When it modernizes its aerial tanker fleet, the Air Force should buy a mix of large- and medium-size aircraft, all of which would be commercial designs converted to meet military requirements.

That is the conclusion stated by RAND Corp. in a long-awaited and much-delayed analysis of alternatives for replacing USAF’s collection of Eisenhower-era refuelers.

According to the RAND study, buying and converting commercial airplanes offers the most cost-effective modernization option. The think tank analysts turned thumbs down on the notion of procuring a new-design military aircraft for the task.

RAND’s study was some two years in the making. Its release marks the start of a fresh Air Force effort to replace its fleet of KC-135s, most of which are at least 45 years old. The AOA also backs up the Air Force’s contention that a multimission aircraft, rather than a pure tanker, is its best choice to support national strategy.

The tanker AOA was part of a broader
Mobility Capabilities Study, which was conducted by the Joint Staff and completed late last year but which remains classified. The MCS determined that a new tanker, or tanker-cargo combination, is needed more than additional C-17 airlifters.

With the AOA in hand, Air Force leaders in April issued a request for information to industry. In the fall, they will issue a full request for proposal with an eye toward launching a tanker acquisition program within the next fiscal year. The RFI seeks industry data on what aircraft will be available, and when, for a possible tanker competition.

Michael W. Wynne, Air Force Secretary, said he hopes to get a formal acquisition program going in Fiscal 2008.

According to RAND, the price of buying new aircraft converted to the refueling role is more cost-effective, by far, than all other options. The field of discarded possibilities included launching an all-new military program which included development, using unmanned tankers, outsourcing the mission to private companies, using smaller or much larger aircraft, or buying used aircraft and refitting them with tanker gear.

The More the Merrier

RAND’s acceptable options include Boeing’s 747, 767, 777, and 787 aircraft as well as the Airbus A330 and A340. The life-cycle cost of various mixes of these aircraft were similar, so much so that RAND found “no reason” to exclude any from the tanker competition.

Boeing has long offered the KC-767, which it already has sold to Japan and Italy, as its top candidate, although company officials have said they would be willing to militarize the 777 if the Air Force wants to buy it.

RAND said the 787 is as good as any other option, though Boeing officials have said the new airliner does not have sufficient structural strength to handle the rigors of the air refueling mission. It makes heavy use of composites and other lightweight materials because it was designed for maximum efficiency in transporting passengers, not cargo or fuel.

The full AOA ran to some 1,800 pages. Because the full report included large amounts of proprietary technical data from various companies and manufacturers, only a 17-page executive summary was released. The rest is classified.

The study found “good arguments” to hurry up and get the tanker replacement program rolling. It noted that the KC-135s already average 46 years old, and the challenges of maintaining such an aged fleet really can’t be predicted.

“There is considerable uncertainty about the future technical condition and sustainment cost of the KC-135,” said the RAND study.

It suggested the Air Force do full-scale fatigue testing and a teardown analysis of representative aircraft to get a better idea of what problems lie ahead for keeping the fleet going.

Through process improvements, the Air Force has managed to slash the amount of time KC-135s have had to spend in depot maintenance, suggesting USAF has solved some of the problems of maintaining such an old airplane. Air Force officials have said that, in the early 2000s, so much work was required on the old airplanes that depot maintenance practically amounted to a “remanufacturing” program.

Secondly, RAND noted, if financial considerations require spreading tanker recapitalization out over a long period of time—as seems to be the case, judging by the 2007 Pentagon budget request—then starting earlier will help reduce the expense in any one year.

Finally, RAND noted, the KC-135 doesn’t have many of the additional capabilities a new aircraft could have. It could not, for example, serve as a communications relay, receive fuel as well as refuel other aircraft, or refuel multiple aircraft simultaneously at a rate faster than possible today. RAND didn’t examine the military value or cost-effectiveness of adding these other capabilities to the tanker fleet.

Need for Judgment

Adding the options mentioned above is a military consideration and “a matter for senior decision-maker judgment,” said the study.

RAND allowed that future conditions could change in ways that would lessen the need for tankers. Fewer aircraft needing air refueling could reduce the requirement; so could “a change in the geopolitical situation” or “technical developments that made a new-design aircraft a more attractive tanker alternative.” Another reason to wait simply would be to use the money for another pressing need.

“The decision of when to recapitalize should be based on considerations
"If I had a properly configured tanker that had doors and floors, could carry passengers, and [had] defensive systems, I could ... return the C-17 either to moving cargo or reduce the [operating] tempo," said Schwartz.

