

9 SECRETS OF THE TANKER WAR

Replacing
America's Aerial
Refueling Tankers
with KC-X



9 Secrets of the Tanker War
By Rebecca Grant
September 2010

The cover photo depicts a KC-135R undergoing a landing gear retraction test at a base in Southwest Asia.

Below, a KC-135R receives patients for aeromedical evacuation from a base in Southwest Asia.



THE WAR FOR KC-X

In theory, the tanker war is all over. The proposals are in. The die is cast. This fall, the Pentagon will evaluate the bids from Boeing and EADS North America for a new aerial refueling tanker plane called KC-X. “K” has served as the military designation for refueling aircraft since converted B-29 bombers strapped on a British gravity-loop hose system to create the first practical air refueling system in 1948.

The Air Force has been waiting nearly 10 years for a program to start replacing some of its KC-135 tanker aircraft, which were built from 1957 to 1965.

“Without tankers, we’re not global,” said Air Force Chief of Staff General Norton Schwartz. The reach of American military power depends on aerial refueling tankers to deploy ground forces and top off fighters and bombers attacking targets and to keep vital surveillance and communications planes in the sky longer.

Where will new KC-X tankers operate? In every one of the scenario sets laid out by the Pentagon’s future strategy review of 2010. That includes homeland defense, two overseas wars, counterinsurgency operations, stability operations and deterring rising military powers. Tankers support US Air Force, Navy, and Marine Corps aircraft and often provide the bulk of refueling support for Coalition partners. Demand for tankers is constant.

KC-X is not just a replacement program, of course. It’s a leap ahead in military capability. It will “be able to multi-point refuel joint and coalition aircraft, carry cargo and/or passengers, conduct aeromedi-

cal evacuation, and self-deploy,” according to the Air Force. Planners won’t have to work around the limitations of the venerable KC-135 or worry about catastrophic failures due to aging that could ground the whole fleet – and hobble US military power.

So why has procuring a tanker been so difficult? The Congressional Research Service summed it up well: “The KC-X acquisition program is a subject of intense interest because of the dollar value of the contract, the number of jobs it would create, the importance of tanker aircraft to U.S. military operations, and because previous attempts by DOD to move ahead with a KC-X acquisition program over the last several years have led to controversy and ultimately failed.”¹

Really, the fire and brimstone should come as no surprise, since it’s an offshoot of robust Western capitalism at work. As soon as the decision was made to compete commercial aircraft, KC-X was bound to get loud and noisy. The business rivalry between Boeing and Airbus is one of the sharpest, most unforgiving match-ups in the history of capitalism. That was the point: base the KC-X tanker on a proven commercial plane and get the best price.

Clear away the smoke, and one cool reality emerges: the absolute military necessity of KC-X. Discussion of capability has often taken a back seat in this very public competition. With that in mind, here are 9 secrets of what’s at stake in the tanker war, both in military operations and in the business of military aircraft manufacturing – including one that may be the best-kept secret of all.

KC-X WAS BOUND TO GET LOUD AND NOISY

The first secrets of the tanker war are really about clearing away some myths and taking the broader view of industry trends that have overshadowed the attempt to get KC-X underway.

First of all, Boeing and Airbus, a subsidiary of EADS, compete fiercely. The Boeing tanker offering will be based on the 767 while the EADS North America tanker offering will be based on the A330. Both compete head-to-head for orders from airlines around the globe. As a result, any procurement involving these two titans was bound to get as loud and noisy as their frequent commercial airline bidding wars. The KC-X bids will be helmed by their well-mannered defense sectors. Still, the bidding styles will reflect raw Western capitalism at work.

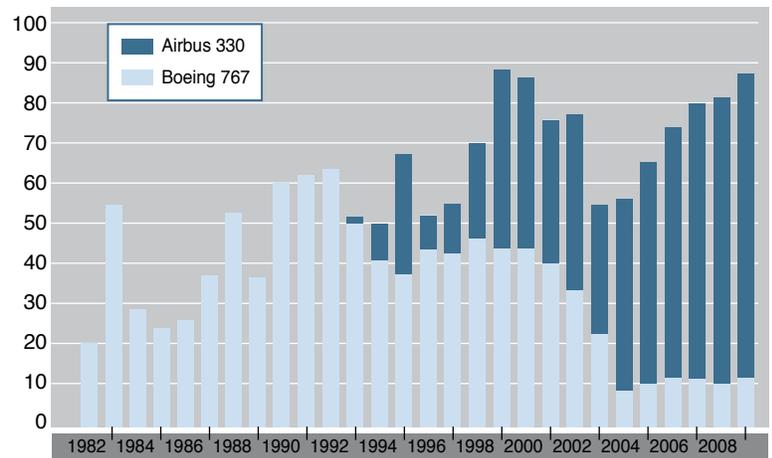
Boeing and Airbus dominate the medium and large jet commercial market. Both build aircraft with a base of global suppliers, and sell aircraft globally. A quick look back shows why fierce competition is actually routine in this business.

