

A NEW 'FREEDOM' FIGHTER
BUILDING ON THE T-X COMPETITION

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Abstract

The development and deployment of state-of-the-art fighter aircraft gives the United States dominance in the air but prevents the U.S. government and aerospace industry from fulfilling the demand of less advanced foreign air forces for low-cost jet fighters. China, in contrast, has succeeded in this market segment for decades and will further its competitive posture in the years to come. U.S. efforts to fill this fighter gap, through the Light Air Support (LAS) program, have focused on identifying a turboprop aircraft for close air support or counterinsurgency (COIN) operations. Many air forces, however, have been reluctant to spend scarce resources on armed turboprops, which they view as having limited capability.

This brief proposes that the U.S. Air Force (USAF) instead capitalize on the existing T-X competition, which seeks a replacement for T-38 training jets, to develop a low-cost fighter for export. During the Cold War, the United States sold a significant number of militarized jet trainers, such as the F-5 and the A-37, to partners in the developing world. The practice of turning a jet trainer into a low-cost, easily maintained fighter was a success and should be revived. This program will allow the United States to strengthen its joint military efforts with partner states, bolster its aerospace industry, and counter rising Chinese influence.

Current Status of Fighter Jet Sales

The superiority of U.S. fighter aircraft makes them an attractive purchase for air forces throughout world. However, not all U.S. partners can afford such advanced aircraft or possess the resources and skill level needed to operate and maintain them. These states instead seek the kind of low-cost, yet capable, fighter aircraft that China has sold for decades. Without change, the United States risks falling further behind China in this market segment.

Comparison of U.S. and Chinese Fighter Jet Sales

Since the end of the Cold War, total U.S. fighter jet sales have exceeded Chinese sales by a margin of nearly 2,000 aircraft.¹ However, during that same time period, China received nearly three times as many orders for low-cost fighters as the United States.² The gap between the two countries has continued to widen. Between 2000 and 2010 China sold 312 low-cost fighters whereas the United States exported only ten.³

Since the end of the Cold War, China has sold aircraft to a greater number of states and in a wider variety of regions. Beijing has exported variants of four fighter models to fifteen states in Africa, Southern Asia, South-Eastern Asia, and South America.⁴ With the K-8, for example, China broke into the Latin American market and increased its sales in Africa.⁵ Chinese fighter jets also have increased in quality. China has progressed from copying Soviet aircraft, such as the MiG series, to producing indigenously designed aircraft like the K-8 and JF-17.⁶

Future Trends in the Chinese Aerospace Industry

Aviation Industry Corporation of China (AVIC), China's state-owned aerospace company, and its export arm, China Aero-Technology Import Export Corporation (CATIC), are taking several steps to strengthen China's competitive posture in the aerospace industry.

- *Development:*
 - China has developed rapid prototyping production centers modeled on Lockheed Martin's Skunk Works and Boeing's Phantom Works projects.⁷
 - AVIC intends to invest \$1.35 billion into jet engine research and development over the next five years. Through this investment, AVIC aims to free China of its dependence on Russian technology and expand Chinese aircraft exports.⁸
- *Export:*
 - AVIC seeks to increase the quality and sophistication of Chinese military aircraft, with the aim of exporting to a wider variety of states, particularly in emerging markets in Africa and Asia.⁹
 - CATIC had made the affordability of Chinese military aircraft, relative to western aircraft, a central aspect of its export strategy.¹⁰
- *Training, Maintenance, and Post-Sale Support:* China places increasing emphasis on customer service and post-sale support for military equipment customers.¹¹ According to AVIC reports, China maintains support offices and overseas companies in 12 African states. China also operates 14 military attaché offices in Africa. Five of those offices are located in states that have purchased Chinese fighter jet aircraft.¹²

Implications of U.S. Fighter Jet Sales

Fighter jet sales produce long-term payoffs that extend beyond the initial transaction. Specifically, fighter jet exports contribute to U.S. political, military, and economic power. Both the U.S. aerospace industry and the country as a whole benefit from these sales.

Political

Fighter jet sales foster closer political-military relationships between the United States and partner states by providing the resources needed to achieve mutual security goals.

- *U.S. Foreign Policy Strategy:* Both the 2010 National Security Strategy (NSS) and the 2010 Quadrennial Diplomacy and Development Review (QDDR) emphasize investment in partner capacity as a means of increasing security burden sharing.¹³

- *Foreign Military Sales (FMS)*: The FMS program strengthens U.S. national security by enhancing the defense capabilities of U.S. partners, which allows those states to better provide for their own defense and to contribute to regional and global security. FMS also increases U.S. leverage in its relationships with purchasing states.¹⁴

Military

Fighter jet sales advance U.S. defense policy by fostering and sustaining military-military relations with other states, primarily through joint-training exercises. Many states choose to buy U.S. military hardware due to superior post-sale support and the opportunity to develop military-military relations. China has taken note and is increasing its efforts in these areas.

- *Joint Training*: The 2010 Quadrennial Defense Review (QDR) recommends improving upon existing efforts to strengthen the defense capacities of partner states through joint-training.¹⁵ According to the QDR, the USAF currently only meets half of the demand for training partner aviation forces. In response, the Air Force intends to field more light mobility and light attack aircraft for training purposes.¹⁶
- *Partner Capacity*: The Defense Department's 2012 Strategic Guidance emphasizes investing in partner capacity.¹⁷ Notably, the report also states that the U.S. military will rebalance toward the Asia-Pacific, China's main sphere of influence.¹⁸ Further, the United States will "seek to be the security partner of choice" and pursue new partnerships in Africa and Latin America, where China is also active.¹⁹
- *Interoperability*: According to the Defense Security Cooperation Agency, which coordinates military exports for the Defense Department, FMS contributes to coalition building and the strengthening of bilateral military relations by enhancing interoperability between U.S. and partner forces.²⁰

Economic

Fighter sales create jobs for the U.S. aerospace industry and lead to the purchase of other military equipment.

