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**KC-X: DUAL SOURCE PROCUREMENT IS THE ONLY OPTION**

by

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## **Abstract**

Without the ability to refuel aircraft in flight, our military forces would not be able to fly non-stop from the United States to any destination in the world. The current backbone of this capability and the U.S. tanker fleet is the KC-135 Stratotanker. As these aircraft continue to age, tanker recapitalization has occupied much discussion within the Air Force. In fact, the Air Force has been trying to resolve a recapitalization plan for several years with its tanker procurement process, the KC-X.

By identifying and analyzing the key issues involved with selecting an aircraft to recapitalize our aging tanker fleet, the hope was to determine which option was best suited for future operations. Throughout this research, it became clear that maybe the answer was not one or the other, but both. The prospect of a dual procurement acquisition strategy appears to be the best option because it would provide numerous benefits. Among the most important benefits are: 1) an accelerated procurement process, 2) continued competition within the tanker replacement program, 3) maximizing different and complementary capabilities, and 4) overall increased tanker fleet capability as a result of the dual airframes.

When taken in whole, dual option procurement provides tremendous capability to meet the different refueling needs which potentially face our military in the future. Clearly, no single option will provide the answer for all our future needs. We must seize this opportunity to realize the benefits of a competitive market created by a dual procurement strategy.

## INTRODUCTION

The United States currently possesses the most powerful military in the world. One of its greatest strengths is the ability to project power anywhere around the world. This “global reach” can be a strong deterrent or it can be used to respond to a nation’s call for aid. Global presence provides security and “peace of mind” to our nation’s citizens and our allies, while keeping our adversaries deterred. However, this power projection cannot occur without aerial refueling. Without the ability to refuel aircraft in flight, our forces would not be able to fly non-stop from the United States to any destination in the world. As stated by General Arthur Lichte, former Commander of Air Mobility Command, “Without a viable tanker fleet, the U.S. Military would not have global reach capability. This force extension capability allows U.S. fighters, bombers, transports, and reconnaissance aircraft to fly farther and longer, and reach destinations and targets that otherwise would be unreachable.”<sup>1</sup>

The backbone of the tanker fleet since 1957 has been the KC-135 Stratotanker. For over 50 years the KC-135, has performed its vital aerial refueling role, guaranteeing that the U.S. and its allies have enjoyed unprecedented capability and global reach. As these aircraft continue to age, recapitalization has dominated discussion within the Air Force. In fact, the Air Force has been trying to resolve a recapitalization plan for several years with its tanker procurement process, the KC-X. While lawmakers, lobbyists, and industry analysts debate the proposed solutions for KC-X, our military continues to rely on these aging aircraft.

There is no question that the KC-135 currently continues to uphold its sustained record of excellence. Even in the face of increased demands and higher operations tempo, the KC-135 has stepped up to the challenge. Recent military operations, to include operations in Kosovo, Afghanistan, Iraq have placed remarkable demands upon our KC-135 fleet and despite its age, it

has been able to meet these requirements.<sup>2</sup> To illustrate the scale, Allied Force and Iraqi Freedom required approximately 150 deployed KC-135s, more than one-third of the 415 aircraft fleet.<sup>3</sup> Mission capable rates are the best method to measure whether aircraft are able to accomplish their mission. KC-135s have historically been able to meet or exceed their goal of an 85% mission capable rate, but that does not guarantee the sustainability of future operations.<sup>4</sup> In fact, there has been concern for several years about the future of our nation's tanker fleet, particularly since it will require a herculean effort to replace the "Eisenhower-era" KC-135s.<sup>5</sup>

As early as 1996, the General Accounting Office (GAO) questioned the "long-term viability of the KC-135 fleet," seeking to explore expeditious replacement options.<sup>6</sup> Initially, these aircraft were cited as having relatively low hours and therefore fully sustainable for the foreseeable future. Following further analysis, the Air Force data suggested that "significant cost increases" would be required between 2001 and 2040.<sup>7</sup> Although not deemed a crisis, between 2002 and 2004, the Air Force explored several failed plans to lease KC-767 aircraft as a stop-gap measure before a full recapitalization plan could be implemented.<sup>8</sup> Ultimately these efforts met their demise amid charges of ethics violations, two criminal indictments, and resignations within both the Air Force and Boeing.<sup>9</sup>

Currently, the Air Force is conducting its second round of competition for selection of a sole-source replacement of the KC-135.<sup>10</sup> As the acquisition process continues to undergo intense scrutiny and numerous protests, the USAF finds itself in a more and more precarious position.

The author's purpose for researching and writing this paper was originally to determine which option, Boeing's KC-767 or Northrop Grumman's KC-45, would best meet our future needs. Throughout this research, it became clear that maybe the answer was not one or the other,

but both. The prospect of a dual procurement acquisition strategy appears to be the best option because it would provide numerous benefits. Among the most important benefits are: 1) an accelerated procurement process, 2) continued competition within the tanker replacement program, 3) maximizing different and complementary capabilities, and 4) overall increased tanker fleet capability as a result of the dual airframes. Despite Northrop Grumman's recent exit from competition, this argument has not been overcome by events because the need still exists and current indicators suggest that EADS may re-enter their submission.

## **THE PROBLEM**

Before getting too far into the replacement analysis, it is important to discuss whether replacement is actually necessary. During the Cold War, the KC-135 fleet was mostly static under the umbrella of Strategic Air Command (SAC), anxiously awaiting notification to launch in support of nuclear bombers enroute to the Soviet Union. As a result, in comparison to civilian aircraft equivalents of roughly the same age, they have significantly fewer hours. The number of hours accumulated on an airframe is usually a good predictor because "as the aircraft structure flexes during flight, it eventually begins to crack; this can be termed 'fatigue.'"<sup>11</sup>

According to The Airline Monitor, "the average age of the fleet of the seven large U.S. passenger airlines...is about 14 years old."<sup>12</sup> Although it is difficult to determine the actual hourly usage of the commercial fleets, given this average age and utilization rates reported to the FAA,<sup>13</sup> commercial aircraft could be reasonably assumed to have approximately 36,000 hours<sup>14</sup> of usage after only 14 years. On average, they are utilized approximately 2,600 hours per year.<sup>15</sup> This is a much higher rate than the KC-135's rate of "about 435 hours per year, on average, since September 2001."<sup>16</sup> At that rate, the "Air Force projects that the KC-135 aircraft [will] have

between 36,000 and 39,000 lifetime flying hours [and] according to the Air Force, only a few KC-135s are projected to reach these limits before 2040.”<sup>17</sup> Clearly, hourly stress is not the determining factor for tanker replacement as the KC-135 will take 80 years to reach a milestone attained in only 14 years by its commercial counterparts.