Lt. Gen. Christopher A. Kelly, the vice commander of Air Mobility Command, told a House panel in February he would prefer that the Air Force buy a mix of aircraft for the tanker mission. Kelly said a mix would offer operational benefits of flexibility. It also would offer a hedge against a problem that could ground the entire fleet. With two types, a problem that grounded one would likely not affect the other.

Kelly also lifted some of the secrecy enshrouding the Mobility Capabilities Study. He said the MCS put the new tanker requirement at “520 to 640 total aircraft inventory” and that AMC believes 520 is the “minimum requirement.” The MCS said the existing tanker fleet “shows a ... shortfall in all scenarios except for one.”

However, Lt. Gen Donald J. Hoffman, the military deputy in the service’s acquisition office, told the same House panel that he thinks USAF should buy only one type of tanker. Hoffman noted it would be cheaper to develop one type of aircraft rather than two, and it would be less costly to buy just one set of unique ground equipment.

He also pointed out that recent legislation requires that the first 100 aircraft ought to “all look the same” and be of the “medium” class. He added that, with the KC-135 and KC-10, USAF already has a “high-low mix” of tankers.

What about used aircraft? RAND said a survey of suitable aircraft available other than the present value of life-cycle costs,” RAND said. However, this finding also is dependent on the KC-135 fleet not developing any fatal problems in the meantime.

RAND also found that it would cost about six percent more to replace the KC-135s with aircraft that could carry cargo and passengers rather than with "pure" tankers with no floors and only cross-bracing inside the fuselage.

Gen. Norton A. Schwartz, head of US Transportation Command, told the House Armed Services Committee in March that buying a combination tanker-cargo aircraft would ease pressure on what he acknowledged is an overworked C-17 fleet.

Proposed rates of replacement could well force the Air Force to keep some KC-135s in the inventory for another 45 years. A 90-year-old fleet would certainly result in maintenance challenges. Here, KC-135s line up for takeoff at RAF Mildenhall, Britain.

Boeing has long offered the KC-767, shown here in drawings by a Boeing artist, as a KC-135 replacement. The aircraft has already been sold to Japan and Italy.
for purchase would still only meet between 10 and 25 percent of the total requirement, and so they would have to be part of a mixed fleet anyway. Because used aircraft won’t meet the whole requirement, at least some portion of the recapitalized fleet will have to be new airframes.

90-Year-Old Aircraft?

In any case, proposed rates of replacement could well force the Air Force to keep some KC-135s in the inventory another 45 years. “The average age of the fleet in 2006 is 46 years, and continued operation to 2050 would result in a 90-year-old fleet. A fleet of this age and size is unprecedented in aviation history,” RAND found, and will surely present maintenance challenges.

RAND defined the optimum-sized aircraft as between 300,000 and one million pounds gross maximum take-off weight. Because both Boeing and Airbus have a number of models in this range, and at comparable life-cycle costs, there is no reason to rule out a mixed buy of aircraft from both companies, RAND said.

Moreover, because the cost of the basic, or “green,” aircraft played such a huge role in overall cost effectiveness, head-to-head competition would probably be a good thing, to get the cost of the aircraft itself as low as possible, according to the AOA. Under some proposals, Boeing and Airbus would compete for 100-airplane lots of new tankers, so that each round would be large enough to justify the corporate expense of competing.

In a blow to Boeing, which has proposed an all-new design called a Blended Wing Body as an answer to the tanker requirement and also as a future cargo airlifter, RAND determined that the expense of a new start would be far higher than adapting an existing design, even though the new design could be optimized for military wishes such as stealth and speed.

A new design suffers in cost analysis because “there are no shared production-learning economies with a commercial version.” Boeing, however, also has proposed the BWB as the basis of a next generation super-jumbo airliner.

The study team did say, however, that a stealthy tanker, while “significantly more expensive” than a standard airframe, does offer “some effectiveness benefits,” such as survivability and providing the means to escort strike aircraft into enemy territory. RAND said it would be “a military judgment” whether “the expense of penetrating tankers” outweigh the much higher costs.

RAND ruled out unmanned tankers because the reliability of current unmanned aircraft is well below that of manned aircraft. Any savings from reducing crew costs would be wiped out by the expense and danger of losing aircraft in crashes. Tankers are “too critical a combat resource in wartime, and too costly to replace in the longer run, to be generally used in ways that risk substantial attrition,” according to the AOA.

RAND said outsourcing the tanker mission was so fraught with problems that it wasn’t worth considering.

Kelly told the House panel that each of six recent tanker studies reached a common conclusion: Recapitalization is needed. Most said it should begin at once, and most recommended against upgrading the KC-135. Passing up that option would free up to $6 billion for new tankers, Kelly said.