Boeing first flew the 767 in September 1981, and has gone on to deliver more than 986 of them. Commercial jet sales are notoriously cyclical. Demand for the 767 tapered in recent years, but customers have still ordered 74 since 2004, predominantly the freighter variants. A growing airline market in the years following US deregulation and the expansion of international markets created a rising tide of airline orders. In 1990, Airbus introduced the A330, a wide-body, twin-aisle jet with significant technical improvements. By the 2000s, the A330 was typically outselling the older Boeing 767 in the commercial market. The chart shows an increase in combined 767 and A330 sales of over 50% from 1988 to 2008.

The fact is that all commercial airliner sales have boomed over the last three decades as global

passenger air traffic (and freight) increased. System revenue departures for US airlines rose from 7.7 million in 1997 to 10.8 million in 2007, an increase of 40%. Global recessions made 2009 a difficult year, but top executives regarded it as a severe but passing storm.

MEDIUM LONG HAUL AIRCRAFT DELIVERIES 1982-2008



Hence, the Obama Administration rightly insisted on fair and open competition despite the spillover of longstanding commercial sensitivities. President Obama assured France's President Nicolas Sarkozy during a March 2010 visit that this round of KC-X would be fair and open. "What I said to President Sarkozy is, is that the process will be free and fair," Obama said at the White House on March 30, 2010.²

"We want a fair and open competition for the tanker. And frankly efforts to discourage US companies from participating in the competition do not help us," reiterated Secretary of Defense Robert Gates.³

THE US MILITARY ALREADY FLIES MANY “FOREIGN” AIRCRAFT

It might as well be a fair and open competition, because several European-made fixed-wing aircraft and helicopters are already being operated by the US military, and bids for more are underway. Most have been brought into the inventory via joint ventures with US companies.

- *The C-27J Spartan bought for short-haul lift in war-zones was first made in the 1960s by Italian firm Alenia, now owned by Italian parent Finmeccanica. The US firm L3com acts as the prime contractor and modifies the C-27J at its US plant.*
- *The Army's venerable C-23 Sherpa bought in the 1980s was made entirely by an Irish firm.*
- *The US Army's new UH-72 Lakota Light Attack Helicopter is actually the Eurocopter, now built in Columbus, Mississippi, by American Eurocopter, a subsidiary of EADS North America. Major suppliers are located in many states. Turbomeca USA manufactures the engines near the DFW airport in Grand Prairie, Texas. To date the Army has taken delivery of more than 125 of the successful Eurocopter variant, and plans to buy up to 360.*

- *The US Coast Guard flies the EADS North America HC-144A Ocean Sentry Maritime Patrol aircraft in homeland defense and rescue roles. Derived from the Airbus Military CN235, the Coast Guard plans a total buy of 36 aircraft.*

- *For that matter, the New York Times reported in June that “the Pentagon has spent \$648 million to buy or refurbish 31 Russian Mi-17 transport helicopters for the Afghan National Army Air Corps.”⁴*

- *Boeing announced in June 2010 that they will team with Italian-owned AgustaWestland in a new competition for the Presidential helicopter.*

- *In future years, if the Air Force replaces its advanced jet trainers, the main options are the Alenia Aermacchi M346 Master, BAE Systems Hawk 128 and Korea Aerospace Industries/Lockheed Martin T-50 Golden Eagle.⁵*

This is why international partnerships have long been welcomed by the Pentagon.



NEITHER BIDDER IS GOING UNDER IF THEY LOSE KC-X

The reality is that KC-X is something close to a drop in the bucket for both Boeing and EADS in comparison to their total commercial sales.