But, there is more to aircraft life expectancy than airframe hour totals. AMC’s *Air Mobility Master Plan 2006* highlighted the results of an aging study which “addressed the aircraft’s life in terms of three variables—usage, age, and utility.”<sup>18</sup> Each of these factors is important, because while the KC-135 has significantly fewer flight hours than its civilian counterpart, it is also significantly older. AMC openly acknowledges that “comparing the age of our KC-135 fleet to the average fleet-age in the US airline industry reveals a telling story—the Air Force operates the oldest “heavy” airframes in the US.”<sup>19</sup> In an effort to mitigate the age of our aircraft, we have undertaken numerous modifications and massive maintenance overhauls to help maintain reliability and effectiveness. Despite these numerous life-extending efforts, there is no denying that the KC-135 fleet has suffered from nature’s harsh environment over the last 50 years.

According to AMC officials, “corrosion management remains a primary focus for the KC-135 fleet. As much as 30-50% of the programmed depot maintenance addresses corrosion issues.”<sup>20</sup> The next major spike in KC-135 maintenance requirements is scheduled to arrive in 2018. AMC has identified and published the “insurmountable ‘Wall of Doom’ chart [which] visually depicts the large increase in depot maintenance hours per aircraft that will be required in the future to keep the KC-135 operational.”<sup>21</sup> The main culprit of this maintenance spike is a requirement to replace the aircraft skin and structural elements due to corrosion. AMC’s projected maintenance hours can be referenced in Figure 1. This figure is not presented to



determine each contributing element of this increased maintenance; rather it is presented to illustrate the drastic nature of the increase. To facilitate these structural repairs, each aircraft will be unavailable to combat forces for a much longer time.

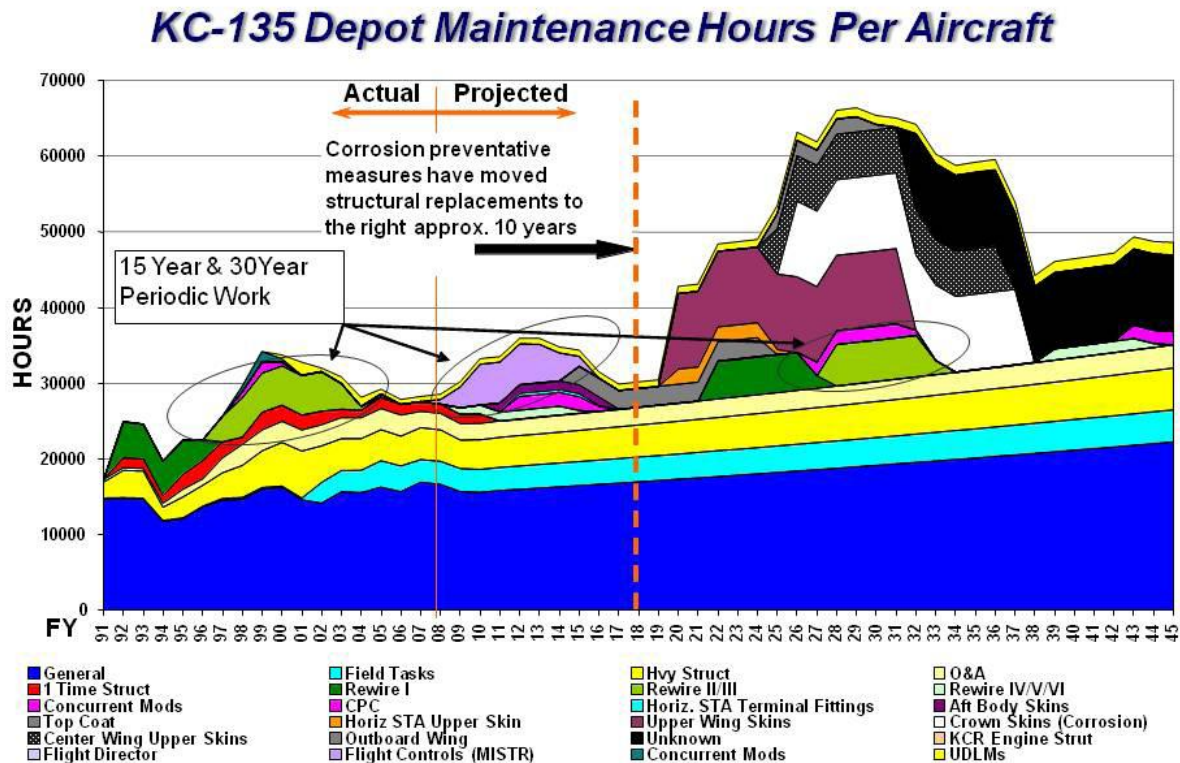


Figure 1<sup>22</sup>

Increased maintenance requirements not only result in a less capable force due to aircraft availability, but also result in much higher operating costs. According to General Lichte, each year tanker procurement is delayed costs an additional \$55 million.<sup>23</sup> It is estimated that “aging-related costs are expected to add at least \$17.8 billion to the process of maintaining the KC-135 for 40 years.”<sup>24</sup> In addition to the time and monetary costs, the risk of catastrophic failure within these aging aircraft is increasing with every year.

