that the Air Force is beginning to take a holistic view of operational training and the Air Force has stood up an Operational Training Division to better focus control over the operational training enterprise. One responsibility of the division will be to update the United States Air Force Live Virtual Constructive Operational Training Flight Plan with all of the desirable characteristics of a comprehensive strategy. The Air Force expects to complete this update by September 2017. By updating this plan to include the desirable characteristics of a comprehensive strategy, such as a risk-based investment strategy that identifies and prioritizes capability needs and a time line for addressing them, the Air Force would improve its ability to develop the capabilities required to achieve its virtual training needs.

We are sending copies of this report to the appropriate congressional committees, the Secretary of Defense, the Under Secretary of Defense for Personnel and Readiness, and the Secretary of the Air Force. In addition, the report is available at no charge on the GAO website at <http://www.gao.gov>.



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Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix III.

A handwritten signature in black ink that reads "Cary Russell". The signature is written in a cursive, flowing style.

Cary Russell  
Director, Defense Capabilities and Management

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*List of Committees*

The Honorable John McCain  
Chairman  
The Honorable Jack Reed  
Ranking Member  
Committee on Armed Services  
United States Senate

The Honorable Thad Cochran  
Chairman  
The Honorable Richard J. Durbin  
Ranking Member  
Subcommittee on Defense  
Committee on Appropriations  
United States Senate

The Honorable Mac Thornberry  
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The Honorable Adam Smith  
Ranking Member  
Committee on Armed Services  
House of Representatives

The Honorable Rodney Frelinghuysen  
Chairman  
The Honorable Pete Visclosky  
Ranking Member  
Subcommittee on Defense  
Committee on Appropriations  
House of Representatives

## Appendix I: Objectives, Scope, and Methodology

The objectives of this report are to determine the extent to which the Air Force has (1) determined requirements to train its combat aircrews for the full range of core missions, (2) met annual training requirements for combat fighter squadrons across the full range of core missions and evaluated the effectiveness of this training, and (3) established virtual training plans that include desirable characteristics of a comprehensive strategy.

This report is a public version of the prior sensitive report that we issued in August 2016.<sup>1</sup> The Department of Defense (DOD) deemed some of the information in the prior report as For Official Use Only (FOUO), which must be protected from public disclosure. Therefore, this report omits FOUO information and data on some of the Air Force's training priorities, completion of annual training requirements for active-duty fighter squadrons, and aircraft maintenance generation capabilities. Although the information provided in this report is more limited in scope, it addresses the same objectives as the sensitive report. Also, the methodology used for both reports is the same.

We focused our review on the annual continuation training requirements for aircrews assigned to aircraft within the active component of the combat air forces.<sup>2</sup> We focused on Air Combat Command as the lead major command for all combat air forces, which has responsibility for developing and managing annual continuation training requirements through the Ready Aircrew Program. The aircraft included in our review were the A-10, F-15, F-16, F-22, and F-35. We selected a non-generalizable sample of units to speak with based on our analysis of annual training completion data and the range of units' core missions. Based on this analysis, we conducted site visits with F-22 units at Langley

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<sup>1</sup>GAO, *Air Force Training: Further Analysis and Planning Needed to Improve Effectiveness*, GAO-16-635SU (Washington, D.C.: Aug. 16, 2016).

<sup>2</sup>In this report, we refer to continuation training as annual training requirements. The Ready Aircrew Program establishes the annual training requirements aircrews must accomplish to sustain combat mission readiness.

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Air Force Base, F-16 Block 40 and F-35 units at Hill Air Force Base, F-15E units at Seymour Johnson Air Force Base, and F-16 Block 50 units at Shaw Air Force Base.

To determine the extent to which the Air Force has determined requirements to train its combat aircrews for the full range of core missions,<sup>3</sup> we analyzed Air Force documents on training to identify the Air Force's current process for developing training requirements, including the Air Force Instruction 11-2, Volume 1 for each aircraft in our review. We interviewed officials involved in the development of the annual training requirements, including officials from Air Combat Command, U.S. Air Forces Europe, Pacific Air Forces, and U.S. Air Forces Central Command. We also interviewed wing and squadron commanders at selected units, as described above, to obtain an operational-level perspective on the training requirements needed to meet the full range of core missions. We reviewed the annual training requirements established for each aircraft for fiscal years 2012 through 2016 to determine how the Air Force establishes the experienced and inexperienced aircrew designations and how sortie and simulator mission requirements have changed over time. We evaluated these processes against Department of Defense (DOD) and Air Force guidance that prioritize and establish training requirements and against the leading practices we have identified for managing strategic training.<sup>4</sup>

To determine the extent to which the Air Force has met annual training requirements for combat fighter squadrons across the full range of core missions and evaluated the effectiveness of this training, we analyzed

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<sup>3</sup>For the purposes of this report, we use the phrase "full range of core missions" to describe the primary and secondary missions as established in each aircraft's Designed Operational Capability statement, which summarizes specific capabilities that an Air Force unit can be called on to provide.