- *Aerospace Industry and Job Creation*: The aerospace industry is a significant source of domestic job creation and also contributes positively to the U.S. economy as a whole. In 2011 aerospace industry exports contributed \$87 billion to the domestic economy. Aerospace also boasts the largest positive trade balance (\$57.4 billion) of any U.S. manufacturing industry.²¹
- *Further Military Hardware Sales*: Purchasers of U.S. fighter jets often buy other military hardware as well, such as missiles, parts, and equipment.²² These additional sales help to extend production lines and lower unit costs.

Looking to the Past: Historical Models for Fighter Aircraft Sales

During the Cold War, the United States undertook several efforts to equip its partners with low-cost but capable aircraft. During the Vietnam War, the United States used jet aircraft as well as piston-powered and turboprop aircraft, such as the A-1 and OV-10. In a second and more general historical model, the United States exported low-cost fighter jets, such as the F-5 and A-37, to partners throughout the world. Many of these aircraft sales took place under the auspices of the Military Assistance Program (MAP), which sought to check Soviet aggression by providing the armed forces of friendly states with military hardware and training programs.²³ Examining these two historical models—turboprops versus fighter jets—will help identify the best path forward.

Use of Prop-Driven Aircraft during the Vietnam War

During the Vietnam War, the United States flew aircraft like the Douglas A-1 Skyraider and the Rockwell OV-10 Bronco for its own combat missions. It also provided A-1s directly to the South Vietnam Air Force (VNAF).²⁴

- *A-1 Skyraider*: The USAF initially used the piston-powered Skyraider to train and equip the VNAF's fighter squadrons.²⁵ In later years the Air Force used the A-1 for its own combat missions in Vietnam. The Skyraider provided close air support and also served in search and air rescue missions.²⁶
- *OV-10 Bronco*: The turboprop OV-10 primarily served as a forward air control aircraft in Vietnam. The Bronco was capable of taking off in short spaces and rough terrain, which allowed it to better support troops in forward areas.²⁷

Cold War Fighter Jet Sales

The simultaneous development of the T-38 trainer and F-5 fighter as well as the T-37 trainer and A-37 fighter demonstrated the effectiveness of turning a trainer aircraft into a light fighter for export.

- *T-38 and F-5*
 - The T-38 and F-5 were both developed from Northrop's privately-funded N-156 lightweight fighter project.²⁸ Northrop designed the aircraft for U.S. partners who wanted a low-cost alternative to more advanced U.S. fighter aircraft. The U.S. military initially rejected the fighter version of the aircraft but did select the trainer version, re-designating it the T-38 Talon.²⁹ The USAF later chose the fighter version to supply foreign air forces under MAP, re-designating the aircraft the F-5 Freedom Fighter.³⁰
 - The F-5 went on to great success as an export aircraft—over 2,300 were sold—and remains the ninth most active combat aircraft in the world.³¹ F-5 sales

benefited from the active support of the Air Force, which used the aircraft operationally in Vietnam and offered joint-training programs with purchasing air forces. The T-38 also remains in service, primarily with the USAF.³²

- *T-37 and A-37:*
 - The Cessna T-37 Tweet initially entered USAF service as a training aircraft.³³ The Air Force later contracted Cessna to modify the T-37 into an attack variant, the A-37 Dragonfly, to replace its aging fleet of A-1 Skyraiders.³⁴ The A-37s took over the missions in Vietnam previously carried out by prop-driven aircraft.³⁵
 - The A-37 also achieved success as an export aircraft—over 500 were sold—and is still operated today, as is the T-37.³⁶ As with the F-5, active USAF support facilitated the export of A-37s and T-37s and strengthened military-military relations through joint training.

Borrowing from the Past: Developing the New ‘Freedom’ Fighter

The remainder of the brief examines two paths forward for the Air Force in its mission to develop a low-cost fighter for export to partner states. The first option is to continue the development of a turboprop aircraft through the Light Air Support (LAS) program. The second option is to repurpose the T-X competition to include the development of a low-cost fighter jet variant, similar to the F-5 and A-37. This brief recommends the second option.

Option #1: Turboprop Aircraft and the LAS Program

The LAS program is designed to provide Afghanistan with an armed turboprop aircraft for light attack, reconnaissance, and COIN missions. The aircraft will fulfill a role similar to that of the A-1 Skyraider and OV-10 Bronco during the Vietnam War. The USAF will select the aircraft and then train the Afghani Air Force to operate it.

- *Origins of LAS:* The LAS program originated in the Air Force’s desire for a Light Attack/Armed Reconnaissance (LAAR) aircraft, intended for export and dedicated to COIN and irregular warfare missions.³⁷ In 2010 LAAR was subsumed into LAS.³⁸
- *Aircraft under Consideration for LAS:* The two aircraft under consideration for LAS are the Hawker Beechcraft AT-6 and the Embraer A-29 Super Tucano.
 - The Hawker Beechcraft AT-6 is a light attack variant of the T-6 Texan II turboprop trainer used by the U.S. Navy and the USAF.³⁹
 - The Embraer Super Tucano, or A-29, is a Brazilian aircraft that currently serves with five world air forces. It functions primarily as a COIN aircraft in rugged terrain environments.⁴⁰

- *Current State of LAS*: The USAF awarded the LAS contract to Embraer in December 2011 but issued a stop-work order in January 2012 pending litigation by Hawker Beechcraft, which believes it was unfairly excluded from the competition.⁴¹ The Air Force cancelled the contract in February 2012 and is due to issue a modified request for proposals in April 2012.⁴²

Limitations of the LAS Program

The LAS program has some advantages. Turboprops cost less than jets to purchase and are cheaper and easier to maintain. Most air forces can operate them.⁴³ They perform well in rugged terrain and with relatively short runways, and can be stationed closer than jets to troops as a result. Turboprops can also loiter in the air longer and at a lower cost than jets. However, the LAS program has a number of significant drawbacks.