Any time an aircraft shows signs of corrosion or age, there must be concern for catastrophic structural failure. This concern was highlighted in 2007 when F-15 non-mission

critical flight operations were suspended following the crash of a Missouri Air National Guard aircraft.<sup>25</sup> It was believed that structural failure caused the crash and operations were suspended as a precaution. A grounding of this magnitude in the KC-135 fleet would be catastrophic to US strategic capability and mobility. There have been three instances where the KC-135 fleet has been impacted by similar circumstances, most recently in 1999 when a crash caused by a stabilizer trim malfunction impacted worldwide tanker operations.<sup>26</sup> In response to the failed actuator, “nearly 200 of the 546 KC-135 aircraft were stood down until they could be inspected and repaired.”<sup>27</sup>

Nearly every operation or trans-continental movement requires some amount of aerial refueling. Our Air Force would instantly lose its ability to project global airpower and would instead be relegated to the use of regional airpower. It is a simple fact that the KC-10 and KC-130 fleet are simply not capable of carrying the KC-135’s share of the workload. While catastrophic failure might be a worst-case scenario, any reduction in available airframes will undoubtedly have an impact on our ability to protect our nation’s global interests.

Reduced airframe availability, coupled with increases in both cost and risk, make it imperative that we begin replacing these vital assets as soon as possible. Currently, the USAF maintains 415 KC-135 Stratotankers within its inventory.<sup>28</sup> Projections estimate that it will take decades to replace the entire fleet. The 2005 Tanker Requirement Study calls for at least 500 aerial refueling aircraft.<sup>29</sup> With mounting maintenance costs, the longer we wait, the more it will cost and the more vulnerable we will become.

As stated previously, we are currently in the middle of another procurement cycle. The current Request for Proposals has changed from previous versions and the Air Force is hoping to award a contract without protest or delay. Unfortunately, it appears that these hopes may not be

fulfilled. Soon after the draft request for proposals (RFP) was released, the Northrop President and CEO notified the Pentagon acquisition chief, Ashton Cater, that “if the Pentagon wants the company and its European partner, EADS, to compete, defense officials must make ‘meaningful changes.’”<sup>30</sup> Their contention was that the RFP was written to favor a smaller aircraft and that they could not compete economically. Company spokesman, Randy Belote claimed the “second draft RFP is fundamentally different from what the Air Force said it wanted and needed 18 months ago.”<sup>31</sup> Furthermore, Northrop showed concern that the RFP showed “a ‘clear preference’ to a smaller plane with ‘limited multirole capability.’”<sup>32</sup> Analyzed objectively, one could argue that these differing RFPs might indicate a legitimate need for both options.

Ultimately, while researching for this paper, Northrop Grumman elected to withdraw from the competition, claiming that the competition “was structured to produce the best outcome for Boeing.”<sup>33</sup> However, there are ample signs that another competitor will emerge. Europe’s EADS, once Northrop Grumman’s partner, “could rejoin the race if it determines ‘there is a fair chance to win, after evaluating all relevant factors.’”<sup>34</sup> Further, in somewhat of a surprise move, Russia’s UAC (United Aircraft Corp) has announced that they “would seek to offer a tanker version of its Ilyushin IL-96 widebody jetliner, dubbed the IL-98.”<sup>35</sup> In the end, the Pentagon may end up with three submissions to compete for this crucial contract.

For the companies looking to garner the KC-X contract there are many issues to be considered. In fact, the request for proposals (RFP) requires that “each bidder must meet 373 mandatory requirements for the new tanker, as specified by the Pentagon, to qualify for the bidding process.”<sup>36</sup> It is within these requirements that problems such as USAF/USN interoperability, force extension, defensive systems, and improved avionics will be solved. Since each of these is mandatory, they will not tip the scales in either company’s favor. Instead each

company will be trying to capitalize on issues such as: 1) fuel offload capability, 2) ability to meet aerial refueling demands, 3) ready access to operational environments, 4) airframe size in reference to Maximum-on-the-Ground requirements, and 5) cargo requirements and capability.

Even though this paper will contend that dual source procurement is the most sensible, the recapitalization plan is still defined as a sole-source “winner-take-all” contract. As such, we must address the key issues that may decide a winning submission before we can discuss the merits of a dual-buy proposal. Furthermore, by analyzing these issues, it will become apparent that both options provide a slightly different capability and might both have a place within future force structures. If a dual-buy does not occur, the airframe selected to replace the KC-135 must provide the best combination of these critical capabilities to meet our diverse refueling needs.

## **KEY ISSUES**

### **FUEL OFFLOAD CAPABILITY**

It seems logical to argue that an aircraft whose mission is aerial refueling would be more capable if it could carry more fuel. Operating in a theoretical world, this statement would be true. However, when considering the actual employment into today’s dynamic environment, it just may not be the case. In fact, it might prove not to be an advantage at all. Just because a dump truck can carry more than a pickup truck does not make it a better choice for everybody’s hauling needs. Other factors such as operating cost, efficiency, and size come into play. The same is true with aircraft. It is no surprise that airlines strive to maximize routes by utilizing the smallest suitable airframe within their inventory. It is much more efficient and cost effective to fly a completely full regional jet than an empty Boeing 747.

With this concept in mind, what capacity is necessary? The KC-X sourcing solution is much more complicated than the media portrayed image of “best value,” which is generally presented as equating to the most fuel capacity for the money. For 50 years, the KC-135 has been the workhorse of global mobility and reach with a maximum capacity of approximately 200,000 pounds of jet fuel.<sup>37</sup> Despite the significantly larger KC-10 and its mammoth 350,000 pound fuel capacity, there are debates about which is more capable.<sup>38</sup> Airfield restrictions on size and weight coupled with required aircraft performance generally dictate reduced fuel loads and may even prohibit operations. Historic data shows that approximately 90% of combat offloads are less than 90,000 pounds of fuel.<sup>39</sup> Even with a reduced fuel load for takeoff planning, KC-135 fuel capacity would still permit approximately 6.3 hours of flight time to and from the refueling area.<sup>40</sup>

This argument should not be misinterpreted to say that there is no utility in a larger fuel capacity. The demand for tanker aircraft is a factor that can be decidedly different based upon the area of operations and objectives to be accomplished. In fact, there are several clear cases where the larger fuel capacity of the KC-10 or the KC-45 is better suited for the mission. For instance, DoD analysis of potential conflicts reveals that “those addressing threats from North Korea and China rely heavily on tankers because of what strategists call the ‘tyranny of distance’ in projecting forces across the vast expanse of the Pacific Ocean.”<sup>41</sup> Additionally, over-water deployments of fighter aircraft are generally more efficient when utilizing a tanker with larger fuel capacity. During these missions, at least one tanker normally accompanies the other aircraft across the ocean and therefore must also account for its own fuel. When utilizing a tanker with a larger internal capacity, such as the KC-10, they can fly further and provide a greater offload to their receivers, thereby minimizing the number of tankers required.