While the global recession caused sales to slip, Boeing expected to deliver 460 to 465 commercial aircraft in 2010 against 481 in 2009, a large number of which would be from the short-haul 737 series, according to Boeing Commercial Airplanes.⁶ Their new 787 is “the fastest-selling new airplane in aviation history.”⁷

is based on a projected 24,097 new aircraft coming into service to replenish current fleets and meet 3.5% annual growth over that period. That time span nearly matches the life of the 179 aircraft KC-X contract. EADS and Boeing will not capture all those sales, to be sure, but the outlook for those titans is far from gloomy.

KC-X won't be central in keeping either company in business – not by a long shot. While it's a prize,



KC-X at 15 aircraft per year would be just over 3% of a total order book of 460 commercial aircraft per year. Boom years like the last half of the 2000s saw some years with 600 or 800 orders or more.

The future commercial market is set to grow steadily over the next two decades based on rising international demand. EADS forecast that the market for passenger aircraft with more than 100 seats could total US \$2.9 trillion from 2009 to 2028. The number

the ultimate health of both firms and the prospects for their employees and supply chain partners do not depend on KC-X.

KC-X, however, is essential to US national security options – all the more so if it ends up being the only new tanker. Accordingly, the next section examines some “secrets” of tanker operations that have been obscured by the business brouhaha.

FUEL OFFLOAD MATTERS

Tanker scheduling and operations are very complicated. “Too small a tank and it lacks the gas our forces need,” summed up former TRANSCOM commander General Walter Kross. “Too big a plane and it clogs runways, and slows down the primary mission flow.”⁸

It’s a trade-off. Planners want plenty of “booms in the air” so that many receiver aircraft can find tankers with fuel ready and waiting. Tanker statistics dominated by KC-135 sorties indicate that the average offload is about 60,000 lbs. of fuel. That said, real world experience has shown that additional fuel often comes in handy in supporting combat operations. Long missions over Afghanistan have left fighters and even big radar planes like JSTARS short on fuel as they overstay mission times while helping troops under fire on the ground.

For the KC-X competition, the government will be evaluating combat flexibility via one very specific measure: the Fleet Effectiveness Value. What’s that? The government will run a simulation of tankers during a handful of combat scenarios. Both KC-X contenders will do a better job than the KC-135R. That’s the point of the competition. The question is which one will score best, and how big the gap will be be-

Think about fuel. The table shows Air Force planning figures for the KC-10 and the KC-135R, nicely illustrating why those big KC-10s are so in demand for bomber refueling, long missions in bad weather, and the task of deploying aircraft overseas (also known as “fighter drags.”)

The next three examples are notional tankers. They portray a range of options for KC-X. (Neither bidder has made the specifications of their aircraft public.) These three notional KC-X simply add 15%, 25% or 35% to the KC-135R’s stated fuel load. The table makes it pretty clear that the Air Force needs a tanker with more fuel than the KC-135R.

Focus in on the key variable of Maximum Offload Available once the KC-X reaches its track. What can it do with the fuel?

- *Refuel bombers, which may take 90,000 to 100,000 lbs. per each refueling.*
- *Refuel airlift aircraft such as the C-17 or C-5, which may need only one refueling on a long deployment, but they must have a tanker with a minimum 90,000 lbs. offload available.*
- *Wait in the tanker track and refuel fighters. This is the most typical mission, and planners stack tanker*

TANKER OFFLOAD AND ENDURANCE

MAXIMUM OFFLOAD AVAILABLE | MISSION RADIUS

	Aircraft Takeoff Fuel lbs.	500 nm	1000 nm	1500 nm	2500 nm
KC-10	327000	233500	195200	156000	78700
KC-135R	180000	122200	99400	76400	30700
15%	207000	140530	114310	87860	35305
25%	225000	152750	124250	95500	38375
35%	243000	164970	134190	103140	41445

Source: Air Force Pamphlet 10-1403

tween its “Fleet Effectiveness Value” and the tally for the second-best tanker. A big enough difference could earn the better plane a discount formula that will boost its chances of winning the KC-X contract.

Although it sounds artificial, the formula strives to get at real wartime planning factors where performance and fuel matter. What follows is not the last word on tankers but a quick sketch of why capability should matter a lot in the KC-X competition.

tracks all over the battlespace to ensure fuel is there when needed.

As the table shows, operations close to bases are relatively easy. Push the tanker tracks out 1000 nm or more, and suddenly not all of the notional tankers can do the job equally well. If the mission called for a long loiter or fueling a big airplane, the qualitative difference of more fuel available kicks in fast.