- Most air forces have no desire to operate turboprops, as they are perceived as less capable—in large part because they are not used in combat by the USAF.⁴⁴
- Given the current fiscal situation, it is unlikely that the USAF will expand its order beyond the 20 aircraft needed for the Afghan Air Force. With no further sales on the horizon, LAS cannot serve as an effective means for building partnership capacity.
- Congress has been skeptical of efforts to field LAS type aircraft.⁴⁵ Possible reasons for this skepticism include disagreements over the aircraft to be used and lack of effective advocacy on the part of the Air Force.⁴⁶ Questions have also been raised about the viability of the long-term U.S.-Afghani relationship.⁴⁷
- Unlike more versatile jet aircraft, turboprops are effectively limited to light air-to-ground and close air support missions. This limited capability reduces the number of threats to which they can respond.
- Turboprops lack the speed of jets and are less able to get to needed locations quickly and to transit danger zones.

Option #2: Fighter Jets and the T-X Competition

The T-X competition will identify a replacement for the USAF's aging fleet of T-38 trainer aircraft. The T-38s have an average age of 43.5 years and need to be replaced given safety concerns and because their dated technology is inadequate for training pilots to fly fifth generations fighters, such as the F-22 and F-35. In addition to selecting a replacement for the T-38, the Air Force should also view T-X as an opportunity to acquire a light attack fighter for export.

- *Overview of T-X*
 - Air Education and Training Command (AETC) began the acquisition process to replace the T-38 in 2003.⁴⁸ The Air Force intends to procure 350 new trainers, but with naval and light attack versions, the U.S. order could reach nearly 1,000 aircraft.⁴⁹ The USAF plans to award the contract in FY2016 and operationalize the T-X fleet in 2020.⁵⁰
 - The Air Force is seeking a low-cost, two-seat military jet trainer aircraft and ground-based training systems.⁵¹
 - The (FY) 2012 budget requests \$300 million for a three year engineering, manufacturing, and development (EMD) phase. Given that level of funding, the USAF's current option is to select an off-the-shelf design.⁵²
- *Aircraft under Consideration:* The three aircraft receiving the most attention are foreign, off-the-shelf designs.
 - Alenia Aermacchi M-346: Alenia Aeronautica expects to rebrand its twin-engine M-346 trainer as the T-100 and offer it for the T-X competition.⁵³
 - BAE Systems Hawk: BAE Systems has partnered with Northrop Grumman Technical Services to offer the Hawk Advanced Jet Training System (AJTS).⁵⁴ AJTS includes the Hawk T2 aircraft and on-the-ground simulators.⁵⁵
 - Korea Aerospace Industries (KAI)/Lockheed Martin T-50 Golden Eagle: Lockheed Martin and KAI plan to offer their T-50 Golden Eagle trainer aircraft, which was designed with the eventual replacement of the T-38 in mind.⁵⁶
 - Boeing: Unlike the other potential bidders, Boeing is considering developing a clean-sheet design that would be purpose built for T-X.⁵⁷
- *Concept of Operations:* The fighter variant of the T-X trainer aircraft would fill a light-to-medium attack and limited air defense role.⁵⁸
- *Potential Market:* The aircraft can be marketed both to areas where China sells low-cost jets and to areas where the planes contending for T-X have already been sold.
 - China has sold comparable aircraft, such as the K-8, to states in Africa (Egypt, Ghana, Namibia, Sudan, Tanzania, Zambia, and Zimbabwe), Southern Asia (Sri Lanka), South-Eastern Asia (Myanmar), and South America (Venezuela and Bolivia).⁵⁹ While many of the above would not purchase U.S. aircraft for political reasons, they represent the kind of air forces interested in acquiring this capability.

- BAE has sold the Hawk T2 to Australia, Bahrain, Canada, India, and the United Kingdom.⁶⁰ KAI has sold the T-50 to Indonesia, and the Philippines has taken the aircraft under consideration.⁶¹ Alenia has sold the M-346 to Singapore.⁶²

Strengths of the T-X Approach

- The USAF needs to replace the T-38s given concerns over the safety of their continued operation and their inability to adequately train F-22 and F-35 pilots.⁶³
- The strategy of turning a jet trainer into a light air sovereignty and attack fighter has worked well in the past, as demonstrated by the F-5 and the A-37.
- Many of the aircraft under consideration for T-X already have the capability to serve as a trainer and a light fighter.
- The development of a fighter version for export would extend the production line for the T-X winner, lowering the unit cost and creating domestic jobs.
- The off-the-shelf nature of the aircraft would minimize concerns over end-use agreements and the sharing of advanced proprietary technology.
- U.S. operation of the trainer version would increase the likelihood of foreign purchases of the fighter version.⁶⁴
- Politically and militarily, the United States would benefit from acquiring an aircraft with which to build partnership capacity and facilitate interoperability in the developing world

Possible Objections

- In the current budgetary environment, the Air Force may be unwilling to invest heavily in developing partner capacity.