Another benefit of the KC-10 over the KC-135 in this situation is the ability to receive fuel inflight, a capability included in both the Boeing and Northrop Grumman submissions. As a result of its greater fuel capacity and its capability for inflight refueling, it is standard practice that over-water deployments include a KC-10 as the primary escort. These aircraft are supplemented by KC-135s which refuel the KC-10 as it needs additional fuel. This method not only minimizes the number of aircraft required, but also minimizes the number of aircraft which must be operated away from home station or from an overseas location. It is in this capacity that a larger tanker with increased fuel storage, such as the KC-45, provides the best value for aerial refueling; however, not all refueling missions require or even benefit from increased fuel capacity.

#### ABILITY TO MEET DEMANDS FOR AERIAL REFUELING

In a different scenario, the critical requirement to fulfill receiver demands for refueling is what I would describe as “booms in the sky.” An operation, heavily dependent on large strike packages tied to time over target limitations, makes the timely transfer of fuel to the receivers the most critical factor of the tanker’s mission. As the number of receivers which have to cycle through each tanker increases, mission timing will be drastically impacted. In many cases, these operations must resort to larger numbers of airborne tankers to ensure everyone is ready to push forward into hostile territory at the same time. An example of this scenario was highlighted in the Lexington Institute’s paper titled “Modernizing the Aerial Refueling Fleet.”<sup>42</sup> The example is as follows:

Take the case of four fighters refueling from a single boom at a transfer rate of 2,000 lbs. per minute. (Tankers can transfer fuel faster but most current fighters can’t receive above this rate.) Assume the fighters will each receive 6,000 lbs. of fuel and each will spend an extra five minutes positioning for the refueling. Those

fighters need 32 minutes if they must depend on just one tanker. Give them two tankers, and the time is cut to 16 minutes. Scale it up to 12 fighters and it takes four tankers to get them on their way in 24 minutes, or six to push them through in 16 minutes. Receiver demand multiplies under combat surge conditions. Multiple tankers are needed to shorten refueling time and keep strike aircraft on schedule.<sup>43</sup>

In situations such as these, capacity is not as important as the number of “booms in the sky” to meet the precise timing demands of combat missions. Utilizing a larger aircraft in this capacity introduces inefficiencies.

During an operation such as Iraqi Freedom, where adequate basing was available within close proximity of Iraq, aircraft availability rather than capacity was the limiting factor. Reports have shown that “in the early months of Operation Iraqi Freedom, 149 KC-135s and 33 KC-10s conducted over 6,000 sorties in support of the joint force, delivering 376,391,000 lbs. of fuel to U.S. and allied planes.”<sup>44</sup> This equates to approximately 63,000 pounds of fuel per mission, clearly within the historical average of 90,000 pounds.<sup>45</sup> In general, larger aircraft tend to have higher operating costs just as a result of their size. According to AFPAM 10-1403, Air Mobility Planning Factors, the fuel burn rates for the KC-10 and KC-135 are approximately 17,800 and 10,700 pounds per hour respectively.<sup>46</sup> These figures illustrate that even though the KC-10 is capable of carrying more fuel, an unnecessary benefit in this scenario, it actually cost more to operate because it burns 66% more fuel per hour. With its smaller size and more efficient operating costs, this scenario is where KC-135 and a smaller aircraft submission excel.

Another aspect that impacts tanker demand is force composition of the U.S. military’s aerial fleet. As platforms change and evolve, the demand for aerial refueling may also evolve. One area where tankers could see a significant change is a result of an increased emphasis on remotely piloted aircraft (RPAs). The Air Force has seen a drastic increase in Predator, Reaper, and Global Hawk aircraft. These aircraft perform differently than their traditional counterparts.

To illustrate this point, the MQ-9 Reaper has a range of over 3,200 nautical miles and can stay aloft for 16 hours unrefueled.<sup>47</sup> Even more impressive, the RQ-4 Global Hawk has a range over 8,700 nautical miles staying aloft for over 28 hours.<sup>48</sup> These platforms have been so successful that Secretary of Defense Robert Gates has predicted that the F-35, Joint Strike Fighter, will be the “last manned fighter” that the Department of Defense procures.<sup>49</sup> It is wholly unclear how this might impact future tanker demand? Will remotely piloted vehicles be designed with the need for aerial refueling or will they incorporate technology eliminating the need for refueling?

Currently, RPAs have generally supplemented force composition and have not resulted in a significant decrease in other platforms. As such, to date they have not had a significant impact on tanker demand. It is difficult to tell how this will play out in the future, and therefore we can only acknowledge that it may become a factor. Ultimately, other factors may outweigh the impact of RPAs. Some experts actually see the need for tankers growing beyond what the Air Force envisions, reaching the 600 number.<sup>50</sup> It is outside the scope of this paper to determine the long-term ramifications of remotely-piloted combat aircraft or the emergence of remotely-piloted tankers.

## READY ACCESS TO OPERATIONAL ENVIRONMENTS

The next major obstacle to tanker procurement is ensuring acceptable access to strategic locations. Military planners and leaders usually do not have the luxury of choosing where they will operate. Operations in Afghanistan highlighted this potential limitation. Analysis shows that “carrier-based Navy and Marine Corps strike fighters operating from stations in the North Arabian Sea substituted almost entirely for Air Force land-based fighter and attack aircraft because of an absence of suitable operating locations close enough to the war zone.”<sup>51</sup>



Additionally, this analysis also showed that “without nonorganic Air Force and RAF tankers to provide inflight refueling support, the Navy’s carrier air wings could not have participated in Operation Enduring Freedom beyond the southernmost target areas in Afghanistan.”<sup>52</sup> This absence of suitable locations also meant that our tanker aircraft were forced to base operations out of fields as far away as Qatar, Bahrain, and the UAE.