<sup>4</sup>GAO, *Human Capital: A Guide for Assessing Strategic Training and Development Efforts in the Federal Government*, [GAO-04-546G](#) (Washington D.C.: Mar. 1, 2004). This guide introduces a framework, consisting of a set of principles and key questions that federal agencies can use to ensure that their training and development investments are targeted strategically. Information in this guide was developed through consultations with government officials and experts in the private sector, academia, and nonprofit organizations; examinations of laws and regulations related to training and development in the federal government; and a review of the sizeable body of literature on training and development issues, including previous GAO products on a range of human capital topics.

training completion data from fiscal years 2012 through 2015 to identify core missions for which aircrews were or were not fully trained. We performed data reliability procedures on the information included in Ready Aircrew Program completion reports by comparing that information against related documentation and interviewing knowledgeable officials on controls over the reporting systems. We determined that the data presented in our findings were sufficiently reliable for the purposes of this report. We reviewed Air Force documentation that describes training challenges and interviewed Air Force officials, including wing and squadron commanders at selected units, as described above, and officials at Air Combat Command's two major range and test facility bases—the Nevada Test and Training Range and the Utah Test and Training Range—to discuss any factors that limit the ability of aircrews to complete training for the full range of core missions. We evaluated the Air Force's process for assessing the effectiveness of its annual training against leading practices we identified for managing strategic training and against the Ready Aircrew Program tasking memorandums, which specify annual continuation training for personnel assigned to combat units.<sup>5</sup>

To determine the extent to which the Air Force has established virtual training plans that include desirable characteristics of a comprehensive strategy,<sup>6</sup> we reviewed planning documents established by the Air Force to guide its virtual training efforts and evaluated these actions against our prior work on desirable characteristics of national strategies. Given that there is no established set of requirements for strategies, we relied on our assessments of national strategies and the criteria that were applied to

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<sup>5</sup>[GAO-04-546G](#).

<sup>6</sup>According to Air Force documents, the live (L) environment is defined as real people operating real weapons systems, the virtual (V) environment is defined as real people operating simulated systems, and the constructive (C) environment is identified as software models and code that are used to improve training scenarios with computer-generated entities—such as terrain, threats, aircraft, people, and vehicles, among others. For the purposes of this report, we refer to training that includes a simulator as virtual training.

assess these strategies.<sup>7</sup> We identified six desirable characteristics that national or department-wide strategies should contain. We assessed these criteria against the two existing Air Force planning documents we found most relevant to the combat air forces—*United States Air Force Live Virtual Constructive Operational Training Flight Plan* and the *Combat Air Force Live, Virtual, Constructive Vision*—to determine the extent to which these documents contain the elements of a comprehensive strategy. We determined whether these actions addressed, partially addressed, or did not address the desirable characteristics of strategy documents, based on our assessment of whether the planning documents explicitly cited all elements of a characteristic and the level of specificity and detail included.

We conducted this performance audit from June 2015 to September 2016 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

We interviewed officials and, where appropriate, obtained documentation at the following locations:

- Office of the Secretary of Defense, Office of the Under Secretary of Defense for Personnel and Readiness
- Headquarters Air Force, Current Operations
- Headquarters Air Force, Readiness and Exercises
- Headquarters Air Force, Live, Virtual, and Constructive/Modeling and Simulation
- Air Force Agency for Modeling and Simulation



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<sup>7</sup>We assessed planning documents established by the Air Force to guide its virtual training efforts against criteria we developed for national strategies. These criteria are cited in GAO, *Combating Terrorism: Evaluation of Selected Characteristics in National Strategies Related to Terrorism*, [GAO-04-408T](#) (Washington, D.C.: Feb. 3, 2004). Given the size and complexity of the Air Force's virtual training efforts, we concluded that a comprehensive strategy to guide these efforts would be similar in scope and would need to include characteristics similar to those of a national strategy.