MORE FUEL CREATES MORE TIME ON STATION

Tankers also have to cover time on station so that gas is available round the clock in major operations. If the receivers are scheduled to be fighters, then the question becomes: how long can the KC-X stay in the track given a typical offload? Assume the offload will be 60,000 lbs. during the mission. More fuel permits more time in the tanker track to wait for receivers.

At 1000 nm, the KC-135 can spend 3.6 hours on station. However the KC-X with 35% more fuel can spend 6.7 hours on station. Looking at KC-X options, manning a 24-hour track would take 5 KC-X with 15%

more fuel but only 4 of the KC-X with 35% more fuel. Doing the job with one less tanker is a significant difference when multiplied across many tracks.

Saving an additional tanker tail does two things. First, it make a tanker available for another assignment. Second, it also saves the fuel to fly the additional tanker to the track and home again. Efficiency like this is useful for servicing more aircraft, redistributing tanker orbits, and taking other measures to get the most out of the tanker force. With KC-X, planners will turn efficiency into effectiveness.

TANKER OFFLOAD AND ENDURANCE

Tanker	Take-off Fuel	Total Offload 1000 nm radius	Average Offload per sortie	Remaining Fuel	Burn Rate per Hour	Hours in Track
KC-10	327,000	195,200	60,000	173,500	17,830	7.5
KC-135R	180,000	99,400	60,000	39,400	10,718	3.6
KC-X 15%	207,000	114,310	60,000	54,310	10,000	5.4
KC-X 25%	225,000	124,250	60,000	64,250	10,500	6.1
KC-X 35%	243,000	134,190	60,000	74,190	11,000	6.7

Source: Air Force Pamphlet 10-1403



WHEN FUEL IS LIMITED, BIGGER IS BETTER...TO A POINT



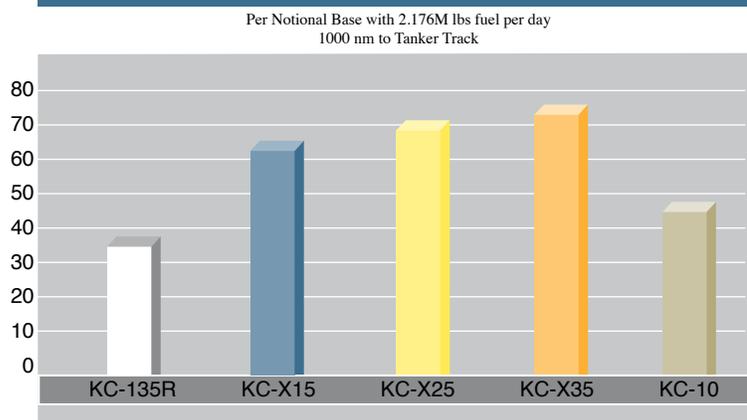
Now pair time on station with another variable, to get a sense of the constraints planners face. A critical element at any base is the amount of fuel it can store and pump to aircraft per day. A big tanker base like Prince Sultan Air Base, Saudi Arabia (which was used in 2003 for Operation Iraqi Freedom and is now closed to US operations) could distribute over 1 million gallons of JP8 per day from its fuel farm. In contrast, one of the most important operating bases for Afghanistan has been the much smaller Manas, Kyrgyzstan, a major air-lift transshipment point. At Manas, Air Force fuels technicians still meet trucks at the gate who transfer fuel into giant fuel bladders. Manas distributes on average 320,000 gallons of fuel per day.

Tankers aren't going to operate out of austere, small bases. Air Force regulations require 7000 ft. runways for them and of course, they need fuel to upload. However, finding enough of the right bases in the right location is always a challenge. During NATO's Operation Allied Force in 1999, the Air Force stuffed tankers into bases well over the maximum number allowed.

So the combination of gas at the base and endurance of the tankers presents a harsh reality – and some analytic surprises. A notional base with fuel supplies like those at Manas could fuel up more of the smaller tankers. In this example, the notional base fuels ten “15s” or nine “25s” or eight “35s.”

However, once on station, the larger tankers hit the sweet spot. Fewer tankers fly, but the slightly larger ones use their additional fuel to provide more hours on station while using fewer airframes. That's operational flexibility.

TANKER HOURS ON STATION



The chart shows hours on station generated from the notional base depending on the distance (as a radius) to the tanker track. Intriguingly, the real-world fuel constraint also puts a damper on the KC-10, showing why the Air Force opted for a medium tanker for KC-X.