Response: Investing in partner capacity is a central aspect of several strategy documents, including the most recent NSS, QDR, QDDR, and USAF Global Partnerships Strategy. This proposal offers a concrete way to make that idea a reality, while capitalizing on a pre-existing and much needed program to replace the T-38.

- In the current business environment and given the failure of the Northrop F-20 (a 1980s era lightweight fighter project), aerospace companies may be reluctant to invest in a new lightweight fighter without the explicit Air Force support.⁶⁵

Response: The F-20 failed in large part due to disagreements and miscommunications between Northrop and the U.S. government. This proposal recommends that the USAF make the development of a fighter variant an explicit component of T-X.

- As the United States and its allies transition to fifth generation fighters, increasing quantities of used F-16s will come onto the market. Many air forces would rather fly a well-regarded aircraft long operated by the United States than take a risk on a new lightweight fighter.⁶⁶

Response: The nearly 40-year-old F-16 is entering the end of its life cycle. Production has slowed and there are few potential new buyers.⁶⁷ Most of the F-16s sold in the past decade were replenishment aircraft for states that already operate the F-16.⁶⁸ The aircraft under consideration for T-X would be cheaper than a new F-16 and most likely cheaper than a used F-16.⁶⁹

An armed T-X can constitute the low-end of a high-low technological mix in a developing air force with a limited budget. Fighter variants of the T-X can specialize in light-to-medium ground support, limited air sovereignty, and aircrew training. F-16s can be used for more demanding mission profiles.⁷⁰

- Air forces never prioritize trainer acquisitions, and the demand for turbine powered trainers, which has shrunk in recent years, is projected to remain flat until 2020.⁷¹

Response: The T-X program is a medium-term investment with initial operating capability slated for 2020. Several factors could contribute to a resurgence in international demand by that year. First, states will have more fully recovered from the economic recession and have a better sense of their defense budgets. Second, aging Cold War era aircraft like the F-5 and A-37 will soon need to be retired and replaced. Third, there would be an opening for a new cost-effective fighter when the F-16 production line closes, as not all states can transition to the F-35.⁷²

Conclusion

Although armed turboprop aircraft are well suited for some missions, they are of little interest to most air forces. Given this reality and mounting congressional opposition, the Air Force should abandon further development of the LAS program. To fill the light fighter gap, the Air Force should instead re-envision the T-X competition as a means to acquire both a new jet trainer and a light attack variant aircraft for export. This approach worked well in the past and should be revived today. Enacting this proposal will allow the United States to enhance its political-military relationships, bolster its aerospace industry, and counter rising Chinese influence.

This proposal is within the reach of the United States and offers a large, long-term pay-off for a relatively small, medium-term investment. While the U.S. military and the U.S. aerospace industry now operate in a more challenging fiscal environment, they can and should work together to advance U.S. security goals. This proposal offers a concrete means to advance U.S.

national security by expanding the T-X competition to include acquiring a light fighter for export—the New “Freedom” Fighter.

¹ SIPRI Arms Transfers Database (Stockholm International Peace Research Institute), s.v. “USA: Transfers of major conventional weapons: sorted by recipient. Deals with deliveries or orders made for year range 1950 to 2010,” December 16, 2011. “Fighter-type” aircraft in this analysis include those weapons designated in the SIPRI database as “Fighter aircraft,” “FGA aircraft” (Fighter/ground attack aircraft), and “Trainer/combat ac” (training aircraft with light attack capabilities); *Ibid.*, s.v. “China: Transfers of major convention weapons: sorted by recipient. Deals with deliveries or orders made for year range 1950 to 2010,” December 16, 2011. From 1991 to 2010 the United States received orders for 2,469 fighter-type aircraft and China received orders for 590 such planes.

² *Ibid.* “Low-cost, low-end fighter-type aircraft” are comparable to the F-5 Freedom Fighter in its day, and below the cost/capability levels of fourth and fifth generation aircraft such as the F-16, F/A-18, F-15, F-35, and AV-8B Harrier II. While all 590 of the Chinese exports were of the low-cost variant, the United States only exported 213 such planes.

³ *Ibid.*, “USA.”; *Ibid.*, “China.”

⁴ *Ibid.*, “China.”; “United Nations Statistics Division: Standard Country and Area Codes Classification.” United Nations, September 20, 2011, <http://unstats.un.org/unsd/methods/m49/m49regin.htm>.

⁵ SIPRI, “China.”

⁶ The K-8 and the JF-17 are both joint efforts of China and Pakistan. The K-8 is a lightweight jet aircraft that serves both as a pilot trainer and light striker fighter. The JF-17 is a lightweight multi-role fighter that is intended to compete with the F-16 in the export market; Gabe Collins and Andrew Erickson, “Jet Engine Development in China: Indigenous high-performance turbofans are a final step toward fully independent fighter production,” *China SignPost*, June 26 2011, <http://www.chinasignpost.com/2011/06/jet-engine-development-in-china-indigenous-high-performance-turbofans-are-a-final-step-toward-fully-independent-fighter-production/>. China’s inability to domestically mass-produce jet engines at consistently high quality levels has limited the growth of the state’s aerospace industry.

⁷ Bradley Perrett, “Avic Defense Adopting Skunk Works Model,” *Aviation Week*, January 14, 2011, <http://www.aviationweek.com/aw/generic/story.jsp?id=news/asd/2011/01/14/01.xml&channel=misc>

⁸ Gabe Collins and Andrew Erickson, “Jet Engine Development in China.”