There is no way to completely solve this problem, but the Air Force must at least consider the options for and the limitations on an aircraft’s ability to operate out of worldwide airfields. Make no mistake, the KC-X will normally operate out of airfields that are suitable for civilian air traffic, but it would be short sighted to ignore this consideration. We cannot procure a worldwide force enabler that has unnecessarily limited basing options or is constrained by size.

#### AIRFRAME SIZE IN REFERENCE TO MOG REQUIREMENTS

Having a runway of sufficient length and width still may not be enough to support sustained military operations. We must also consider the concept of maximum-on-the-ground (MOG). Simply, MOG is the maximum number of aircraft that can be handled on the ground at any given time. During Operation Allied Force, numerous fields such as RAF Mildenhall (34 tankers) and Moron Air Base (38 tankers) simply ran out of space.<sup>53</sup> The larger the aircraft the more space necessary for parking, maintenance, and general support functions. When planning an operation, the MOG of an airfield must be carefully considered. An airfield’s parking MOG is determined by its construction and size.<sup>54</sup> Simply stated, the larger the aircraft, the lower the airfield’s MOG.

Consider the previous Afghanistan example, suitable airfields located within striking distance and within the territories of willing allies were extremely limited. MOG became

increasingly important as we built up our forces to sustain prolonged operations. Eventually, we were able to mitigate some of these problems through construction and improvement, but it is not prudent to expect that we will always be able to do so. To fully understand the challenges the KC-X procurement process poses, we need to look no further than to the size of each submission.

For comparison purposes the KC-135 dimensions are listed as roughly 136' long by 131' wide, equivalent to a 17,800 sq ft footprint.<sup>55</sup> The smaller of the current submissions, Boeing's KC-767 is 159' long by 156' wide with a 24,800 sq ft footprint (approximately 40% larger than our current fleet of KC-135s).<sup>56</sup> In contrast, the Northrop Grumman KC-45 is approximately 193' long by 198' wide, equating to a footprint of approximately 38,200 sq ft (more than twice the size of the KC-135).<sup>57</sup> Clearly, when considering square footage required, both aircraft are larger than the KC-135, making MOG a key factor in procurement. Interestingly, the Northrop Grumman version is so large that it is nearly 30% larger than even the KC-10 which measures approximately 181' long by 165' wide.<sup>58</sup> Similar to the discussions of airfield access, we must consider these size requirements to ensure flexibility while minimizing the unnecessary constraints and expenses placed upon operations.

## CARGO REQUIREMENTS AND CAPABILITY

Another area where size has found its way to the forefront of the procurement process is in regards to cargo capacity. Enhanced cargo capacity and the desire for a dual role tanker have consistently been at the heart of the procurement process. Historically, due to its size and limitations, the KC-135 has played a very minor, almost nonexistent role in delivering cargo. Although this capability is identified as a secondary mission within Air Force Doctrine,<sup>59</sup> the KC-135 design limits cargo capacity to "six very light-weight cargo pallets."<sup>60</sup> With growing

concern over fiscal responsibility and the impending completion of C-17 production it has been a stated goal that the KC-X provides a greater cargo capability.

General Norton A. Schwartz, USAF Chief of Staff, has stated that he is “looking for versatility; single mission airplanes don’t give that.”<sup>61</sup> One of the major benefits cited is the reduction in demands on C-17 and C-5 aircraft. This is an obvious benefit provided since both key competitors provide much greater capability than the KC-135 in this area. Preliminary specifications show that “Boeing’s KC-767 Advanced Tanker transports 190 passengers and 19 pallets of bulk cargo while Northrop Grumman’s KC-45 delivers 226 passengers and 32 pallets...compared to the KC-135’s capacity of about 50 people and just six pallets.”<sup>62</sup>

The ’06 Mobility Capability Study indicates that there would be some benefit to increased cargo capacity in the KC-X; however this has since come into question. In 2007, the GAO reported a “lack of mandatory analyses to support passenger and cargo capability for the new replacement refueling aircraft.”<sup>63</sup> Possibly in response, the most recent RFP seems to place a decreased emphasis on this aspect. It now includes provisions for “93 non-mandatory, ‘above threshold’ requirements that add value.”<sup>64</sup> Cargo and passenger handling capability are now included within these non-mandatory items.<sup>65</sup> These are items that the aircraft companies are not required to provide and therefore may or may not have an impact on the contract selection. In other words, there is less incentive to include these items. Clearly, cargo capacity and capability appear to have taken a reduced role, but it is hard to ignore the potential capability a new tanker would provide.

## **BENEFITS OF DUAL SOURCE PROCUREMENT STRATEGY**

The fact of the matter is that the United States has a vital need to replace 415 of its most critical assets. The fact also remains that “the KC-135 Stratotanker is Air Mobility Command’s primary platform for air refueling and provides approximately 90% of the command’s air refueling capability.”<sup>66</sup> Realistically, this is not only 90% of AMC’s refueling capability, but also 90% of the nation’s capability. This fleet has sustained our refueling needs for many years, but it is getting harder and harder to provide the required aircraft to meet our nation’s demands. AMC’s *Air Mobility Master Plan 2006* has identified that “KC-135 availability has been decreasing due to maintenance and modification requirements of an aging fleet, while costs continue to increase.”<sup>67</sup> This shortage and cost increase makes it imperative that we address the replacement now in order to allow the necessary time for production. Any replacement endeavor will not be cheap and it will not be quick. To compound the problem, not only will we need to pay for new aircraft, but the longer it takes, the higher the cost to maintain our current fleet of KC-135s will become.

The procurement process does not appear to be taking the necessary steps to mitigate these concerns. Currently, the KC-X program seeks to procure 179 new tankers over the next 15 years.<sup>68</sup> When this phase is complete, the USAF’s fleet of KC-135s will be nearly 70 years old and the fleet will be in the middle of even costlier upgrades and maintenance costs. Shockingly though, the KC-X plan will not even get us in the ballpark of the requirements identified by the Mobility Capabilities and Requirements Study 2016. This study conducted in 2009 and published in early 2010 “represents a significant effort by the Department [of Defense] to identify the mobility capabilities and requirements that will be needed to support U.S. strategic objectives in the 2016 timeframe.”<sup>69</sup> This study discovered that our current tanker inventory

does not satisfy the demand we will potentially face in two of the three likely scenarios identified. The results showed that “demand ranged from a low of 383 KC-10s/KC-135R-equivalents...to a high of 567 KC-10s/KC-135R-equivalents.”<sup>70</sup> The global capability and security of our nation demands that we take steps to optimize the effectiveness, efficiency and fiscal requirements of our tanker force.