These calculations do not capture all the complexity of tanker scheduling and mission execution. What they do show is how the variable of fuel – both on the ground, and in the air – can shape the way tankers are used.

THE PACIFIC IS TOUGH

Endurance could become critical out in the Pacific.

In 2009, the Air Force and Navy began working together on improving their capabilities for an air and sea campaign against China in the Pacific. While the US has good trade relations with China, the way of military planning is to prepare for the most taxing scenario. The 2010 QDR specifically stated that defense strategy “assumes the need for a robust force capable of protecting U.S. interests against a multiplicity of threats, including two capable nation-state aggressors.”⁹

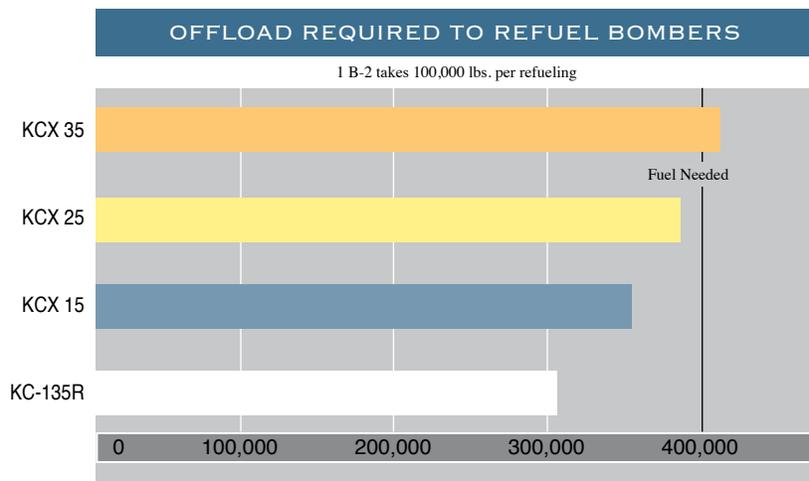
The Pacific scenario features long distances and heavily defended airspace around China and the Strait of Taiwan. It’s a classic “anti-access” strategy problem where China has only to defend its area of influence, while the US and allies face the much tougher problem of projecting power to break through Chinese defenses.

Any air campaign will demand extremely long reach and heavy use of tankers. The distance from Guam to Taipei, for example, is 1474 nm.

Look at a Pacific scenario where tankers meet a B-2 bomber four times at distances 1500 nm away from the tanker’s base. Bombers are key to deterrence in the Pacific.

Based on operational experience from the B-2’s intercontinental combat missions in 1999, a typical bomber mission from long distance may take four refuelings of nearly 100,000 lbs. of fuel each. KC-10s are usually scheduled due to the amount of fuel offload needed and their ability to loiter.

As the chart shows, the larger KC-Xs can handle the scenario with four aircraft. However, the smaller notional KC-X would require a minimum of five and likely more tankers to meet both the offload and the



timing requirements for the mission. Multiply that over dozens of aircraft and the overall effect of endurance stands out: tankers with a bit more fuel can handle the workload with fewer sorties, or most important, free tankers for the kind of emergency operations that seem to occur in every air campaign. It’s interesting to note that while KC-X is not intended to replace the KC-10, the fact that a KC-X with greater capacity can accomplish some of the longer missions creates very useful force sizing and utilization options.

The military requirement for KC-X is clear and compelling. The competition itself has been a real saga, but the secret insight here is: that’s normal in the aircraft manufacturing business.

KC-X KEEPS AMERICANS WORKING IN THE AEROSPACE INDUSTRY, EITHER WAY

The KC-X tanker at peak production is likely to support about 50,000 jobs for American workers – under either winner. Boeing estimates its tanker program will employ 50,000 Americans. EADS North America estimates its tanker program will employ 48,000 Americans.

The key is that not all those jobs are directly with Boeing or EADS North America. Thousands of jobs will come from the payroll of what are called *suppliers*: big and small firms that contribute parts ranging from engines to fasteners.

aircraft are manufactured. Aircraft manufacturing went global in the 1980s. The aerospace industry in America relies on a global supply chain of supplier firms. In turn, American suppliers send parts to big international firms.

When a supplier excels, it usually sells to multiple firms for different aircraft types.