⁹ Wendell Minnick, “China Leaps Into Global Aircraft Market,” *DefenseNews*, November 23, 2009, <http://minnickarticles.blogspot.com/2009/11/china-leaps-into-global-aircraft-market.htm>. For decades, many Chinese fighter jet sales have been to “pariah” states such as Iran, Myanmar, Sudan, and Zimbabwe, which were unable to buy elsewhere due to arms and trade sanctions; Sale at Dubai Air Show: 3 JF-17 Thunders for a price of a F-16,” *Rupee News*, November 13, 2011, <http://rupeenews.com/2011/11/sale-at-dubai-air-show-3-jf-17-thunders-for-a-price-of-a-f-16/>.

¹⁰ Reuben Johnson, “China’s CATIC/AVIC Offering New Full-Spectrum Flight Training System,” *Aviation Week*, January 31, 2010, http://www.aviationweek.com/aw/generic/story_channel.jsp?channel=busav&id=news/CATIC013110.xml; Siva Govindasamy, “China’s AVIC steps up sales push for FC-1, J-10 fighters,” *Flightglobal*, September 30, 2009, <http://www.flightglobal.com/news/articles/chinas-avic-steps-up-sales-push-for-fc-1-j-10-fighters-332905/>. Specifically, CATIC intends to aggressively market the J-10 and JF-17 to states seeking to modernize their fleets but unwilling or unable to pay for western fourth or fifth generation jet aircraft.

¹¹ Reuben Johnson, “This Is Not The Last Chinese Aircraft We Will Buy: Pakistan,” *Aviation Week*, July 22, 2010, http://www.aviationweek.com/aw/generic/story.jsp?id=news/awx/2010/07/22/awx_07_22_2010_p0-242943.xml&channel=defense.

¹² Kent Hughes Butts and Brent Bankus, “China’s Pursuit of Africa’s Natural Resources,” U.S. Army War College Center for Strategic Leadership, June 2009, http://www.csl.army.mil/usacsl/publications/CCS1_09_ChinasPursuitofAfricasNaturalResources.pdf. Those five states are Nigeria, Namibia, Sudan, Zambia, and Zimbabwe.

¹³ “National Security Strategy,” White House, May 2010, 11, http://www.whitehouse.gov/sites/default/files/rss_viewer/national_security_strategy.pdf; “Quadrennial Diplomacy and Development Review,” U.S. Department of State, 2010, <http://www.state.gov/documents/organization/153108.pdf>.

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- ¹⁴ Robert N. Peterman, *Fighter Aircraft Foreign Military Sales: Industry Survival and National Power*, 1993, 1, <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA276788>.
- ¹⁵ “Quadrennial Defense Review,” U.S. Department of Defense, February 2010, 49, http://www.defense.gov/qdr/images/QDR_as_of_12Feb10_1000.pdf.
- ¹⁶ *Ibid.*, 53.
- ¹⁷ “Sustaining U.S. Global Leadership: Priorities for 21st Century Defense,” U.S. Department of Defense, January 2012, 9, http://www.defense.gov/news/Defense_Strategic_Guidance.pdf.
- ¹⁸ *Ibid.*, 8.
- ¹⁹ *Ibid.*, 9.
- ²⁰ “ForeignMilitarySales,” DefenseSecurityCooperationAgency, http://www.dsca.osd.mil/home/foreign_military_sales.htm; Carter Ham (discussion, Defense Writers Group, Washington, D.C., September 14, 2011), U.S. Africa Command, <http://www.afcom.mil/getarticle.asp?art=7205>. General Carter Ham, Commander, U.S. AFRICOM, has stated that while he does not view Chinese military sales in Africa as a competition between the United States and China, he would prefer that African states purchase U.S. equipment, as it would facilitate joint-training and strengthen military-military relations.
- ²¹ Aerospace Industries Association, *2011 Year-End Review and Forecast*, http://www.aia-aerospace.org/assets/YE_Analysis.pdf.
- ²² “Morocco – AIM-9X-2 SIDEWINDER Missiles,” Defense Security Cooperation Agency, May 18, 2011, http://www.dsca.mil/pressreleases/36-b/2011/Morocco_11-01.pdf. For example, two years after Morocco reached an agreement with the United States to purchase F-16s, the DCSA notified Congress of a possible \$50 million FMS package to Morocco consisting of Sidewinder missiles, as well as associated equipment, parts, training and logistical support.
- ²³ Donald F. Blake, “A Realistic Look at USAF Military Assistance and Foreign Military Sales,” *Air University Review* (November-December 1970), <http://www.airpower.au.af.mil/airchronicles/aureview/1970/nov-dec/blake.html>. The Military Assistance Program (MAP) fit into a broader U.S. effort during the Cold War to check Soviet expansion by fostering political, economic, and military relationships with allied and partner states. In particular, MAP sought to strengthen the armed forces of friendly states by providing them with military hardware and training programs. In regard to aircraft, between 1950 and 1970 the USAF provided or programmed approximately 16,750 aircraft, such as the F-5 Freedom Fighter, to 55 states.
- ²⁴ Jane’s International Defense Review: IDR., Volume 41, Jane’s Information Group, 2008, http://books.google.com/books?ei=zvAVT4_3NKjv0G6j82BAw&id=e2I-AQAIAAJ&dq=turboprops+in+vietnam&q=%22during+the+vietnam+war%22#search_anchor.
- ²⁵ “Douglas A-1E Skyraider,” National Museum of the U.S. Air Force, February 15, 2011, <http://www.nationalmuseum.af.mil/factsheets/factsheet.asp?id=297>.
- ²⁶ *Ibid.*
- ²⁷ E. Burrows, “Legends of Vietnam: Bronco’s Tale,” *Air and Space*, March 2010, 4, <http://www.airspacemag.com/military-aviation/Legends-of-Vietnam-Broncos-Tale.html?c=y&page=4>.
- ²⁸ Anthony Tambini, *F-5 Tigers over Vietnam* (Boston: Branden, 2001), 8. Northrop initiated the project after discovering that many NATO and SEATO allies could not utilize existing U.S. fighters and desired an affordable and easily-maintained multi-role fighter.
- ²⁹ Jerry Scutts, *Northrop F-5/F-20* (London: Ian Allan, 1986), 8.
- ³⁰ F.G. Swanborough, *United States Military Aircraft Since 1909* (London: Putnam, 1963), 396-7.
- ³¹ SIPRI, “USA.”; Flightglobal Insight, *World Air Forces 2011/2012*, 8, http://www.flightglobal.com/airspace/media/reports_pdf/empty/90190/world-air-forces-2011-2012.pdf. As of 2011, 518 F-5 remain in service with 23 world air forces.
- ³² *Ibid.* As of 2011, 564 T-38 remain in service with two world air forces. The majority are operated by the USAF.
- ³³ “Cessna T-37B Tweet,” National Museum of the U.S. Air Force, October 11, 2007, <http://www.nationalmuseum.af.mil/factsheets/factsheet.asp?id=381>. In 1959 a more powerful and advanced version of the T-37, the T-37B, entered service. An export version of the T-37, the T-37C, was also developed with provisions for armament and extra fuel.
- ³⁴ “Cessna A-37 Dragonfly,” National Museum of the U.S. Air Force, February 15, 2011, <http://www.nationalmuseum.af.mil/factsheets/factsheet.asp?id=326>. After the successful performance of the A-37As in Southeast Asia, the USAF ordered newly built A-37Bs which included further improvements in power, armament, and fuel capacity.
- ³⁵ Kev Darling, *Tweet and the Dragonfly: the Story of the Cessna A-37 and T-37* (Lulu.com, 2005), 19.