## ACCELERATED PROCUREMENT PROCESS

In an effort to accomplish these tasks, we should be seeking as rapid a replacement as possible. With operating costs increasing every year, with growing concern over structural failure and the impending maintenance “Wall of Doom,”<sup>71</sup> we cannot afford to delay any longer. Our nation’s global mobility and global reach depend upon the Air Force’s tanker fleet and further delays will only compound the problem. Acquiring tankers faster can best be achieved through a dual source procurement. This option has three distinct benefits that will help speed up the procurement process.

First, dual source procurement will serve to mitigate the risk of another protest and contract nullification. Do not be mistaken, utilizing dual source procurement for the sole reason of avoiding a protest is not a legitimate answer. There are numerous other reasons why I will contend dual source procurement is the best option. Avoiding a protest is simply an additional benefit of a decision which will help accelerate the lengthy KC-X procurement process.

The KC-X procurement process has been a black-eye for both the Air Force and the Department of Defense. No matter what the outcome of the current bidding process, there may be justifiable cause for another protest. The RFP has been identified as favoring Boeing and I tend to agree. This would give Boeing a case for claiming that the Air Force did not properly

assess the satisfaction of requirements if they should lose. Likewise, if Northrop Grumman or EADS re-enters the process and subsequently loses, the significant restructuring of the RFP requirements could provide a case for them to protest. Northrop Grumman executives have already stated that they “feel [they] have substantial grounds to support a [Government Accounting Office] or court ruling to overturn this revised source selection process.”<sup>72</sup>

The second benefit of dual source procurement is increased aircraft delivery. Under a dual source contract, we would expect to receive 24-30 aircraft per year rather than 15<sup>73</sup> that are expected under sole-source procurement.<sup>74</sup> Even at the low end of these numbers, dual source procurement would mean significant savings over future maintenance costs. Granted, this plan will require a greater up-front cost, but with the KC-135 maintenance requirements facing drastic increases from 3,000 hours to 5,000 hours per aircraft in 2018<sup>75</sup> and then again to 6,500 hours per aircraft in 2026,<sup>76</sup> we stand to benefit from “huge savings that would result from retiring old tankers earlier because their replacements arrive sooner.”<sup>77</sup>

Ultimately, the increased acquisition of new aircraft could help avoid costly re-skinning and other structural modifications that the KC-135 will require.<sup>78</sup> For illustration purposes, let’s assume that the USAF began taking delivery of aircraft in 2012 (an admittedly ambitious timeline, but one that is still possible considering both aircraft are already in production), we could theoretically possess between 144 and 180 new tankers before KC-135 re-skinning efforts begin. Possession of these more capable aircraft would enable the Air Force to begin retiring our oldest KC-135 aircraft on at least a 1:1 basis, thereby saving the maintenance time and costs associated with keeping these older aircraft operational.

Finally, the third benefit of dual source procurement’s accelerated schedule is protection from project delays. Nearly all aircraft procurements in recent history have incorporated some

amount of delay. The CV-22, the F-22, and the F-35 have all either experienced or are experiencing delays. While, the fact that these aircraft had to be designed from the ground up makes these examples slightly different than the KC-X procurement process, Boeing has proven that delivering a KC-767 tanker is not as easy as promised. In fact, despite ordering their tankers in 2002, Italy has yet to take delivery due to “a series of hitches, including vibrations in wing pylons.”<sup>79</sup> The latest problem is one that will likely impact any version purchased by the USAF. The problem is one that involves inflight instability of the centerline refueling drogue extending from the fuselage.<sup>80</sup>

We have already identified that the United States has a vital need for a robust and capable tanker force. Even assuming that Boeing resolves this problem prior to receiving a contract, it is not unreasonable to think that either Boeing or Northrop Grumman/EADS could experience some delays. To protect against this situation, dual source selection would provide motivation and incentive for these companies to deliver on time. If one of them should fail to maintain their timeline, we will have built-in protection against further procurement delays. This competitive environment is also instrumental to other benefits of dual source procurement.

## CONTINUED COMPETITION

There are many acquisition authorities who whole-heartedly prescribe dual source procurements as the best way to control costs. To be fair, there are also opponents to this plan who argue that:

building two designs would increase KC-X development costs by requiring the development of two aircraft, increase KC-X procurement costs by splitting the production learning curve for the program between two sources, and increase the KC-X life-cycle operating and support costs by requiring the Air Force to maintain two sets of KC-X training, maintenance, and support facilities.<sup>81</sup>

These may all be valid points, but we must also consider the benefits of the dual-procurement as well as the KC-135's looming maintenance costs.

The first benefit stems from the fact that this is only the first stage in a much larger effort to fully replace the U.S. tanker fleet. The KC-X program is just the first of three potential processes to procure “approximately 540 new tanker aircraft.”<sup>82</sup> We cannot afford to lose the competitive nature of this larger effort. If we publicly state that we are opposed to having two different tanker platforms in our inventory, even though we already do, what incentive remains to compete in the KC-Y process? Clearly, the KC-X winner would have the advantage for future competitions. The U.S. has already come dangerously close to having an uncontested procurement of our future tanker. By awarding a dual-procurement contract, we will guarantee future competition for the KC-Y and KC-Z while creating an environment which fosters competitive pricing and incentives for superior performance.