- Air Combat Command, Flight Operations
- Air Combat Command, Airspace, Ranges, and Airfield Operations
- Air Combat Command, Operations
- Air Combat Command, Resources and Budget
- U.S. Air Force Warfare Center
- Nevada Test and Training Range
- Langley Air Force Base, 1st Fighter Wing
- Langley Air Force Base, 27th Fighter Squadron
- Langley Air Force Base, 94th Fighter Squadron
- Hill Air Force Base, 388th Fighter Wing
- Hill Air Force Base, 4th Fighter Squadron
- Hill Air Force Base, 34th Fighter Squadron
- Utah Test and Training Range
- Shaw Air Force Base, 20th Fighter Wing
- Shaw Air Force Base, 77th Fighter Squadron
- Shaw Air Force Base, 79th Fighter Squadron
- Seymour Johnson Air Force Base, 4th Fighter Wing
- Seymour Johnson Air Force Base, 335th Fighter Squadron
- Seymour Johnson Air Force Base, 336th Fighter Squadron
- Pacific Air Forces, Exercises and Readiness
- U.S. Air Forces Europe, Training, Readiness, and Exercises
- U.S. Air Forces Central Command, Air Operations and Training



## Appendix II: Comments from the Department of Defense

	<p>OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE 4000 DEFENSE PENTAGON WASHINGTON, D.C. 20301-4000</p>
<p>READINESS</p>	<p>JUL 27 2016</p>
<p>Mr. Cary Russell Director, Defense Capabilities Management U.S. Government Accountability Office 441 G Street, NW Washington DC 20548</p>	
<p>Dear Mr. Russell:</p>	
<p>This is the Department of Defense (DoD) response to the GAO Draft Report GAO-16-635, "AIR FORCE TRAINING: Further Analysis and Planning Needed to Improve Effectiveness," dated May 25, 2016 (GAO Code 100139).</p>	
<p>The Department appreciates the opportunity to comment on this draft. We see value in the GAO's review but we non concur with Recommendations 1 and 2, and concur with Recommendation 3. The Department's comments on the GAO draft recommendations are enclosed.</p>	
<p>The Defense Office of Prepublication and Security Review found that portions of the draft GAO report contain For Official Use Only (FOUO) material that is not publicly releasable. The detailed results of that security review have been provided to you under separate cover.</p>	
<p>My point of contact is Frank C. DiGiovanni who can be reached at frank.c.digiovanni.civ@mail.mil or 703-695-2618.</p>	
<p>Sincerely,</p>	
	
<p><i>For</i> Diana C. Banks Deputy Assistant Secretary of Defense (Force Education and Training)</p>	
<p>Attachments: As stated</p>	

GAO DRAFT REPORT DATED MAY 25, 2016  
GAO-16-635 (GAO CODE 100139)

“AIR FORCE TRAINING: FURTHER ANALYSIS AND PLANNING NEEDED TO  
IMPROVE EFFECTIVENESS”

DEPARTMENT OF DEFENSE COMMENTS  
TO THE GAO RECOMMENDATION

**RECOMMENDATION 1:** The GAO recommends that the Secretary of Defense direct the Secretary of the Air Force to comprehensively reassess the assumptions underlying its annual training requirements—including, but not limited to, the total annual training requirements by aircraft, the criteria for designating aircrews as experienced or inexperienced, and the mix between live and simulator training—and make any appropriate adjustments in future training plans.

**DoD RESPONSE:** Non concur. The Department is has already begun a comprehensive reassessment of the assumptions underlying annual training requirements and those results will be used to influence future training plans. Regarding the “total annual training requirements by aircraft” and “the mix between live and simulator training,” Air Combat Command (ACC) has directed the funding and execution of a comprehensive study to reassess the full spectrum of fighter Ready Aircrew Program (RAP) requirements. A Request for Proposal is being finalized with an anticipated contract start date in September 2016. It is important to note that RAP currently establishes the minimum level of training for a Combat Mission Ready aircrew but is often interpreted as a maximum. ACC anticipates study results will be available about 12 months after contract award that will provide a range of readiness levels associated with varying training levels. Regarding “the criteria for designating aircrews as experienced or inexperienced,” ACC directed a study of all factors that contribute to aircrew experiencing in the F-22 and the completed study resulted in substantive changes for F-22 experiencing criteria. ACC has commissioned a follow-on study to include analysis of the experiencing criteria of all 4th Generation fighters (A-10, F-15C, F-15E, and F-16). This follow-on study is expected be completed by 30 Sep 2017.