³⁶ SIPRI, “USA.” The A-37 sold particularly well in Latin America. Purchasers included Chile, Colombia, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Peru, and Uruguay. It was also sold to states in Asia such as South Korea, South Vietnam, and Thailand; Flightglobal Insight, *World Air Forces*. As of 2011, 58 A-37 aircraft remain in service with six world air forces. Similarly, 118 T-37 aircraft remain in service with five world air forces.

³⁷ “Air Combat Command (ACC) Light Attack/Armed Reconnaissance (LAAR),” U.S. Air Force, July 27, 2009, https://www.fbo.gov/index?print_preview=1&s=opportunity&mode=form&id=b30065477e7b9159bb2687f2cc2a3667&tab=core&tabmode=list. In 2009 the USAF issued a request for information (RFI) detailing the requirements for a LAAR aircraft to be supplied to Air Combat Command (ACC) starting in (FY) 2012.

³⁸ Graham Warwick and Bill Sweetman, “U.S. Wants COIN Aircraft For Foreign Training,” *Aviation Week*, April 20, 2011, http://www.aviationweek.com/aw/generic/story_channel.jsp?channel=defense&id=news/dti/2011/04/01/DT_04_01_2011_p38-297236.xml. Specifically, the LAS program aims to procure 20 aircraft for the Afghan Air Force and an additional 15 aircraft to meet USAF’s requirement for a LAAR aircraft with which to build partner capacity. Delivery of aircraft to Afghanistan was originally scheduled to begin in April 2013, but that date will likely be pushed back due to litigation issues surrounding the contract.

³⁹ Warwick and Sweetman, “U.S. Wants COIN Aircraft.” In addition to its armament, the AT-6 includes an integrated surveillance/attack mission system supplied by Lockheed Martin as well as an upgraded avionics package based on the A-10C.

⁴⁰ “A-29 Super Tucano Wins Defense Contract in U.S.,” Embraer, December 30, 2011, <http://www.embraer.com/en-US/ImprensaEventos/Press-releases/noticias/Pages/SUPER-TUCANO-VENCE-CONTRATO-DE-DEFESA-NOS-EUA.aspx>. The A-29 was originally designed to fulfill the Brazilian Air Force’s requirement for a light-attack/advanced-trainer aircraft.

⁴¹ Molly McMillin, “Air Force Temporarily Halts Contract After Hawker Beechcraft Suit,” *Wichita Eagle*, January 5, 2012, <http://www.kansas.com/2012/01/05/2163375/air-force-temporarily-halts-contract.html>.

⁴² Andrea Shalal-Esa, “Air Force scraps deal with Embraer, Sierra Nevada,” Reuters, 28 February 2012, <http://www.reuters.com/article/2012/02/29/us-embraer-snc-aircraft-idUSTRE81R1W920120229>; Amy Butler, “USAF Crafts New Light Air Support RFP,” *Aviation Week*, April 6, 2011, http://www.aviationweek.com/aw/generic/story_generic.jsp?channel=aerospacedaily&id=news/asd/2012/04/06/02.xml&headline=USAF%20Crafts%20New%20Light%20Air%20Support%20RFP.

⁴³ Interview with retired Air Force general officer, January 5, 2012.

⁴⁴ *Ibid*; Interview with Air Force major, February 16, 2012.