According to former Pentagon acquisition Chief Jacques Gansler, “the benefits of competition are well established: innovation, efficiency, effectiveness, quality and performance.”<sup>83</sup> He whole-heartedly endorses dual source procurements to maximize all of these benefits. He argues that claims of increased cost are incorrect. Citing cases such as “the so-called ‘Great Engine War’ to supply the F-16 and F-15”<sup>84</sup> as well as the “production of Tomahawk missiles,”<sup>85</sup> he is able to illustrate dramatic results. Overall, he claims competition can result in “net cost savings that range from 12 percent to 52 percent.”<sup>86</sup> In fact, studies have shown that “in winner-take-all competitions, costs tend to increase markedly after the award, whereas when two teams remain competitively engaged, costs tend to go down.”<sup>87</sup>

A separate study, conducted in 2006 by Dr. Thomas P. Lyon, Dow Professor of Sustainable Science, Technology and Commerce and Professor of Business Economics at the



University of Michigan's Ross School of Business, sought to determine the effects of dual-sourcing on Defense procurement. His paper used "a unique panel dataset comprising 14 tactical missiles over the period 1975–1995 to explore the factors that motivate production competition and the effects of competition on the government's procurement costs."<sup>88</sup> Through his empirical analysis of these missile systems he was able to achieve the following conclusive results:

My empirical results indicate that dual sourcing is being used in such a way that it does successfully lower procurement costs. Indeed, dual sourcing appears to produce procurement cost savings on the order of 20% for those missiles to which the policy is applied. The benefits of dual sourcing appear to be two-fold: 1) it reduces informational asymmetries between suppliers, thereby inducing more aggressive bidding in subsequent auctions, and 2) it gives the buyer more leverage over non-contractible dimensions of product quality.<sup>89</sup>

The data and results obtained through studies conducted by the former Pentagon acquisitions Chief and Dr. Thomas P. Lyon, PhD of Engineering Economic Systems, indicate strong support for dual procurement strategies. Coupling these results with the risk of further delays and price increases associated with a sole-source selection, preserving a competitive environment seems to be in the U.S.'s best interest. We must remember that the KC-X is only the first stage of a much bigger process where we cannot afford to create a monopoly.

## DIFFERENT AND COMPLEMENTARY CAPABILITIES

Throughout this paper, we have analyzed the requirements which may prove vital to the selection of a future aircraft. Issues such as: 1) fuel offload capability, 2) ability to meet demands for aerial refueling, 3) ready access to operational environments, 4) airframe size in reference to MOG requirements, and 5) cargo requirements and capability. We have also shown that each potential candidate for the KC-X program can meet these demands differently. Each

version would provide unique capabilities that ensure increased efficiency and effectiveness across different contingencies.<sup>90</sup>

We can plan for what we think will happen in the future, but the truth of the matter is that we never really know what threat tomorrow will bring. Additionally, as pointed out by the Lexington Institute, “figuring out which aircraft are best suited to meeting future refueling needs is further complicated by the fact that long-range missions employing big aircraft generate very different refueling needs than short-range missions employing smaller, more numerous planes.”<sup>91</sup> If we can hedge against both possible futures, while fostering a competitive environment conducive to cost savings and increased effectiveness, why wouldn’t we?

Having a force composition that relies on one airframe for 90% of its refueling needs is a risky proposition. Clearly there is compelling evidence that a complete grounding of the KC-135 fleet would cripple our military forces. Opponents to dual procurement of the KC-X contract have suggested alternatives such as purchasing used “surplus” aircraft which would be modified as an alternative to purchasing new aircraft. It is argued that these DC-10s would increase our large tanker force and help mitigate the risks associated with an aging tanker fleet.<sup>92</sup> In fact, the DOD’s Aerial Refueling Analysis of Alternatives (AR AOA) “found that purchasing used aircraft as tankers is ‘generally not as cost effective’ (as purchasing new aircraft).”<sup>93</sup>

Another factor to consider with this option, one that is all but missing from all discussions about tanker procurement, is the fact that the first KC-10s were procured in 1981<sup>94</sup> and have an average age of 25 years and “obsolescence issues are surfacing.”<sup>95</sup> Just like the KC-135, as the KC-10 fleet gets older, AMC’s *Air Mobility Master Plan 2006* has identified that “availability has been decreasing due to maintenance and modification requirements of an aging fleet, while costs continue to increase.”<sup>96</sup> In fact, KC-10 life expectancy is currently projected to

the year 2040.<sup>97</sup> With this information, why are we not looking at this process as an opportunity to capitalize on a competitive environment where we can replace both the KC-135 and the KC-10? Boeing's submission is similar in size and fuel offload capability to the KC-135 and the Northrop Grumman/EADS submission is much closer in size and capability to the KC-10. Capitalizing on the different capabilities and efficiencies presented by each submission will allow us to posture ourselves for the future rather than continuing to operate the U.S.'s oldest heavy aircraft fleet.<sup>98</sup> This posturing will lead to the final major benefit of a dual procurement option: a more capable tanker fleet.

#### OVERALL INCREASED TANKER FLEET CAPABILITY

As airspace requirements become more stringent and both the KC-135 and the KC-10 grow older, the Air Force has spent considerable time and money on funding required modifications. The solutions offered by Boeing and Northrop Grumman/EADS provide a much more capable and compliant airframe than our current fleet. Recently, it has been difficult for the Air Force to keep pace with the evolving requirements of international air traffic. The modifications we have accomplished have ensured our ability to operate in the global environment, but additional modifications are needed.

Recent restrictions and requirements for advanced equipment imposed by the International Civil Aviation Organization (ICAO) as well as the global Communications, Navigation, Surveillance/Air Traffic Management (CNS/ATM) upgrades have jeopardized our ability to operate in certain areas. These required upgrades continue to increase KC-135 and KC-10 operating costs. Within the 373 mandatory items listed in the KC-X RFP are provisions to meet or exceed all current airspace requirements.<sup>99</sup>

These aircraft will also significantly increase the USAF capability to transport cargo. Whether the Air Force openly states that they desire this capability, it would be beneficial. Currently the C-17 force is performing much better than anyone could have hoped. Unfortunately studies have shown that this “extraordinary performance...comes with a cost. The Air Force planned to have a 30-year life span, flying 1,000 hours per year. The pace of current operations, however, requires these aircraft to log 1,500 to 1,800 hours a year.”<sup>100</sup> Utilizing the cargo capacity of the KC-X for bulk cargo on a space available basis would free up the C-17. The cargo requirements outlined previously in this paper would provide a tremendous value, especially during the deployment of fighter aircraft where the tankers can both carry the unit’s cargo and provide fuel. Furthermore, “integrating the KC-X as a mobility platform will permit more efficient use of C-17 and C-5 aircraft for outsized cargo.”<sup>101</sup>

It is clear that both aircraft offered within the KC-X procurement process are more capable than our current tanker fleet. They will be fully modernized, they will include countless crew enhancements and efficiencies, they will be able to receive fuel inflight,<sup>102</sup> and will provide a dramatic increase in AMC’s and the USAF’s cargo capability.<sup>103</sup> By combining both in a dual procurement option, our capability is further enhanced as a result of their complementary capabilities. A combination of Boeing and Northrop Grumman aircraft in a proportional ratio provides a significant increase in capability over the current composition.