**RECOMMENDATION 2:** The GAO recommends that the Secretary of Defense direct the Secretary of the Air Force to:

- establish desired learning objectives and training support elements needed to accomplish the training expectations in its annual Ready Aircrew Program tasking memorandums; and
- develop a process to collect data to assess the effectiveness of annual training against these features.

**DoD RESPONSE:** Non concur. The Department's position is that aircrew training differs significantly from other syllabus-directed courses of instruction. Ready Aircrew Program (RAP) training methods and reporting is a robust set of institutionalized processes that meet or exceed all regulatory requirements as well as the needs of USAF leadership. Regarding "establish desired learning objectives," GAO frequently refers to its previously published report *Human Capital: A Guide for Assessing Strategic Training and Development Efforts in the Federal Government* in the analysis of the USAF fighter continuation training program (i.e., RAP); however, RAP differs significantly from other syllabus-directed courses of instruction. While fighter aircrew do accomplish formalized upgrade training, which adheres to principles and guidelines described in the GAO guide, RAP directs training that is not governed by a syllabus. Desired learning objectives for RAP sorties are set by the flight lead based on the training needs and experience levels of the flight members. The fighter RAP Tasking Memoranda (RTM) for all Mission Design Series (MDS), direct that Squadron Commanders should "...develop unit training programs that focus on their primary and secondary missions." Further, the RTMs state: "Per AFI 11-2(MDS), Volume 1, an effective RAP mission requires accomplishing a complete tactical mission scenario or a basic skills mission. In order to be effective, each mission must successfully complete a sufficient number of events applicable to that mission type, according to the Squadron Commander." Finally, AFI 11-2(MDS), Volume 3 provides briefing guides that direct the flight lead to set Mission Objectives. This guidance provides Higher Headquarters direction at the appropriate level of fidelity while providing local Commanders and leaders the flexibility to set detailed learning objectives for individual sorties, which in turn, allows them to maximize the training value and efficiency of each sortie. Employment of fighter aircraft is a fleeting skill set that requires the adjustment of training objectives on a day-to-day and individual basis. Regarding "training support elements," RTMs for the F-15C, F-15E, F-16, F-22, and F-35 contain Table A1 that lists Desired Adversary Ratios. This table serves to list "training support elements" needed to accomplish the training expectations and is derived from Combat-Numbered Air Forces expectations. Further, ACC is partnering with our sister services to maximize joint force training opportunities in Close Air Support, Maritime Air Support, Combat Search and Rescue, and Forward Air Controller (Airborne) both as the force being trained and the training support element. Regarding "develop a process to collect data to assess the effectiveness of annual training against these features," once it is understood that desired learning objectives and, derivatively, measures of effectiveness for RAP continuation training are set at the local level, it becomes clear that accomplishment and not effectiveness is the appropriate metric to be reported to the Major Command.

**RECOMMENDATION 3:** The GAO recommends that the Secretary of Defense direct the Secretary of the Air Force to continue to refine its planning for virtual training to incorporate the desirable characteristics of a comprehensive strategy, including developing a risk-based investment strategy that identifies and prioritizes capability needs and includes a time line for addressing them.

**DoD RESPONSE:** Concur. The Department is taking a holistic view of the Operational Training it accomplishes in both Live and Virtual (Synthetic) environments. Additionally, across the Department, due primarily to the emergence of 5th generation weapon system capabilities, Blended Training (live training enhanced with synthetic entities) is getting more

attention and development planning has already begun. Consequently, the Air Force Director of Current Operations (AF/A30) recently stood up an Operational Training Division (AF/A30T) to better focus his span of control over the Operational Training enterprise. One of the first responsibilities of the new Operational Training Division is to update the UNITED STATES AIR FORCE LIVE VIRTUAL CONSTRUCTIVE OPERATIONAL TRAINING FLIGHT PLAN (22 Feb 2013). This updated document, expected by September, 2017, will incorporate all the desirable characteristics of a comprehensive strategy and provide a vision for how the Air Force intends to optimize its operational training.

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## Appendix III: GAO Contact and Staff Acknowledgments

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### GAO Contact

Cary Russell, (202) 512-5431 or [russellc@gao.gov](mailto:russellc@gao.gov)

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### Staff Acknowledgments

In addition to the contact name above, Matthew Ullengren, Assistant Director; Karyn Angulo; Russell Bryan; Joanne Landesman; Kirsten Lauber; Amie Lesser; Jim Lloyd; Justin Riordan; and Sabrina Streagle made key contributions to this report.

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## Strategic Planning and External Liaison

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