⁴⁵ Marcus Weisgerber, “Lawmakers Nix Light-Attack Aircraft Proposal,” *Military Times*, October 14, 2011, <http://www.militarytimes.com/news/2011/10/defense-lawmakers-nix-light-attack-aircraft-proposal-101411/>. In 2011 the House Appropriations, House Armed Services, and Senate Armed Services committees rejected a \$17 million request by U.S. Central Command (CENTCOM) for the Combat Dragon II program. In 2010 those same committees rejected a \$22 million Department of Defense request to continue funding for the Navy-initiated Imminent Fury program.; Robert F. Dorr, “Capitol Hill Rejects Light Attack Aircraft Request,” Defense Media Network, October 21, 2011, <http://www.defensemedianetwork.com/stories/capitol-hill-rejects-light-attack-aircraft-request>. The Combat Dragon II program sought to identify a light-attack aircraft for COIN and counterterrorism missions in Afghanistan. CENTCOM argued that a turboprop such as the Super Tucano could provide effective support to ground troops at a dramatically lower cost than jet fighters. Similar to Combat Dragon II, the Imminent Fury program sought to test the effectiveness of light-attack turboprops in Afghanistan. The funding would have enabled the deployment of four leased Super Tucanos to Afghanistan for six months. The Kansas delegation, which favors the HBC AT-6 over the Embraer Super Tucano, pressured the committees to reject funding for Imminent Fury.

⁴⁶ “Remarks by Senator John McCain on the Conference Report of the FY2012 Omnibus Appropriations Bill,” December 16, 2011, http://www.mccain.senate.gov/public/index.cfm?FuseAction=PressOffice.PressReleases&ContentRecord_id=48F0C068-A39A-0237-FB09-7FAF7546FB90. For example, when discussing his opposition to Combat Dragon II, Senator John McCain cited an uncompetitive bidding process for the aircraft selection and the lack of an urgent operational requirement. He also stated that the program was not requested by either the administration or the Pentagon.

⁴⁷ Interview with Richard Aboulafia, March 7, 2012.

⁴⁸ “Advanced Pilot Training (APT) Family of Systems (FoS) Program – Request for Information: Second Request,” U.S. Air Force, August 5, 2009, <https://www.fbo.gov/utlils/view?id=f65874909e984d772cae27f9170b0346>.

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- ⁴⁹ Stephen Trimble, "US Air Force, Industry Prepare for T-38 Replacement," *Flightglobal*, June 22, 2010, <http://www.flightglobal.com/news/articles/us-air-force-industry-prepare-for-t-38-replacement-343393/>.
- ⁵⁰ Stephen Trimble, "USAF delays T-38 trainer replacement to 2020," *Flightglobal*, February 17, 2012, <http://www.flightglobal.com/news/articles/usaf-delays-t-38-trainer-replacement-to-2020-368456/>.
- ⁵¹ "Advanced Pilot Training (APT) Family of Systems (FoS) Program," U.S. Air Force, Federal Business Opportunities, August 5, 2009, https://www.fbo.gov/index?s=opportunity&mode=form&tab=core&id=d493f09e6c5a91bf36509a4fbdccb3e8&_cvi_ew=0. The five desired training tasks for the T-X aircraft are sustained high-G operations, air-refueling, night vision imaging systems operations, air-to-air intercepts, and data-link operations.
- ⁵² Stephen Trimble, "Lockheed Ponders T-50 Re-Engining for T-X Programme," *Flightglobal*, May 24, 2011, <http://www.flightglobal.com/news/articles/lockheed-ponders-t-50-re-engining-for-t-x-programme-357148/>.
- ⁵³ Amy Butler, "Alenia Proposing M-346 for U.S. Trainer," *Aviation Week*, September 24, 2009, http://www.aviationweek.com/aw/generic/story_channel.jsp?channel=defense&id=news/M346092409.xml&headline=Alenia%20Proposing%20M-346%20for%20U.S.%20Trainer. Alenia, an Italian company, is still considering whether or not to partner with a U.S. partner. Currently the M-346 has 52% U.S. content, but Alenia officials intend to increase that to over 60%.; Amy Butler, "Contractor Teams Shaping Up for T-X Work," *Aviation Week*, September 29, 2011, http://www.aviationweek.com/aw/generic/story.jsp?id=news/awst/2011/09/26/AW_09_26_2011_p34-373061.xml&channel=defense. Alenia is working on a light-attack kit concept that would allow the T-100 to be armed and serve in close air support roles during combat and then de-armed and returned to training. Partner candidates include Boeing, Raytheon, and L-3 Communications.
- ⁵⁴ Amy Butler, "T-X Mating Dance Continues With Industry and Congress," *Aviation Week*, September 21, 2011, <http://www.aviationweek.com/aw/blogs/defense/index.jsp?plckController=Blog&plckBlogPage=BlogViewPost&wspaperUserId=27ec4a53-dcc8-42d0-bd3a-01329aef79a7&plckPostId=Blog%3A27ec4a53-dcc8-42d0-bd3a-01329aef79a7Post%3Ab5723c92-fe9a-41b5-b541-871fd660848a&plckScript=blogScript&plckElementId=blogDest>.
- ⁵⁵ "L-3 Link Simulation & Training Joins BAE Systems Hawk AJTS Team to Pursue U.S. Air Force T-X Contract," BAE Systems, Inc., January 12, 2012, http://www.marketwatch.com/story/l-3-link-simulation-training-joins-bae-systems-hawk-ajts-team-to-pursue-us-air-force-t-x-contract-2012-01-12?reflink=MW_news_stmp.
- ⁵⁶ Butler, "Contract Teams Shaping Up." For the T-X competition, Lockheed Martin and KAI would take on more U.S. supplier content and find a domestic assembly location.
- ⁵⁷ Trimble, "USAF delays T-38 trainer replacement."
- ⁵⁸ Jay Menon, "BAE Wins New Trainer Order from India," *Aviation Week*, December 12, 2011, http://www.aviationweek.com/aw/generic/story.jsp?id=news/awx/2011/12/12/awx_12_12_2011_p0-405197.xml&channel=defense. The BAE Hawk T2 can be used as a ground attack or air defense aircraft and is capable of carrying rockets, bombs, and air-to-air missiles; "No. 76 Squadron," Royal Australian Air Force, <http://www.airforce.gov.au/units/76sqn.aspx>. They Royal Australian Air Force uses it BAE Hawk 127s both for lead-in flight training and to provide close air support to Army operations; Greg Waldron, "PICTURES: KAI Rolls Out First Production T/A-50," *Flightglobal*, January 26, 2011, <http://www.flightglobal.com/news/articles/pictures-kai-rolls-out-first-production-ta-50-352346/>. In addition to serving as a lead-in fighter, the T/A-50 can carry air-to-air and air-to-surface weapons.
- ⁵⁹ SIPRI, "China."
- ⁶⁰ *Flightglobal* Insight, *World Air Forces 2011/2012*, http://www.flightglobal.com/airspace/media/reports_pdf/empty/90190/world-air-forces-2011-2012.pdf; Jay Menon, "BAE Wins New Trainer Order from India," *Aviation Week*, December 12, 2011, http://www.aviationweek.com/aw/generic/story.jsp?id=news/awx/2011/12/12/awx_12_12_2011_p0-405197.xml&channel=defense.
- ⁶¹ Bradley Perrett, "Indonesia Orders 16 T-50s From Korea Aerospace," *Aviation Week*, May 27, 2011, http://www.aviationweek.com/aw/generic/story_channel.jsp?channel=defense&id=news/asd/2011/05/27/05.xml; Florante S. Solmerin, "Spratlys Arms Race Heats Up; AFP to Buy Six Fighter Jets," *Manila Standard Today*, July 2, 2011, <http://www.newsflash.org/2004/02/hl/hl110929.htm>.
- ⁶² Jung Sung-ki, "Source: Singapore Chooses Italy's M-346 Trainer Jet," *DefenseNews*, July 1, 2010, <http://www.defensenews.com/article/20100701/DEFSECT04/7010310/Source-Singapore-chooses-Italy-s-M-346-Trainer-Jet>; Siva Govindasamy, "UAE Stops Talks With Alenia Aermacchi on M-346 Contract," *Flightglobal*,