## CONCLUSION

Before tankers, our nation could not respond globally, aircraft and people took time to get from one location to another. During World War II, aircraft heading to Europe were forced to hop across the Atlantic.<sup>104</sup> These trips would sometimes take weeks. We cannot afford to lose

our incredible mobility. There is little doubt about whether a new tanker is required. AMC's latest white paper pointedly states: "Without tankers we're not global...our joint force would face immediate paralysis and long-term degradation. Our nation, our collective security, cannot wait for the moment of crisis to wake up and realize the urgency of tanker recapitalization."<sup>105</sup> Current debate concerns the question of: "Which tanker do we need?"

It is my contention that this question does not fully address our needs. Not only is the KC-135 suffering reduced availability and increased costs, but so is the KC-10. Both airframes are older than any of the U.S.'s other heavy aircraft fleets.<sup>106</sup> We have an opportunity to capitalize on the fact that industry competitors provided options with such different capabilities. If executed properly the U.S. could realize significant benefits.

Among the biggest benefits would be the ability to replace the KC-135 fleet at an accelerated pace, minimizing the effects of preventative maintenance requirements in the next decade. Despite higher up-front costs, the savings realized from reduced maintenance coupled with the competitive pricing environment created by a dual procurement strategy could result in significant cost savings over the long-term. Numerous studies have been shown to support this logic.

Ultimately, as only the first phase of a much broader plan to replace the entire fleet of KC-135s,<sup>107</sup> it would be in our best interest to keep multiple parties engaged in the competition. Northrop Grumman has already shown what can happen when a manufacturer feels it cannot be competitive. We must guard against creating a monopoly where prices are allowed to increase unchecked by healthy competition. EADS, Northrop Grumman's previous partner, has expressed interest in re-entering the competition. We must strive to create an environment which reinforces our commitment to an open field for healthy competition.

When taken in whole, dual source procurement provides tremendous capability to meet the different refueling needs which potentially face our military in the future. Clearly, no single option will provide the answer for all our future needs. Each excels in a different area and when combined provides a complementary and synergistic capability. Finally, the overall increase in cargo and multi-role capability is something that will help prolong the C-17 life expectancy while more efficiently meeting our cargo needs. AMC has stated it best when they announced that “in the strategic uncertainty of this century, the flexibility and versatility of multi-role weapon systems will be the driving factor in their utility and, consequently, their longevity as an active weapon system.”<sup>108</sup>

Finally, we must consider the words of Dr. Jacques Gansler, former Under Secretary of Defense for Acquisition, Technology and Logistics, “in this instance, there are two in-production commercial aircraft—made by Boeing and Airbus—with existing worldwide support. Yet the option of competitive dual-sourcing for production of tankers has been overruled with the hope that ‘this time will be different’ and sole-source suppliers will achieve desired performance and costs.”<sup>109</sup> In such a costly endeavor, we cannot afford to base our decision on unsupported hope. We must seize this opportunity to realize the benefits of a competitive market created by a dual procurement strategy.

## Endnotes

(All notes appear in shortened form. For full details, see appropriate entry in the bibliography.)

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- <sup>3</sup> Ibid., 2.
- <sup>4</sup> Ibid., 3.
- <sup>5</sup> Air Force Print News, “AMC commander welcomes news of KC-X tanker request for proposal.”
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- <sup>9</sup> R. Jeffrey Smith, “Roche Cited for 2 Ethics Violations,” *Washington Post*.
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- <sup>18</sup> HQ AMC/A55PL, *Air Mobility Master Plan 2006*, 77.
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- <sup>23</sup> Amy Butler, “Running on Fumes,” *Aviation Week & Space Technology*, 2.
- <sup>24</sup> Ibid., 2.
- <sup>25</sup> Air Force Print News, “Air Force suspends some F-15 operations.”
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- <sup>28</sup> Air Force Official Factsheets, KC-135.
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- <sup>30</sup> John T. Bennett, “Northrop Threatens to pull out of KC-X race,” *Air Force Times*.
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- <sup>34</sup> Jim Wolf and Maria Sheahan, “Russians, EADS eye rich U.S. aerial tanker deal,” *Reuters News*.
- <sup>35</sup> Ibid.
- <sup>36</sup> Esme E. Deprez, “Clear-Cut Tanker Decision Promised for Boeing, Airbus,” *Business Week*.
- <sup>37</sup> Air Force Official Factsheets, KC-135.
- <sup>38</sup> Air Force Official Factsheet, KC-10.
- <sup>39</sup> Rick Lemaster, “KC-X Tanker Update,” 4.
- <sup>40</sup> 175,000lbs fuel load – 90,000lbs offload = 85,000 lbs for tanker consumption. 85,000 – 17,000 lbs fuel reserve = 68,000 lbs ÷ 10,700 lbs/hour = 6.3 hours. Calculations based on personal experience and planning factors contained within AFPAM 10-1403.
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- <sup>43</sup> Ibid., 11-12.
- <sup>44</sup> Ibid., Executive Summary.
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- <sup>47</sup> Air Force Official Factsheets, MQ-9.
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- <sup>52</sup> *Ibid.*, 452.
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- <sup>56</sup> Boeing, “KC-7A7 Specifications.”
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- <sup>59</sup> Air Force Doctrine Document (AFDD) 2-6, *Air Mobility Operations*, 49.
- <sup>60</sup> Colonel Michael Isherwood, “KC-X, The Game Changer for Mobility,” *Air & Space Power Journal*, 57.
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- <sup>76</sup> *Ibid.*, 17.
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