Here are two examples:

- *Ateliers de la Haute Garonne, a French firm, supplies fasteners – bolts, rivets, etc. – to all of Boeing and Airbus' widebodies.*



“The aerospace industry is dominated by a few large firms that contract to produce aircraft with Government and private businesses, usually airline and cargo transportation companies. These large firms, in turn, subcontract with smaller firms to produce specific systems and parts for their vehicles,” explained the Bureau of Labor Statistics. The American aerospace industry in 2008 totaled about 3100 firms which manufactured aircraft and spacecraft of all types plus guided missiles.

The idea of an “American-made” plane is an illusion that doesn’t reflect the longstanding reality of how

- *Vought Aircraft in Dallas, Texas, manufactures wing and fuselage elements for both the Boeing 767 and the Airbus 330, as well as for other major aircraft.*

International markets are vital for the US aerospace industry, and the global supply chain helps US firms of all sizes stay competitive. Both KC-X teams list scores of US and global suppliers. Many of the 50,000 American jobs on KC-X will come from supplier firms.

KC-X MAY BE THE ONLY NEW TANKER

Here's the ninth and last secret of the tanker war. No one in Washington is saying it yet, but KC-X may end up being the *only* tanker competition. Originally, plans called for a second phase dubbed KC-Y with another 179 tankers, followed by KC-Z with the final 179. That was before defense budgets ballooned during the Iraq war and the global recession hit. Then there's the unfortunate fact that the Air Force has failed to restock its fighters and bombers in the number needed. The Air Force bought 744 B-52 bombers up through 1962, 100 B-1s in the 1980s and just 21 B-2s in the 1990s. With that track record, prospects for fully replacing the tanker fleet aren't too good. Even if the US buys more than the 179 tankers in KC-X, those buys are two decades away.

What's increasingly likely is that the future fleet will consist of KC-X, KC-10s and some KC-135Rs. Legacy tankers will outnumber KC-X for a long time. Commanders will search for ways to insert KC-X efficiently into a force that still has many of the smaller KC-135Rs.

In that case, it's essential to get KC-X right. Factors like extra fuel and endurance of KC-X will be especially valuable. KC-135Rs will take on stations closest to bases. The best possible KC-X would be bigger than a KC-135R, and smaller than a KC-10, and carry all the fuel it could.



CONCLUSION



The United States government has done all in its power to assure that this final KC-X round will be a fair and open competition.

There's no time to lose. New tankers need to be flying before another round of significant structural overhauls for KC-135Rs come due in the years from 2019 to 2037. Costs could rise to \$6 billion per year to maintain 70-year old KC-135s.¹⁰ That flies in the face of the Pentagon's new initiatives to cut overhead costs.

At the end of the day, the tanker war is an extension of fierce competition between long-term rivals. What's more, that competition stands to benefit the US by wringing out the best possible price and by growing jobs for Americans. It will also boost the already-positive US trade balance in aerospace products regardless of who wins.

The fate of commercial aviation giants and America's half million aerospace workers does not rest solely in the arms of KC-X. However, the global reach of the American military does.

The real advantage comes with the new capabilities KC-X will bring. From enhanced refueling to cargo to improved facilities for aeromedical evacuation, KC-X will give commanders in theater and around the globe compelling options for how they use the tanker fleet in the years to come.

Leave the last word to Air Force Chief of Staff Schwartz: "Our nation, our collective security, cannot wait for the moment of crisis to wake up and realize the importance of tanker recapitalization.... our joint force would face immediate paralysis and long-term degradation."

The time for KC-X is now.



END NOTES

¹ J. J. Gertler, Air Force KC-X Tanker Aircraft Program: Background and Issues for Congress, Congressional Research Service, May 14, 2010.

² President Obama and President Sarkozy Media Availability, March 30, 2010, whitehouse.gov

³ Secretary of Defense Robert Gates, Media Availability, June 8, 2010.

⁴ Craig Whitlock, New York Times, "U.S. Buys Russian Choppers for Afghan Military," June 18, 2010.

⁵ Stephen Trimble, "Previewing the T-X," Flightglobal, June 21, 2010.

⁶ Harry Suhartono and Mariko Katsumura, "Airshow Update: Boeing Sees Aircraft Order Book Shrinking," Reuters, February 2, 2010.

⁷ James McNerney, "2009 Address to Shareholders," boeing.com

⁸ Walter Kross, "Try Fighting Without Us," Washington Times, May 26, 2002.

⁹ Department of Defense, Quadrennial Defense Review, 2010, p. 42.

¹⁰ Gertler, op. cit.



IRIS INDEPENDENT
RESEARCH

www.irisresearch.com