February 24, 2011, <http://www.flightglobal.com/news/articles/uae-stops-talks-with-alenia-aermacchi-on-m-346-contract-353563/>. Alenia previously discussed a fighter variant of the M-346 with the United Arab Emirates.

⁶³ Interview with Air Force major, February 16, 2012.

⁶⁴ Interview with retired Air Force general officer, January 5, 2012.

⁶⁵ Interview with retired Air Force general officer, January 9, 2012.

⁶⁶ Interview with retired Air Force general officer, January 5, 2012.

⁶⁷ Flightglobal Insight, *World Air Forces 2011/2012*, 8,

http://www.flightglobal.com/airspace/media/reports_pdf/emptys/90190/world-air-forces-2011-2012.pdf. “Active”: Aircraft in day-to-day use; Stephen Trimble, “Egypt Named as F-16 Sales Candidate,” Flightglobal, January 28, 2009, <http://www.flightglobal.com/news/articles/egypt-named-as-f-16-sales-candidate-321733/>.

⁶⁸ F-16.net, http://www.f-16.net/f-16_user.html. Only four of the 13 states that purchased the F-16 between 2000 and 2010 were acquiring it as a new airframe The four states acquiring the F-16 as a new airframe between 2000 and 2010 were Chile, Italy, Morocco, and Oman.

⁶⁹ Mark Thompson, “Sticker Shock: Iraqi F-16s \$165 Million Each,” *TIME* Battleland, September 28, 2011, <http://battleland.blogs.time.com/2011/09/28/sticker-shock-iraqi-f-16s-165-million-each/#ixzz1ZFsmXwOf>. The base price of the new F-16s being sold to Iraq is \$165 million a plane; SIPRI, s.v. “Transfers.” As a reference for used F-16 sales, in 2009 the Netherlands agreed to sell Chile 18 F-16C aircraft for \$15 million each.; Siva Govindasamy, “Singapore Confirms Order for M-346 Trainer,” Flightglobal, September 28, 2010, <http://www.flightglobal.com/news/articles/singapore-confirms-order-for-m-346-trainer-347885/>. Singapore recently ordered Alenia Aermacchi M-346s at a price of \$28.3 million per aircraft.; “Hawk T2,” RAF Valley, <http://www.raf.mod.uk/rafvalley/aboutus/ajt.cfm>. Currency calculation performed via Wolfram Alpha at <http://www.wolframalpha.com/input/?i=convert+450+million+pounds+to+dollars+on+24+october+2006>. The estimated cost for a BAE Hawk T2 is \$30.1 million.; “Korea’s T-50 Family Spreads Its Wings,” Defense Industry Daily, January 5, 2012, <http://www.defenseindustrydaily.com/koreas-t-50-spreads-its-wings-04004/>. The estimated cost for a KAI T-50 is \$20 million.

⁷⁰ The financial logic that has led to the fielding of advanced jet trainers by air forces in the developed world applies equally to states in the developing world. Advanced jet trainers, and their fighter variants, are cheaper to operate and maintain. Training the air crew also places less of a burden on government coffers. This economy of operation is one of the reasons air forces chose to operate the F-5 rather than buying used F-4 Phantoms, although the later was more capable.

⁷¹ Richard Aboulafia, “Market Overviews: Trainer/Light Attack Aircraft,” June 2011, Teal Group Corporation.

⁷² Interview with Richard Aboulafia, March 7, 2012.

